

## Drawing a Scientific Map of the Knowledge-Based Businesses Development with a Bibliometric Approach

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**Purpose:** Today, having knowledge-based organizations and businesses is considered an important and main capital for a country and can create a competitive advantage. As a result, the aim of this study was to drawing a scientific map of the knowledge-based businesses development with a bibliometric approach.

**Methodology:** The current research in terms of purpose was applied and in terms of implementation method was descriptive. The population of this study was the conducted research in the field of knowledge-based business development in the Scopus database from 1985 to 2023 year. The data of this study were analyzed by the bibliometric method according to the systematic approach with the two objectives of functional analysis and citation network analysis and with PRISMA protocol in VOSViewer software.

**Findings:** The functional analysis findings showed that in the field of knowledge-based businesses development, Gambardella and McGahan had the most citations (372 times) with an article entitled Business-model innovation: General purpose technologies and their implications for industry structure. Also, authors including Crenicean, Ichijo, Kohlbacher, Markopoulos, Popescu, Sequeira, Vanharanta and Will and countries including United Kingdom, China, United States, Germany, Italy, Romania and South Korea respectively had the most research in the field of knowledge-based businesses development. In addition, the findings of the citation network analysis showed that for collaboration between authors there were 21 links, 7 keywords and 1 cluster and for collaboration between countries there were 34 links, 22 keywords and 5 clusters. Also, for co-referencing words there were 1475 links, 138 keywords and 6 clusters, which were more related to the words of business development, knowledge-based systems, innovation and knowledge management.

**Conclusion:** The results of the present research about the knowledge-based businesses development with a bibliometric approach can have an effective role in designing and implementing programs to improve knowledge-based businesses.

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## 1. Introduction

The rapid and complex changes of the past few decades have compelled various societies to prepare themselves more than ever for embracing change and transformation, placing knowledge at the forefront of all matters (Kulanthaivel & Ulagamuthalvi, 2020). The significance of knowledge in creating value, enhancing productivity, and promoting economic growth plays a crucial role in economics. Knowledge-based economies have become a reliable foundation for economic growth and development in many countries, increasing employment and attracting individuals to various economic sectors (Lee, Ham, & Choi, 2016). In today's dynamic world, the foundation of industrial economies has shifted from resource-centered to intellectually and knowledge-based; in such economies, knowledge is the primary factor of production and the most significant competitive advantage for businesses (Carayannis, Ferreira, Jalali, & Ferreira, 2018). A country's economy flourishes when it provides the necessary platform for innovation and global market competition, with innovation and change in product and service mix being central to knowledge-based business activities. The economic growth and job creation in these businesses are proportionate to their capacity for innovation (Dias, Espadinha-Cruz, & Matos, 2022). Nowadays, in developing countries, small and medium enterprises are recognized as the backbone of the economy due to their significant role in employment, economic growth, fostering creativity, and innovation, and being an important source for the future success of larger businesses (Trzcielinski, 2015). Knowledge as an intangible asset has gained significant importance in various organizations, and many successful global businesses and organizations are establishing knowledge-based businesses, leading to the formation of a knowledge-based economy. The primary income of these businesses is more from knowledge-based human resources than from natural resources, capital, and labor, contributing to wealth generation and added value (Yu & Yan, 2021). In the post-industrial age, one of the pillars of sustainable development in any country is the flourishing of knowledge-based businesses. Since sustainable and inclusive growth and global competition require a shift from resource-based to knowledge-based economies, knowledge-based businesses can play a key role in wealth generation in developing countries by defining and modeling research and development processes. They are prioritized in a country's development programs, with the government facilitating their establishment and growth by providing infrastructure and incentives (Khishtandar & Danesh Shakib, 2020).

