Article

Building the Cognitive Enterprise in the Energy Sector

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Abstract: Currently, emerging technologies support many problems arising in the energy industry. The "cognitive enterprise" concept, introduced by the IBM company, assumes that emerging technologies are used together with cognitive workflows to increase enterprise intelligence. The pursuit of enterprises from the energy sector to obtain the status of a cognitive enterprise requires the use of many emerging technologies, including cognitive technologies. Thus, the aim of the paper was to present the current state of research and identify the core components of the cognitive enterprise. To analyze the trends and challenges in scientific research development, the bibliometric approach was used. The analysis was made by means of the Web of Science and Scopus platforms; 70,177 records were retrieved. The results comprise the geographic distribution of research and the time analysis as well as the author and affiliation analysis. Additionally, descriptive statistics are provided. Consequently, the research milestones regarding the transformation of the traditional energy enterprise into the cognitive enterprise were defined. The findings of this research have supported the construction of the conceptual framework of the core transformation components for the cognitive energy enterprise. The study have several theoretical and practical implications. The proposed framework could be used to assess the level of readiness for transformation from the traditional to the cognitive energy enterprise. The discovered scientific gaps can constitute future research directions on cognitive enterprise concept.

Keywords: cognitive enterprise; energy sector; bibliometric analysis; transformation; framework; business process management

1. Introduction

Digital transformation is driving the development of modern organizations in many industries. The increasing adoption of emerging technology is especially important, enabling organizations to generate new value by improving their reactivity and resilience, situational awareness, agility, and operational excellence [1]. The following technologies are especially meaningful for enterprises: big data (BD), artificial intelligence (AI), cognitive computing (CC), Internet of Things (IoT), blockchain, robotic process automation (RPA), and edge computing (EC), etc. Currently, many of these technologies empower modern enterprises. Moreover, they have become the main advantage of the "cognitive enterprise" (CE) concept, which was introduced several years ago by the IBM company [2]. A cognitive enterprise is, in simple terms, the application of cognitive and other emerging technologies to enterprise business needs. According to Ramadoss, a cognitive company is "one that invests in data and technologies that allow all workers, particularly knowledge workers, to perform at higher, more efficient and more productive levels" [3].

The IBM company concept was created based on several areas: people and their skills, organizational culture, technology, and management [2]. The intelligence conveyed from AI requires a new organizational culture [3]. The companies which use cognitive computing have a deep understanding of the customers and their profiles [3,4]. They apply artificial intelligence and automation to create and enable new experiences and foster an enterprise culture based on learning and adaptation [3,4]. Thus, customer-facing workflows must be enabled by artificial intelligence, RPA, and machine learning, and together with the

above framework for thinking and learning systems, provide the opportunity to humanize business delivery to customers [3,4].

Furthermore, according to the IBM experts' opinions, the convergence of new exponential technologies such as AI, automation, IoT, blockchain, and 5G give the power to change business models, reinvent processes, and redesign the way of working toward the cognitive enterprise [5] (p.4).

However, an enterprise should overcome many challenges during the transformation. One of the most meaningful areas is that, driven by a culture of agile innovation. The CE embraces "new skills, workforces, and ways of working" [5] (p.7). Leaders need to enable cross-functional multidisciplinary teams to make effective decisions. According to IBM, the enterprise needs to fill "not just regular gaps in technology skills, but widespread and frequent changes in all kinds of skills across the workforce" [4] (p. 45). "This means leaders need to master the skills agenda and continually evaluate where new skills are needed and how best to support employees acquire those skills" [4] (p. 46). Effective training programs and self-service learning systems should be applied [4]. "The deliberative skills agenda" which includes "skills gap analysis and review of recruitment, training, and management programs" should be constructed [4] (p. 46). Intelligent leadership, skills, and culture, create a perspective of continuous learning as well as the agile management of skill reassignment along intelligent workflows.

Additionally, next-generation enterprise resource planning (ERP) systems could serve as the backbone of the cognitive enterprise. Based on this backbone, workflow uses external and internal data and exponential technology to integrate traditional processes [6,7]. For example, by extending the legacy of ERP financial journal entry processes with intelligent robotic process automation (RPA), companies can automate the capture, extraction, and validation of financial journal data from email and other sources [5].

Moreover, according to the Tietoevry company point of view, there is a connection between sustainability and cognitive enterprise concepts [8]. They underline the importance of creating a sustainable and innovative culture throughout the organization [8].

To overcome the challenges and to mitigate the risks of rapid changes, organizations need to apply the right methods and strategies, mindsets, and technologies to bring teams together and unlock their power across the enterprise in their journey to becoming a cognitive enterprise [5]. Moreover, IBM argues that "human-technology partnership and use of new skills and culture must underpin platform and workflow transformation, and cannot be started too soon. At the same time, these aspects are some of the hardest to durably change" [5] (p. 10).

This idea gave the impulse to the research presented in this paper. The aim was to analyze the literature on the topic and define the core transformation components for a CE. These components could be used as the basis for future research on the CE concept implementation.

The CE concept could be applied in many economic sectors. Due to continuous transformation, one of the most challenging sectors is the energy industry. Additionally, energy is the world's largest industrial sector, and it is about 70% of the world's GDP [9]. According to IBM, "modern enterprises need novel approaches to build new platforms and capabilities while maintaining, modernizing, and operating legacy environments" [5]. Thus, emerging technologies are intended to deal with the problems in energy enterprise management.

In addition, due to continuous transformation of the energy enterprise, many skill lifecycles in this sector, and their relevance, are getting shorter and shorter. Thus, a cognitive enterprise should create a culture of continuous learning and establish a set of new approaches. This new culture would value learning and embraces soft skills (such as collaboration) over specific technical or business skills [4].

Considering the afore-mentioned challenges, the energy sector was selected as the subject of research. The bibliometric method was used to provide the analysis of the potential of the scientific research on the CE topic and conduct a quantitative literature

review. While bibliometrics is considered an interdisciplinary science focused on the quantitative analysis of bibliographic data using statistical and mathematical tools [10], it allows for the definition of theoretical frameworks and the formulation of hypotheses that guide the way to novel research. The following core features of the bibliometric method were used: the possibility to draw valuable conclusions [10], using easy to manage and objective information [11], facilitating decision-making, and channeling the researcher's efforts [12].