Knowledge-based businesses, institutions, organizations, and companies are those formed to sustainably transform knowledge into wealth. Their economic activities are based on and accompanied by research and development in advanced and new technologies, contributing to the development of the knowledge-based economy (Vu, Alonso, Tran, & Nicholson, 2023). Knowledge-based businesses are groups of educated individuals from scientific and research centers who, in addition to learning theoretical sciences and scientific theories, learn methods of transforming sciences into income-generating activities and value creation through commercialization (Shakeri & Ajang, 2022). These businesses, established by independent entrepreneurs and innovators, use creativity, innovation, and new knowledge in the production and delivery of products and services, providing a unique organizational environment for guiding fundamental innovation (Minbaeva, 2013). Knowledge-based businesses are intermediaries between idea and technology, guiding ideas towards technology. They are characterized by a higher ratio of specialists to total employees compared to other businesses, require and utilize significantly more research and development budget, and their development relies on technology rather than capital or hardware. Often, these businesses are small and medium in size, with their competitive advantage being innovation in technology (Gorman, Rosa, & Faseruk, 2005). Operating in a knowledge-based industry, they rely on innovation and scientific invention, distinguished by high levels of research and development, creating new knowledge, and employing a large number of scientific and technical staff (Nicolaeescu, Florea, Kifor, Fiore, Cocan, Receu, & Zanetti, 2020). These businesses engage in creating knowledge and innovation to create value in competitive environments, with value creation for customers and its management being key factors in their success and survival. They also play an important role in outlining and modeling production, research and development processes, scientific and technical

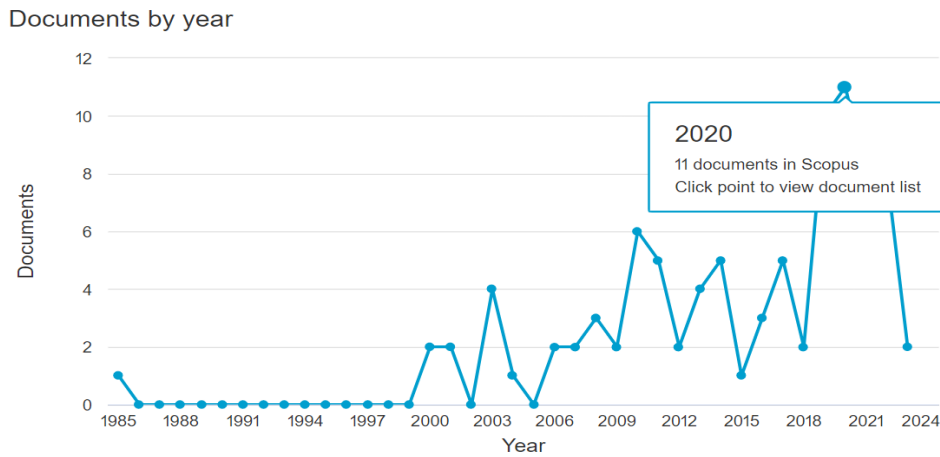
enrichment, education, human development, knowledge transfer, and the dissemination and promotion of innovation in each country (Chowdhury, Budhwar, Dey, Joel-Edgar, & Abadie, 2022).

In knowledge-based businesses, there should be an emphasis on defining and modeling knowledge production (research and development of new knowledge), knowledge enrichment (education, development, and human nurturing), and knowledge transfer (publishing and spreading knowledge and innovation). The goal of these businesses is to contribute to the synergy of science and wealth, develop the knowledge-based economy, expand inventions and innovations, and commercialize the results of research and development for practical applications (Clarke, Mortensen, & Freytag, 2023). Knowledge-based businesses are among the most important and effective factors in creating employment, innovation, social system development, and the growth and formation of the knowledge-based economy in any country. Typically, they are established to meet specific market needs (Vaio, Hasan, Palladino, Profita, & Mejri, 2021). Relying on innovation as a competitive resource, they use advanced technologies for their products and services, characterized by high skills, higher education of the workforce, a strong export orientation, a high percentage of intangible assets, and products and services with short life cycles and high gross margins (Consoli & Elche-Hortelano, 2010). These businesses are based on the dissemination, use, and creation of information and knowledge, aligning themselves more with emerging changes and transformations in the business environment than non-knowledge-based businesses, striving to survive in competitive environments (Peng, Li, Shen, & Wong, 2022). Knowledge-based businesses play a significant role in the effectiveness and efficiency of production, embodying knowledge and information in new goods, products, and services, elevating the economic level and welfare, and producing wealth and added value in a society. They are oriented towards innovation and change in the composition of goods, products, and services in the realm of their activities (Mason, 2018). The three main characteristics of knowledge-based businesses include new or idea-centric ideas (paving the way for the innovation process and the generation of new ideas as a significant source of innovation within the organization), the commercial viability of ideas (bringing a product and service to the market guarantees the success and survival of the organization, and commercialization is a vital factor in transforming technology into successful economic products), and the competitiveness of ideas (organizations constantly strive to differentiate themselves from competitors and through competitiveness, create the conditions for positive competition, generation, and development) (Wu, Ong, & Hsu, 2008). Knowledge-based businesses play a significant role in the effectiveness of production, the embodiment of knowledge in new products and services, elevating the economic level and welfare, and producing wealth and added value in a society. They focus on innovation and change in the composition of products and services in the realm of their activities (Duque, Godinho, & Vasconcelos, 2022).