It should be noted that the CE is a novel concept and only several scientific manuscripts were published in this area. Thus, in this paper, the bibliometric analysis aims to present the potential of the research on the core elements of the cognitive enterprise.

2. Materials and Methods

The bibliometric analysis is a popular literature review method in the energy sector [13]. Different topics have been discussed in two last decades [14–25]. However, despite the substantial number of studies presenting a bibliometric analysis in the energy sector, there are few scientific studies on the cognitive enterprise concept.

The research procedure can be described by the steps presented in Figure 1.
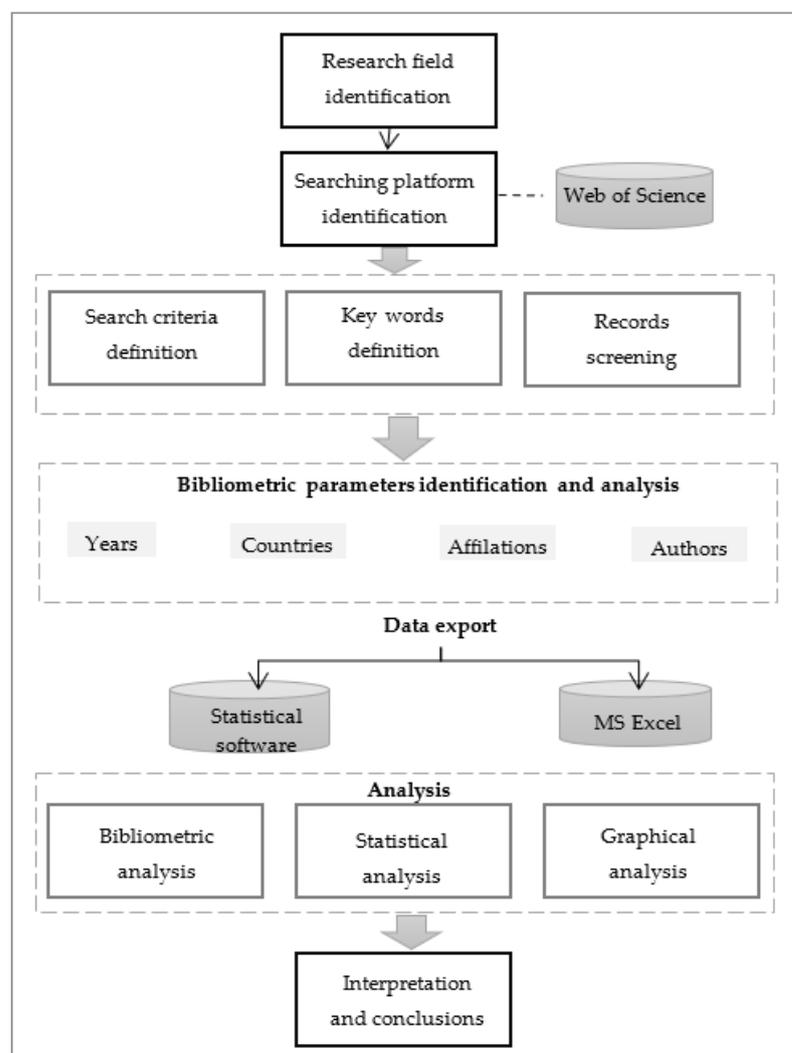

Figure 1. The methodological framework of publication analysis.

The procedure begins with the identification of the research field. After defining the field studied, the first challenge in the bibliometric study is the choice of the scientific

research platform to be used [26]. The choice of the scientific research platform is one of the actions that has a significant impact on the bibliometric analysis; therefore, it must be well planned in order to obtain the appropriate results and avoid any reworking. The bibliometric parameters such as research area, affiliation, country, institution, citations, and authors, etc., could be extracted from scientific research platforms. The combination of one or more platforms for mining the scientific data can result in a more consistent bibliometric analysis, and, in the same time, can increase the difficulty in comparison [26]. Integrating information from disparately structured platforms is becoming increasingly difficult, and although computational tools exist to support this data integration still need to be significantly improved [26]. Moreover, the different research platforms contain different tools for mining scientific data.

In [26] the authors mentioned the following difficulties in mining the data using various databases:

(a)   Differences in the classification of information they accept; the returned results may not be the same;

(b)   The variation in the article count is explained by the different search parameters used and the specific scope of each platform. The differences in results produced by platforms are addressed in [26–30].

For the above reasons, the literature survey presented in this paper focuses exclusively on the Web of Science database.

When the platform selection has been completed, the search criteria and keywords should be identified. After the data extraction, different types of analysis could be used, such as statistical analysis, bibliometric analysis using different software tools, such as VOS Viewer and graphical analysis.

At the result stage, the following bibliometric parameters were analyzed: research fields, years, countries, affiliations, and authors.

The final stage of the research contains the discussion on the results' interpretation and the conclusions.

3. Results

The data was extracted from the WoS database at the end of July 2022 (Table 1).

Table 1. The results of the bibliometric analysis of publication number on CE technologies in the energy sector.

Year	Blockchain	Big Data	AI	5G	IoT	EC	RPA
2013	0	115	506	241	200	0	8
2014	1	261	616	308	375	0	11
2015	0	817	809	436	717	6	16
2016	7	1210	885	658	1204	34	18
2017	59	1421	1200	945	1896	149	24
2018	267	1649	1393	1291	2896	407	44
2019	445	1956	2344	1230	3467	752	33
2020	609	1938	3009	1801	3531	991	37
2021	823	2137	4444	1503	3741	1152	51

The following key words were defined based on emerging technologies included in the CE concept: "5G", "blockchain", "big data", "artificial intelligence", "IoT", "edge computing", and "robotic process automation" (Table 1). Used together with "energy" as a keyword the statistics were extracted from WoS database: "5G" AND "energy", and "Blockchain" AND "energy", etc.

A statistical analysis was also performed (Table 2).

The descriptive statistics presented in Table 2 show that IoT technology had the highest median and mean value, while AI technology obtained the highest maximum position.

Additionally, the correlation analysis is presented in Appendix A. Table A1 shows the correlation results.

Table 2. The descriptive statistics of publication number on cognitive technologies.