Today, with the shift in the economic paradigm from mass production-based to knowledge-based, the generation of capital through knowledge as a competitive advantage and its role in comprehensive development is evident. This change in approach causes fundamental changes in other economic factors, including technology, services, industry, and their functions. This issue has brought up terms and processes such as knowledge-based economy and, in other words, knowledge-based in the current world. Considering the role and importance of the knowledge-based economy, businesses that are formed on the basis of knowledge and are knowledge-based can create a competitive advantage for the organization and business. Another important point regarding the scientific mapping of knowledge-based businesses is that the results of this study can help better understand the different dimensions of knowledge-based businesses and design and implement programs for their improvement. Therefore, today, having knowledge-based organizations and businesses is considered a significant and primary asset for a country and can create a competitive advantage. Consequently, the aim of this study was to map the scientific development of knowledge-based businesses with a bibliometric approach.

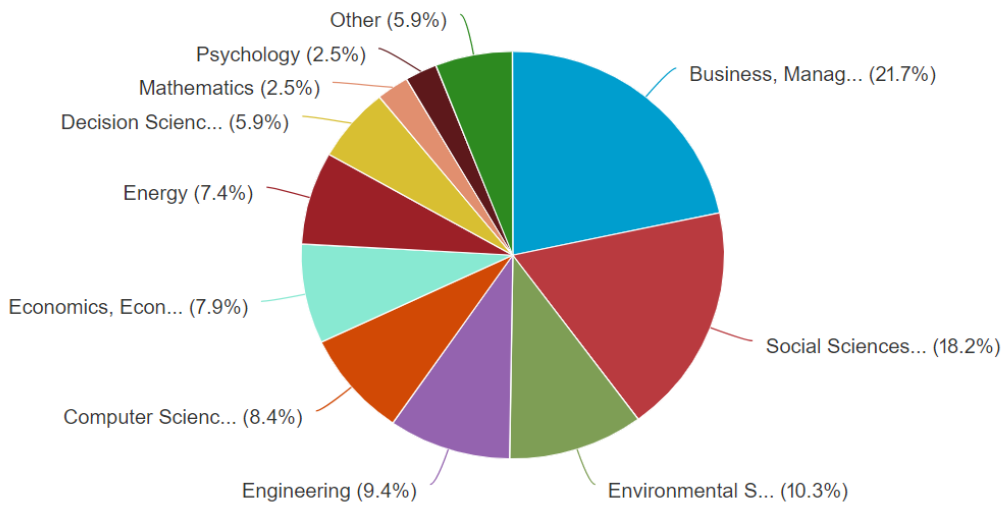
## 2. Methodology

The present study, in terms of its purpose, was applied, and in terms of its method, descriptive. The population of this study was research conducted in the field of development of knowledge-based businesses in the Scopus database from 1985 to 2023. The statistics of the research conducted in this field are visible in Figure 1.



**Figure 1.** Statistics of studies conducted in the field of knowledge-based business development in the Scopus database

The research domains of the studies conducted in the field of development of knowledge-based businesses in the Scopus database are visible in Chart 2.



**Figure 2.** Domains of research conducted in the field of knowledge-based business development in the Scopus database

Considering the accumulation of scientific knowledge and the diversity of research areas in the development of knowledge-based businesses, researchers have used a systematic review approach based on bibliometrics to examine past studies. Bibliometrics aims to describe science and its outputs using quantitative data related to the production, distribution, and use of scientific texts.