	Blockchain	BD	AI	5G	IoT	EC	RPA
Mean	246	1278	1690	935	2003	388	26.9
Median	59	1421	1200	945	1896	149	24
Sum	2211	11,504	15,206	8413	18,027	3491	242
SD	312	741	1326	558	1436	462	15.1
Minimum	0	115	506	241	200	0	8
Maximum	823	2137	4444	1801	3741	1152	51

In the first stage, the total number of publications was analyzed. The largest number of studies was found in the field of AI applications in the energy sector (Figure 2). The number of publications has been constantly growing. The research on edge computing and blockchain has started to increase in popularity since 2016. The RPA applications had the lowest popularity.
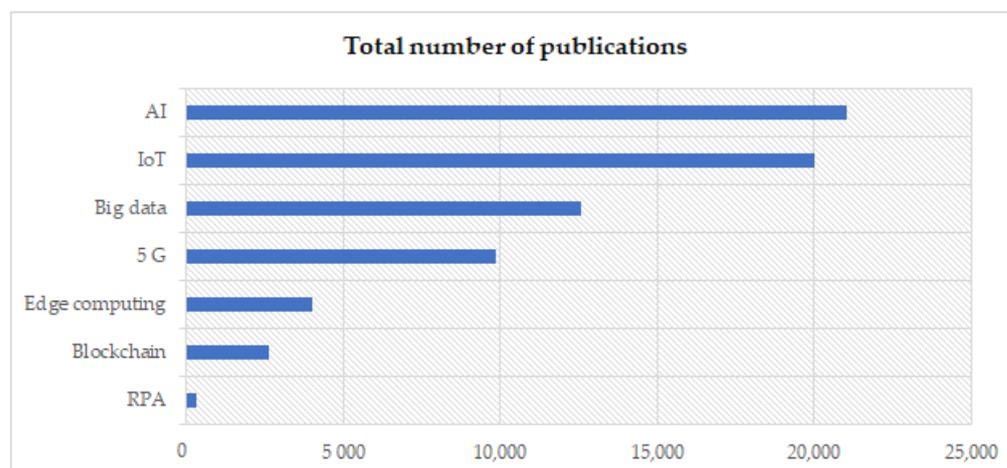

Figure 2. Publication analysis on emerging technologies in the energy industry by technologies (all the years).

The detailed analysis of publication dynamics reveals the rapid increase in the number of papers on IoT in energy sector. The research area on IoT technology had the highest growth rate over the last few years, while the largest number of papers was published in the area of AI applications (Figure 3). Moreover, according to the descriptive statistics presented in Table 2, the number of papers in IoT was the highest between 2013 and 2021, while edge computing and blockchain are relatively novel areas of research and the number of papers in these areas was the lowest.

Figure 4 describes another perspective in publication dynamics. While the previous Figure better shows the growth rates, Figure 4 presents the general tendencies and values. An overall upward trend was noticed. However, this overall upward trend was disrupted in some cases such as with 5G and big data.

Analyzing the publications in the energy industry by countries, the results show that the largest number of publications were developed in RP China—from 11.4% for IoT to 53.1% for edge computing—and in the USA—from 16.4 to 19.7% (Figure 5). A large share was also achieved in India and South Korea with the results from approximately 7 to 11 %. In Europe, England was at the leading position in this area with from 4 to 7.5% share. High positions were also obtained in Germany, Italy, France, and Spain with values from 2 to 5% of publications. Among all the technologies studied, only research on RPA was dominated

by the USA. Due to the huge difference in the number of publications between China and the rest of the world, Figure 5 presents the results for two leading countries, China and the USA.
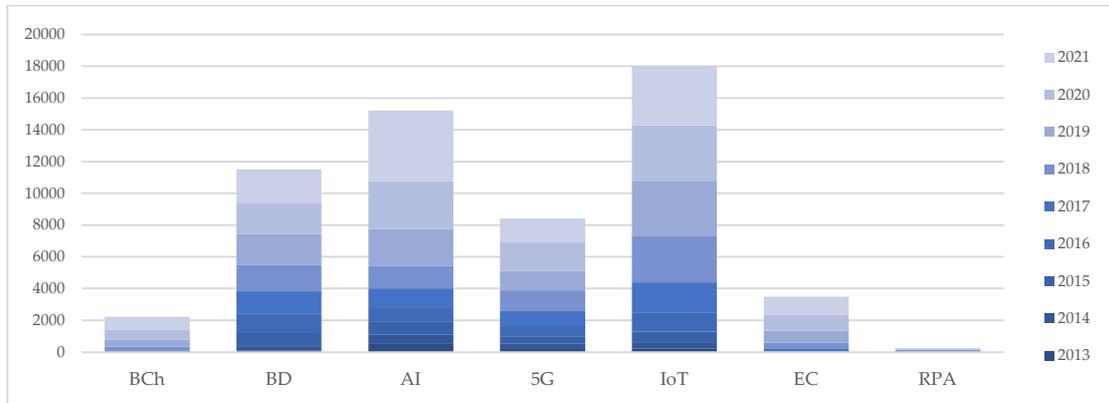

Figure 3. The publication analysis on emerging technologies from 2013 to 2021.
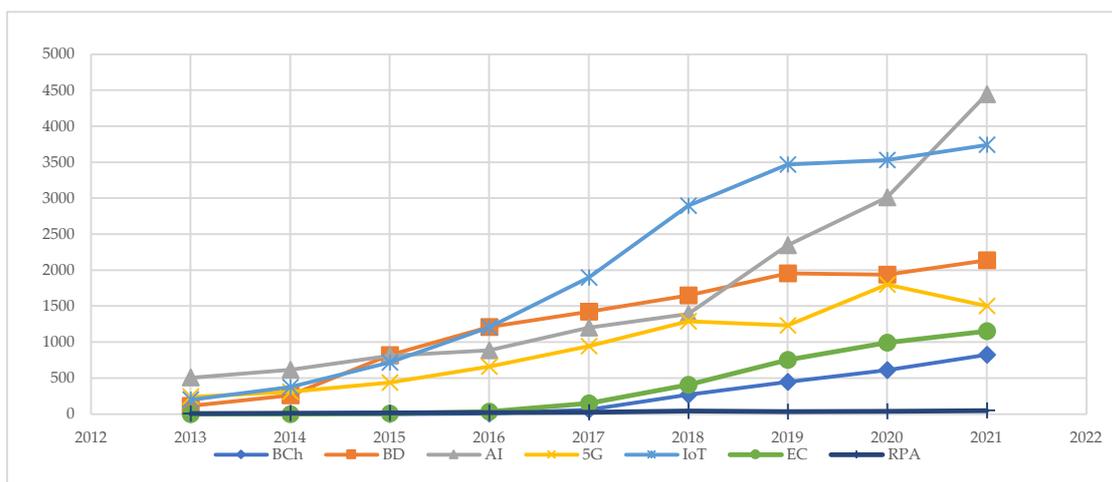

Figure 4. Publications analysis on emerging technologies from 2013 to 2021.

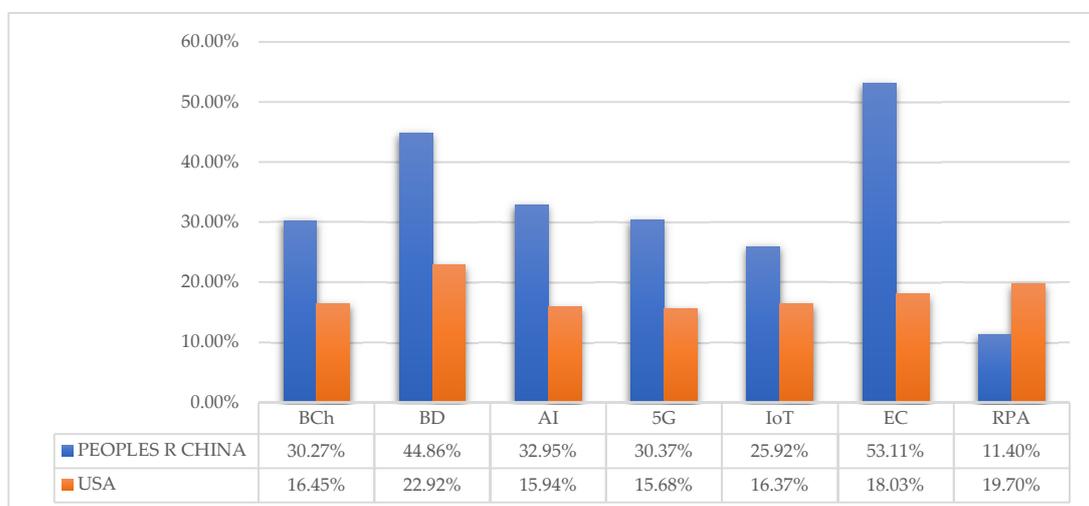|	BCh	BD	AI	5G	IoT	EC	RPA
PEOPLES R CHINA	30.27%	44.86%	32.95%	30.37%	25.92%	53.11%	11.40%
USA	16.45%	22.92%	15.94%	15.68%	16.37%	18.03%	19.70%

Figure 5. Publications analysis by countries.

An affiliation analysis revealed the significant research concentration in several institutions, such as the Chinese Academy of Science, United States Department of Energy—DOE, Beijing University of Posts Telecommunications, University of California System, University of Electronic Science Technology of China, University of Petroleum Energy Studies—UPES, and Nanyang Technological University (Figure 6). The Chinese Academy of Science obtained a leading position in the following areas: AI, 5G, IoT, edge computing, and RPA, while the DOE obtained a leading position in big data applications. Nanyang Technological University obtained a leading position in blockchain technologies. In the case of RPA, the best results were obtained by the DOE and the Chinese Academy of Science, and they were similar.
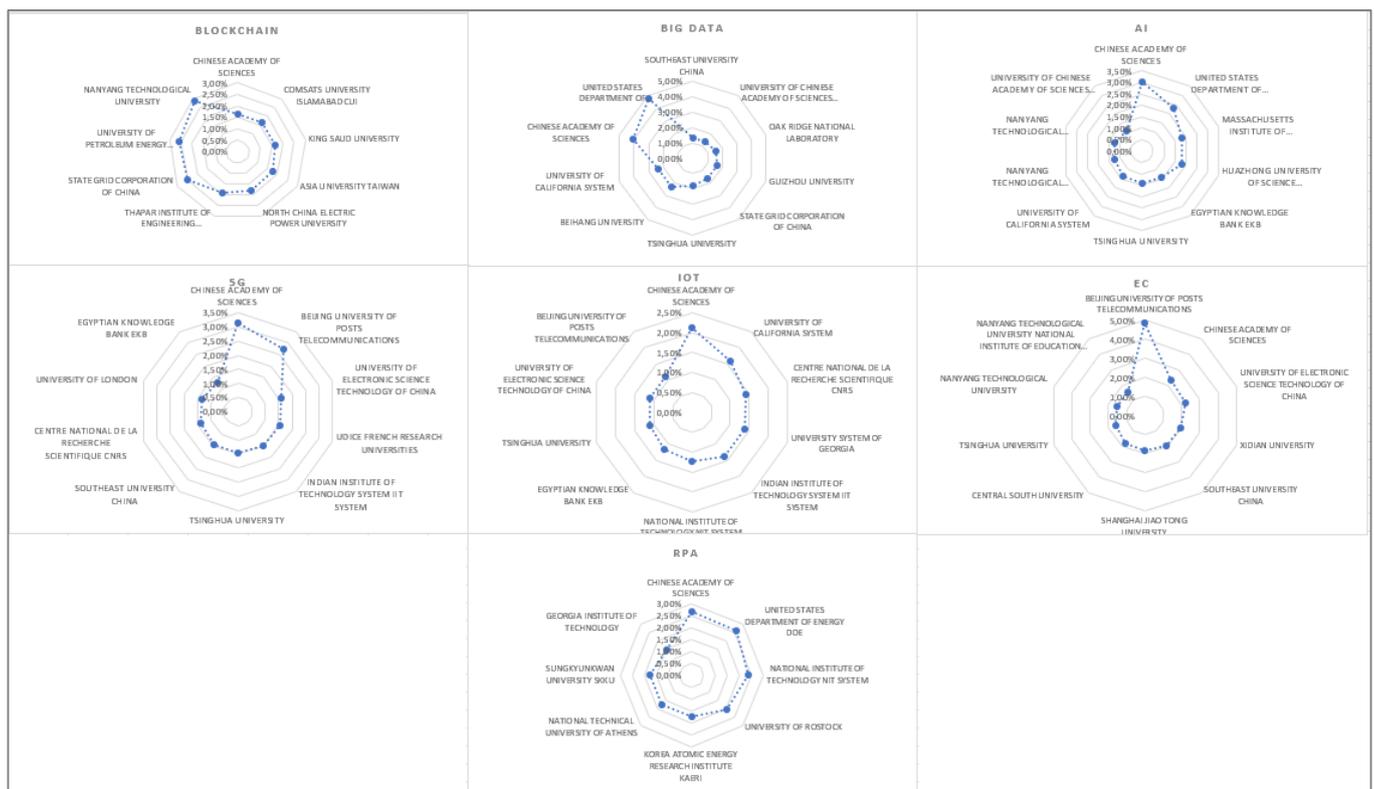