For this study, the Scopus database was examined using keywords "Knowledge-based business development" and "Business development" in title, abstract, and keywords sections, spanning from 1985 to 2023. All review and research journal articles in all languages with English reference sections, totaling 537, were selected. In this research, 80 articles were excluded due to duplication, and 75 due to anonymity, resulting in 382 articles. Articles without English reference sections were also excluded (40 in total), leaving 342 articles. Finally, after eliminating 9 irrelevant articles based on the time range and content, 333 articles were selected as the final sample for analysis.

The data from this study, derived from the analysis of 333 articles, were analyzed using bibliometric methods in a systematic approach with dual objectives: performance analysis and citation network analysis, using the PRISMA protocol in VOSViewer software. The objective of performance analysis was to identify the most influential authors, countries, and articles in the field of knowledge-based business development. The goal of citation network analysis was to identify the most collaboration among authors, countries, and co-citation of keywords in this field.

### 3. Findings

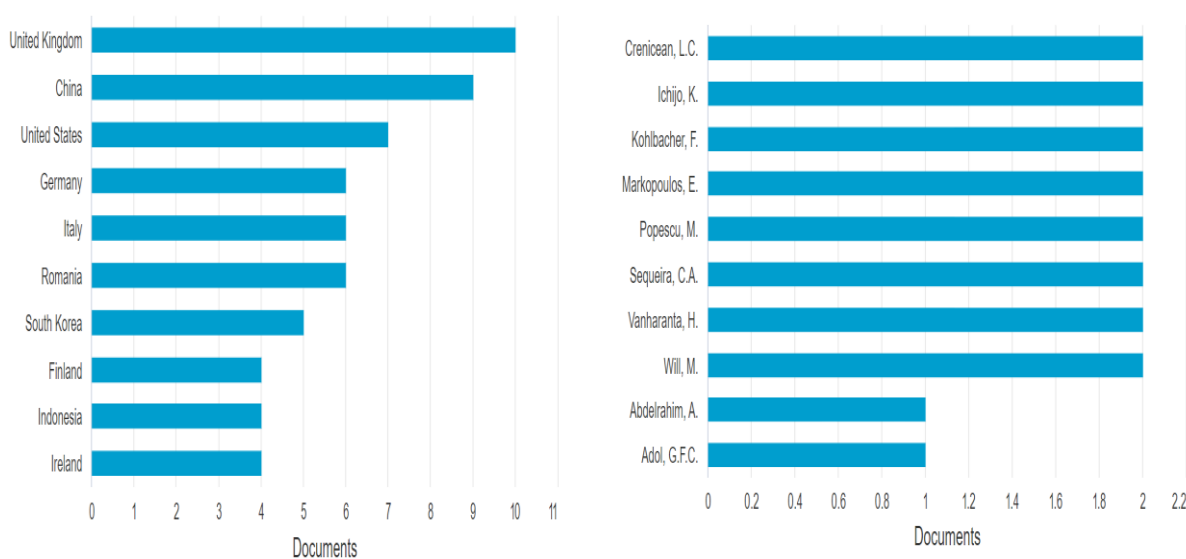
Performance analysis revealed that in the field of knowledge-based business development, Gambardella and McGahan's article titled "Business-model innovation: General purpose technologies and their implications for industry structure" had the highest citations (372 times). The results of the top 10 most cited articles are visible in Table 1.

**Table 1.** Authors, titles, year of publication and citation count of the most cited journal in the field of knowledge-based business development in the Scopus database

Authors	Title	Year of publication	Journal, Volume(Issue), Pages	Citation count
Gambardella A, McGahan AM	Business-model innovation: General purpose technologies and their implications for industry structure	2010	Long Range Planning. 43(2-3): 262-271	372
Zeng X, Gong R, Chen WQ, Li J	Uncovering the recycling potential of "new" WEEE in China	2016	Environmental Science and Technology. 50(3): 1347-1358	222
Vaccaro A, Parente R, Veloso FM	Knowledge management tools, inter-organizational relationships, innovation and firm performance	2010	Technological Forecasting and Social Change. 77(7): 1076-1089	148
Jalali Naini SGh, Aliahmadi AR, Jafari-Eskandari M	Designing a mixed performance measurement system for environmental supply chain management using evolutionary game theory and balanced scorecard: A case study of an auto industry supply chain	2011	Resources, Conservation and Recycling. 55(6): 593-603	117
Centobelli P, Cerchione R, Esposito E	Knowledge management in startups: Systematic literature review and future research agenda	2017	Sustainability. 9(361): 1-19	101
Wolfert J, Verdouw CN, Verloop CM, Beulens AJM	Organizing information integration in agri-food-A method based on a service-oriented architecture and living lab approach	2010	Computers and Electronics in Agriculture. 70(2): 389-405	99