Figure 6. Publication analysis by affiliations.

The authors' analysis revealed a research concentration around the following persons (Figure 7): Zhang Y—the leading position in AI with 133 of papers, 5G with 87 of papers, IoT with 138 of papers, and edge computing with 67 of papers; Wang J—the leading position in big data with 115 of papers; Kumar N—the leading position in blockchain with 51 of papers.
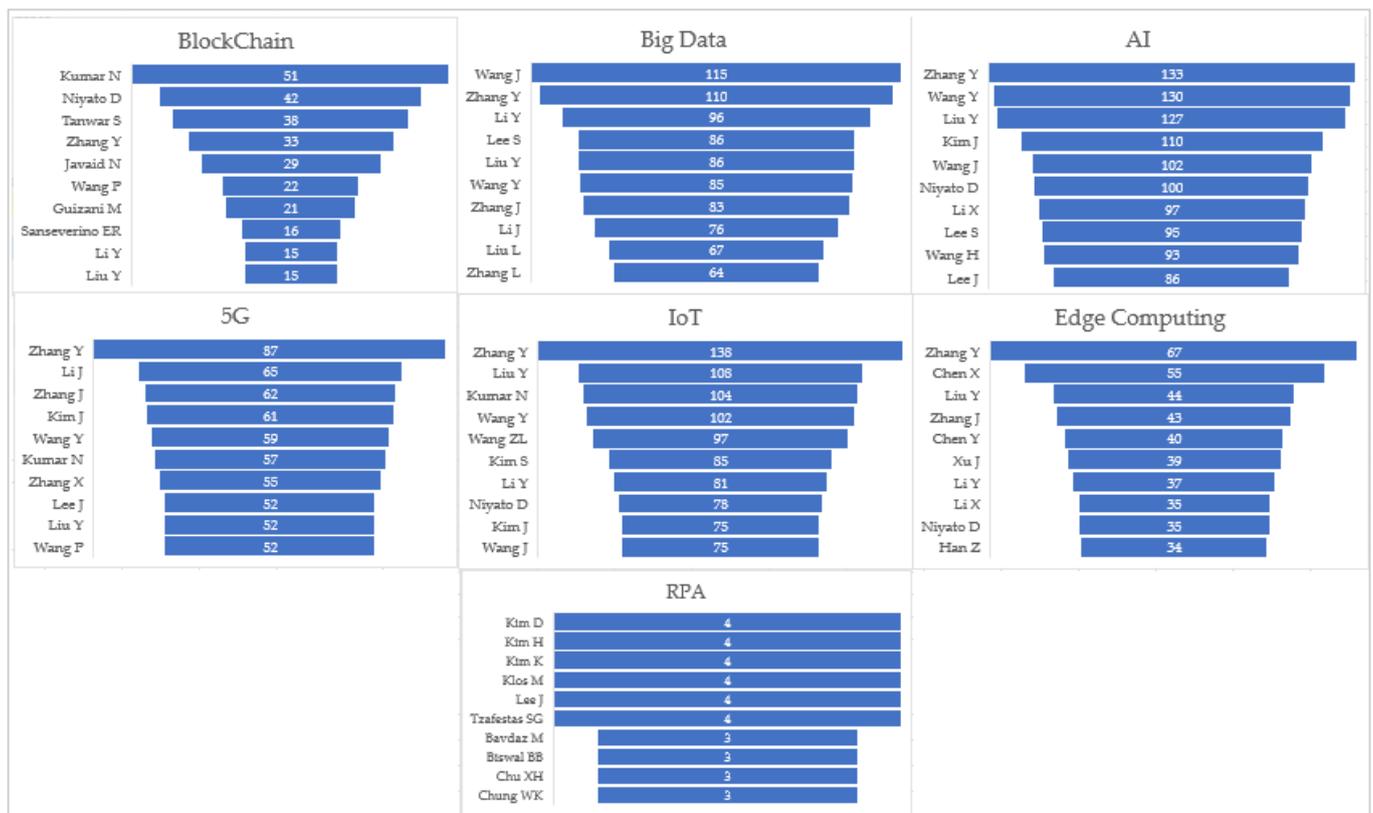
Figure 7. Publication analysis by authors.

4. Discussion

The research revealed many scientific challenges on the path toward CE. The first problem is the nature of CC. According to [31] "interdisciplinary cognition-inspired computing still grapples with fundamental long-standing problems in building computational models and decision-making mechanisms based on the neurobiological processes of the brain, psychology and cognitive science". Second, the small number of influential academic publications in core areas such as cognitive enterprise, cognitive business process management (BPM), and skills transformation was noted [32]. The search results based on the keywords "cognitive enterprise" AND "energy" have not yet been found in the Web of Science database. Third problem is the need to rethink core management concepts such as BPM, knowledge management, and human resources, etc. Finally, the noticeable geographical research concentration with the leading position of several countries such as China, United States of America, India, and South Korea as well as the top institutions' leading positions, such as the Chinese Academy of Science, United States Department of Energy—DOE, Beijing University of Post Telecommunications, University of California System, University of Electronic Science Technology of China, University of Petroleum Energy Studies—UPES, and Nanyang Technological University

The following research results were used to create the research milestones framework:

- The research is highly focused in several countries and in several institutions and research teams;
- There is a lack of scientific research on the cognitive enterprise concept;
- There is a small number of scientific publications on cognitive issues in visualizations, dashboards, and ERP systems in the energy sector.
- There is a small number of scientific publications on blockchain and edge computing due to their novelty;
- There is a lack of research on the connection of the United Nations (UN) sustainable development goals (SDG) and the cognitive enterprise concept.

Additionally, during the previous research, the following milestones related to the cognitive computing topic were retrieved [32]:

- A decreasing trend in publications on cognitive computing during the 2020–2021 year;
- Cognitive-inspired computing still struggles with fundamental, long-standing problems in building computational models and decision-making mechanisms [31];
- The need for reinventing core management areas such as BPM, knowledge management, and human resources, etc.;
- The small number of scientific publications with a high impact in core areas such as cognitive enterprise, cognitive BPM, and competence transformation in the energy industry [32];
- The noticeable geographical research concentration with leading positions of certain countries such as the USA, China, and Germany.

Taking into consideration the results obtained from previous research on cognitive computing analysis [32] it could be concluded that more research should be undertaken to provide novel methods to support the process of transformation from traditional energy enterprises to cognitive energy enterprises.

All the above-mentioned findings were combined in the one complex framework as shown in Figure 8.

Cognitive Energy Enterprise			
Lack of scientific publications on cognitive enterprise concept	Need of reinventing the core management concepts	Small number of publications on competences transformation	Lack of works on UN SDG and CE connection
Small number of publications on cognitive BPM and cognitive workflow	Small number of publications on cognitive issues in visualization, ERP systems and dashboards	CC still struggle with problems in building computational	Reduction of publication number on CC in 2020-2021
Publication concentration in several institutions and teams	Publication concentration in several countries	Small number of publications on Blockchain and Edge computing	Small number of publications on some AI techniques
Traditional Energy Enterprise			

Figure 8. Research milestones in the transformation of energy enterprises into the cognitive enterprises (own preparation based on [32]).

Thus, Figure 8 presents the milestones divided into three levels from the more detailed to the more common: the technology level, the cognitive issues level, and the common challenges in core transformation elements. The list of challenges is open and could be expanded in future research. The number of developed milestones was used as the basis for the transformation framework construction.

Based on the bibliometric study and taking into consideration the results of IBM company research, the core transformation perspectives and their elements for the cognitive energy enterprise (CEE) were defined (Figure 9). Adapted from 7-S model [33], IBM's frameworks [2–5], and the Tietoevry opinion [8], the CEE was divided into eight perspectives.

According to the IBM company the core elements of a successful CE are [34]: "The AI, and it's combination with a range of emerging technologies, proprietary data—properly harnessed with clear intent and proactive approach to talent and skills-building".

The list of emerging technologies related to the CE concept could remain open. According to IBM opinion, in the near future businesses are going to invest in the following emerging technologies: "mobile—71%, IoT—54%, cloud computing—54%, AI/Cognitive

technologies—26%, RPA—21%, Virtual reality—16%, robots—16%, augmented reality—15%, 3D printing—11%, blockchain—10%" [35].
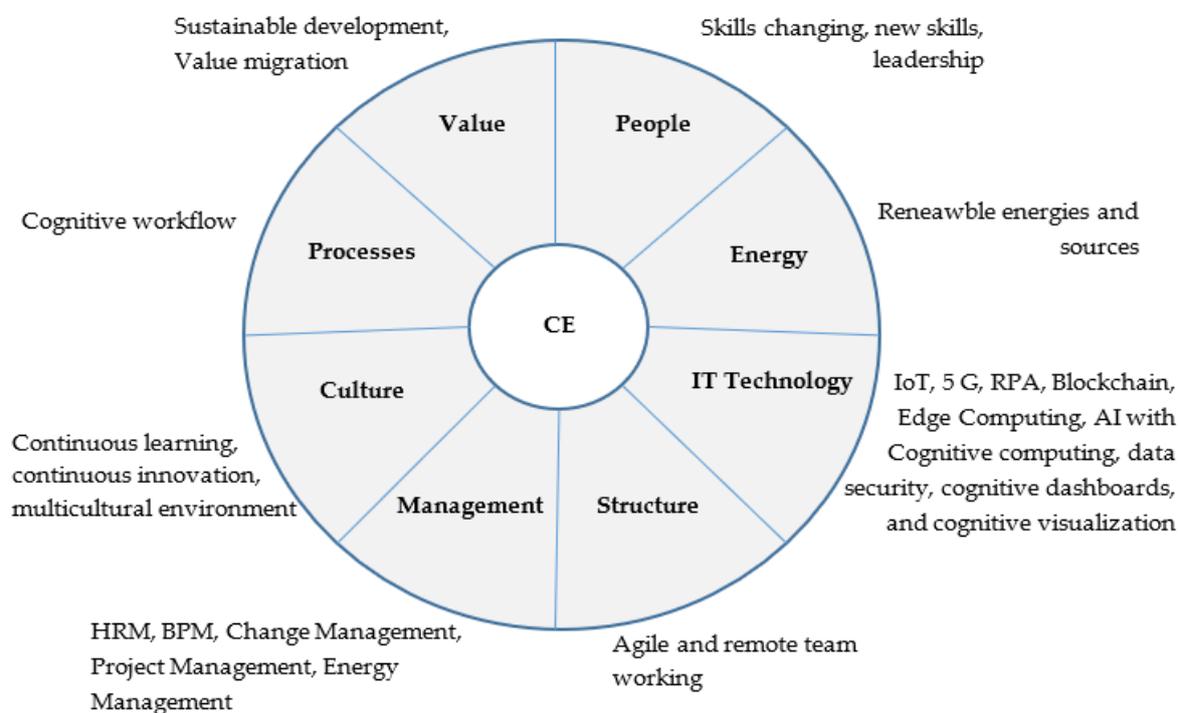

Figure 9. A conceptual framework of the CE core transformation perspectives.

Moreover, IBM leaders have frequently mentioned the importance of culture transformation, related management concepts' rethinking, business process automation with the means of a cognitive workflow, and structural changes from traditional to remote and with more agility.