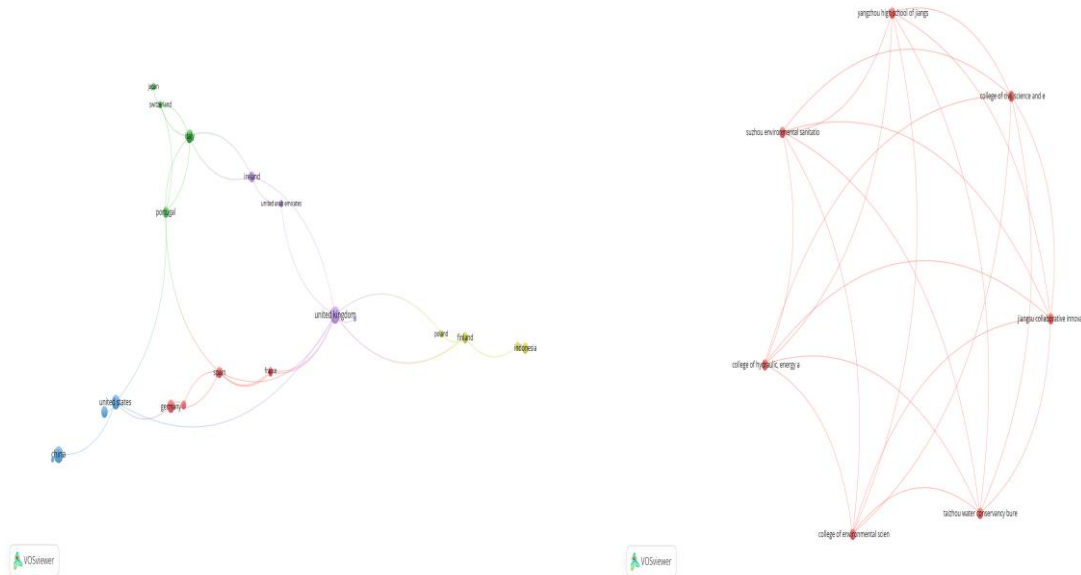
Vonder Gracht HA, Vennemann CR, Darkow IL	Corporate foresight and innovation management: A portfolio-approach in evaluating organizational development	2010	Futures. 42(4): 380-393	89
Kim TT, Kim WG, Park SSS, Lee G, Jee B	Intellectual capital and business performance: What structural relationships do they have in upper-upscale hotels?	2012	International Journal of Tourism Research. 14(4): 391-408	77
Yun JJ, Won D, Jeong E, Park KB, Yang J, Park JY	The relationship between technology, business model, and market in autonomous car and intelligent robot industries	2016	Technological Forecasting and Social Change. 103: 142-155	76
Munoz-Pascual L, Curado C, Galende J	The triple bottom line on sustainable product innovation performance in SMEs: A mixed methods approach	2019	Sustainability. 11(1689): 1-22	55

Other performance analysis findings showed that authors including Crenicean, Ichijo, Kohlbacher, Markopoulos, Popescu, Sequeira, Vanharanta, and Will and countries including the United Kingdom, China, the United States, Germany, Italy, Romania, and South Korea had the most research in this field, respectively. The results of the top 10 authors and countries are visible in Figure 3.