Finally, the eight core transformation perspectives were defined as: people, energy, IT technology, structure, management, culture, processes, and values. Here, IBM's idea was summarized and extended with energy, sustainable development, and value migration components. First, the digital economy and the established SDG lead to value migration [36]. Intelligent workflows' capabilities are designed and delivered in modules using cloud-centric approaches and they also deliver the new value [5]. Moreover, the CE unlocks new pools of value by applying exponential technology and recalibrating skills with skill maps, resources, technology across workflows, prioritizing automation, standardization, and differentiation [5].

Due to new energy technologies and sources, new skills in renewable technologies will be required [37,38]. Moreover, COVID-19 and other reasons for changes in the methods of communication lead to agile and remote multicultural team-working [34]. Some management concepts should be reconsidered: human resource management, business process management, energy management, change management, and project management.

All the components of the framework are interrelated. For example, applying emerging technologies and realigning skills helps to capture new value pools by mapping skills, assets, and technologies across workflows to determine priorities for automation, standardization, and differentiation.

The present research has several limitations. First, the data was analyzed by means of the WoS database analysis tool, which is restricted to the WoS's capability for analysis. Although the WoS database is very comprehensive and valid, it is better to analyze additionally other databases [39]. On the other hand, it allows the avoidance of several difficulties and challenges previously mentioned in the Materials and Methods section. An-

other limitation is that the research includes publications in English and it is recommended that future research includes documents published in other languages.

5. Conclusions

Due to the current transformation of the energy industry, the application of the CE concept could be more difficult than in other sectors. According to IBM company, different methods and novel approaches could be applied to support the CE transformation. For example, the "Garage" method could be applied for envisioning the transformation from the traditional to the cognitive enterprise [34]. They also emphasize the importance of the introductory "think stage" of the "Garage" method when the core strategic objectives, blueprints and migration plans should be defined [34].

To support the sustainable dissemination of the CE concept in the energy sector the developed by author milestone framework could be used to define the areas where there is a lack of research. Considering the discovered scientific milestones, the risks associated with the introduction of the CE concept to the energy sector could be high. In order to reduce the risks, an assessment of energy enterprise readiness for the implementation of the CE concept could be conducted.

Thus, this research has several theoretical and practical implications. The CE concept could be adapted to the energy sector's purposes by using the framework presented in Figure 9. It should be noted that the framework has a conceptual character and will be extended. Its components could be applied to ascertain whether the energy enterprise is prepared for transformation or not. The AI techniques and methods could help to support the process of assessment and to define the level of preparation needed for transformation at each step of the journey. The discovered scientific gaps on different transformation elements of CE concept could become the perspective for future research.

Data Availability Statement: The data retrieved from the WoS database can be sent upon request.

Conflicts of Interest: The author declares no conflict of interest.

Appendix A

Table A1. Correlation Matrix.

		Blockchain	BD	AI	5G	IoT	EC	RPA
Blockchain	Pearson's r	—						
	p-value	—						
BD	Pearson's r	0.820	—					
	p-value	0.007	—					
AI	Pearson's r	0.982	0.818	—				
	p-value	<0.001	0.007	—				
5G	Pearson's r	0.877	0.934	0.837	—			
	p-value	0.002	<0.001	0.005	—			
IoT	Pearson's r	0.904	0.964	0.867	0.967	—		
	p-value	<0.001	<0.001	0.002	<0.001	—		
EC	Pearson's r	0.994	0.846	0.968	0.906	0.928	—	
	p-value	<0.001	0.004	<0.001	<0.001	<0.001	—	
RPA	Pearson's r	0.876	0.906	0.850	0.909	0.938	0.868	—
	p-value	0.002	<0.001	0.004	<0.001	<0.001	0.002	—

References

1. Elia, G.; Margherita, A. A conceptual framework for the cognitive enterprise: Pillars, maturity, value drivers. *Technol. Anal. Strateg. Manag.* **2021**, *34*, 377–389. [CrossRef]
2. Building the Cognitive Enterprise: Nine Action Areas Core Concepts. Available online: https://www.ibm.com/downloads/cas/VPGQAGEY (accessed on 17 July 2022).
3. Ramadoss, B. Enabling A Cognitive Enterprise. The Cognitive Enterprise: Activating Cognitive DNA. 28 August 2019. Available online: https://www.forbes.com/sites/forbestechcouncil/2019/08/28/the-cognitive-enterprise-activating-cognitive-dna/ (accessed on 20 July 2022).
4. Available online: https://www.forbes.com/sites/forbestechcouncil/2019/08/28/the-cognitive-enterprise-activating-cognitive-dna/?sh=607b669e58bf (accessed on 12 July 2022).
5. Building the Cognitive Enterprise: Nine Action Areas: Deep Dive. Available online: https://www.ibm.com/downloads/cas/JKJA41PW (accessed on 10 July 2022).
6. Building the Cognitive Enterprise: A Blueprint for AI-Powered Transformation. Available online: https://www.ibm.com/thought-leadership/institute-business-value/report/build-cognitive-enterprise (accessed on 12 July 2022).
7. Hernes, M. A cognitive integrated management support system for enterprises. In *International Conference on Computational Collective Intelligence*; Springer: Cham, Switzerland, 2014; pp. 252–261.
8. Designed to Run. Available online: https://www.tietoevry.com/en/campaigns/2021/cognitive-enterprise/ (accessed on 11 July 2022).
9. Vezzoli, C.; Ceschin, F.; Osanjo, L.; M'Rithaa, M.K.; Moalosi, R.; Nakazibwe, V.; Diehl, J.C. Energy and sustainable development. In *Designing Sustainable Energy for All*; Vezzoli, C., Ed.; Springer: Berlin/Heidelberg, Germany, 2018; pp. 3–22.
10. Broadus, R. Toward a definition of "bibliometrics". *Scientometrics* **1987**, *12*, 373–379. [CrossRef]
11. Liao, H.; Tang, M.; Luo, L.; Li, C.; Chiclana, F.; Zeng, X.J. A bibliometric analysis and visualization of medical big data research. *Sustainability* **2018**, *10*, 166. [CrossRef]
12. Diem, A.; Wolter, S.C. The use of bibliometrics to measure research performance in education sciences. *Res. Higher Educ.* **2013**, *54*, 86–114. [CrossRef]
13. Ismail, S.; Nason, E.; Marjanovic, S.; Grant, J. Bibliometrics as a tool for supporting prospective R&D decision-making in the health sciences: Strengths, weaknesses and options for future development. *Rand Health Q.* **2012**, *1*, 11.
14. Reyes-Belmonte, M.A. Bibliometric Analysis on Energy Research. Available online: https://encyclopedia.pub/entry/2453 (accessed on 17 July 2022).
15. Trianni, A.; Merigó, J.M.; Bertoldi, P. Ten years of Energy Efficiency: A bibliometric analysis. *Energy Effic.* **2018**, *11*, 1917–1939. [CrossRef]
16. Gajdzik, B.; Grabowska, S.; Saniuk, S.; Wieczorek, T. Sustainable Development and Industry 4.0: A Bibliometric Analysis Identifying Key Scientific Problems of the Sustainable Industry 4.0. *Energies* **2020**, *13*, 4254. [CrossRef]
17. Opejin, A.K.; Aggarwal, R.M.; White, D.D.; Jones, J.L.; Maciejewski, R.; Mascaro, G.; Sarjoughian, H.S. A Bibliometric Analysis of Food-Energy-Water Nexus Literature Open. *Sustainability* **2020**, *12*, 1112. [CrossRef]
18. Entang, M.; Budiman, R.; Nina, K.; Candradewini, C.; Riki, M. Bibliometric Analysis and Visualization of Energy Economics and Policy in Scopus from 2010 to 2021. *Int. J. Energy Econ. Policy* **2021**, *11*, 503–507. [CrossRef]
19. Ziabina, Y.; Pimonenko, T. The Green Deal Policy for Renewable Energy: A Bibliometric Analysis. *Virtual Econ.* **2020**, *3*, 147–168. [CrossRef]
20. Kumar, R.; Singh, S.; Sidhu, A.S.; Pruncu, C.I. Bibliometric analysis of specific energy consumption (SEC) in machining operations: A sustainable response. *Sustainability* **2021**, *13*, 5617. [CrossRef]
21. Xiao, Y.; Wu, H.; Wang, G.; Mei, H. Mapping the Worldwide Trends on Energy Poverty Research: A Bibliometric Analysis (1999–2019). *Int. J. Environ. Res. Public Health* **2021**, *18*, 1764. [CrossRef] [PubMed]
22. Zhang, Y.; Yu, Q.; Li, J. Bioenergy research under climate change: A bibliometric analysis from a country perspective. *Environ. Sci. Pollut. Res.* **2021**, *28*, 26427–26440. [CrossRef] [PubMed]
23. Rosokhata, A.; Minchenko, M.; Khomenko, L.; Chygryn, O. Renewable energy: A bibliometric analysis. *E3S Web Conf.* **2021**, *250*, 03002. [CrossRef]
24. Ziegler, B.E. Methods for Bibliometric Analysis of Research: Renewable Energy Case Study. Ph.D. Thesis, Massachusetts Institute of Technology, Cambridge, MA, USA, 2009.
25. Qin, Y.; Xu, Z.; Wang, X.; Škare, M. Green energy adoption and its determinants: A bibliometric analysis. *Renew. Sustain. Energy Rev.* **2022**, *153*, 111780. [CrossRef]
26. De Oliveira, O.J.; Da Silva, F.F.; Juliani, F.; Barbosa, L.C.F.M.; Nunhes, T.V. Bibliometric Method for Mapping the State-of-the-Art and Identifying Research Gaps and Trends in Literature: An Essential Instrument to Support the Development of Scientific Projects. In *Scientometrics Recent Advances*; Kunosic, S., Zerem, E., Eds.; IntechOpen: London, UK, 2019.
27. Abrizah, A.; Zainab, A.N.; Kiran, K.; Raj, R.G. LIS journals scientific impact and subject categorization: A comparison between Web of Science and Scopus. *Scientometrics* **2013**, *94*, 721–740. [CrossRef]
28. Bartol, T.; Budimir, G.; Dekleva Smrekar, D.; Pusnik, M.; Juznic, P. Assessment of research fields in Scopus and Web of Science in the view of national research evaluation in Slovenia. *Scientometrics* **2014**, *98*, 1491–1504. [CrossRef]

29. Juliani, F.; Oliveira, O.J. State of research on public service management: Identifying scientific gaps from a bibliometric study. *Int. J. Inf. Manag.* **2016**, *36*, 1033–1041. [CrossRef]

30. Filser, L.; Silva, F.F.; Oliveira, O.J. State of research and future research tendencies in lean healthcare: A bibliometric analysis. *Scientometrics* **2017**, *112*, 799–816. [CrossRef]

31. Ye, J.; Pang, S. Special issue on cognitive-inspired computing and applications. *Neural Comput. Appl.* **2022**, *34*, 2501–2502. [CrossRef]

32. Pilipczuk, O. Cognitive Computing—Will It Be the Future "Smart Power" for the Energy Enterprises? *Energies* **2022**, *15*, 6216. [CrossRef]

33. Channon, D.F.; Caldart, A.A. McKinsey 7S model. In *Wiley Encyclopedia of Management*; John Wiley & Sons: Hoboken, NJ, USA, 2015; p. 1. ISBN 978-1-118-78531-7. [CrossRef]

34. The Cognitive Enterprise Part 1—The Journey to AI and the Rise of Platform-Centric Business Architectures 2018. Available online: https://www.ibm.com/downloads/cas/10OLAVXZ (accessed on 22 May 2022).

35. 19th Global C-Suite Study, IBM Institute Business Value. Available online: https://www.ibm.com/thought-leadership/institute-business-value/en-us/c-suite-study (accessed on 25 July 2022).

36. Jabłoński, M. Value Migration to the Sustainable Business Models of Digital Economy Companies on the Capital Market. *Sustainability* **2018**, *10*, 3113. [CrossRef]

37. Pilipczuk, O. Sustainable Smart Cities and Energy Management: The Labor Market Perspective. *Energies* **2020**, *13*, 6084. [CrossRef]

38. Pilipczuk, O. Determinants of Managerial Competences Transformation in the Polish Energy Industry. *Energies* **2021**, *14*, 6788. [CrossRef]

39. Akbari, M.; Khodayari, M.; Danesh, M.; Davari, A.; Padash, H. A bibliometric study of sustainable technology research. *Cogent Bus. Manag.* **2020**, *7*, 1751906. [CrossRef]