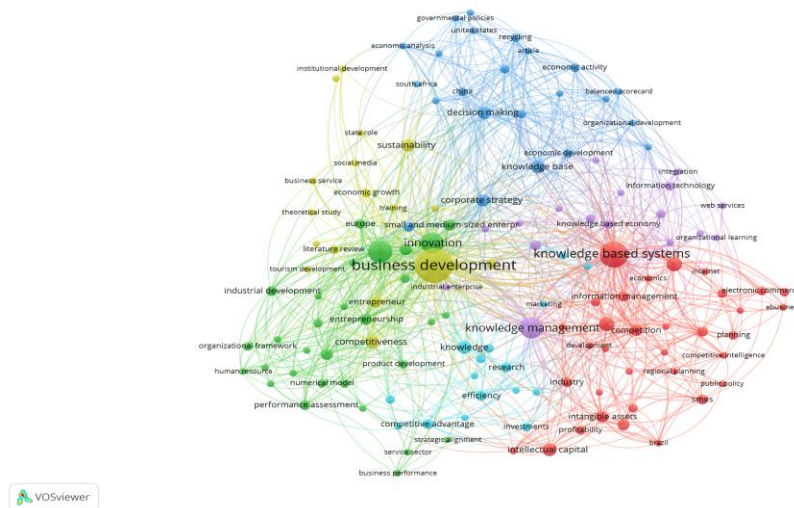
**Figure 3.** The results of 10 authors and 10 countries with the most studies in the field of knowledge-based business development in the Scopus database

Citation network analysis findings indicated that for collaboration among authors, there were 21 links, 7 keywords, and 1 cluster; for collaboration among countries, there were 34 links, 22 keywords, and 5 clusters. The results of collaboration among authors and countries are visible in Figure 4.



**Figure 4.** The results of co-authorship and the countries with most studies in the field of knowledge-based business development in the Scopus database

Citation network analysis also revealed that for co-citation of keywords, there were 1475 links, 138 keywords, and 6 clusters, with a stronger connection between the keywords related to business development, knowledge-based systems, innovation, and knowledge management, as shown in Figure 5.



**Figure 5.** The results of co-citation of the words in the field of knowledge-based business development in the Scopus database

#### 4. Discussion

Iran, as an example of a developing country, has demonstrated the unmistakable role of innovations and technological businesses in its growth and advancement. The enactment of laws supporting knowledge-based businesses and commercialization of inventions and innovations in 2009, and the recent expansion of parks and growth centers, reflect the understanding of policymakers and implementers of the role of businesses, particularly knowledge-based and technology-based, in developing a knowledge-based economy. This is manifested in the form of support for knowledge-based businesses to realize ideas, employ inventions and

innovations, and commercialize research outcomes by universities and industry. Having knowledge-based organizations and businesses is considered a significant and primary asset for a country, capable of creating a competitive advantage and driving economic growth. Therefore, the aim of this study was to map the scientific development of knowledge-based businesses using a bibliometric approach.

Performance analysis findings showed that in the field of knowledge-based business development, Gambardella and McGahan's article titled "Business-model innovation: General purpose technologies and their implications for industry structure" had the highest citations (372 times). Additionally, authors including Crenicean, Ichijo, Kohlbacher, Markopoulos, Popescu, Sequeira, Vanharanta, and Will, and countries such as the United Kingdom, China, the United States, Germany, Italy, Romania, and South Korea had the most research in this field. Furthermore, citation network analysis revealed significant collaborations among authors and countries. In recent years, small and medium-sized organizations, especially knowledge-based businesses, have increasingly attracted the attention of academics and policymakers. The development of new knowledge-based businesses is increasingly seen as a crucial point in the growth and development of modern society. Knowledge-based businesses, formed to sustainably transform knowledge into wealth and whose economic activities are based on and accompanied by research and development in new and advanced technologies, greatly contribute to the development of the knowledge-based economy. Knowledge-based businesses are intermediaries between idea and technology, guiding ideas towards technology and engaging in creating knowledge and innovation to create value in competitive environments. The successful response of knowledge-based businesses in a highly dynamic and changing environment depends on their ability to offer innovative and technological products to the market, reach customers, and find ways to deliver products and services. In knowledge-based businesses, gaining and developing competitive advantages through optimal management of intellectual resources and nurturing core marketing capabilities is possible, and these businesses use market knowledge and information to align with the pace and change in market environmental components and meet customer needs through the provision of services and products. Additionally, based on studies, the most sustainable economies in the world are related to knowledge-based economies, with knowledge-based businesses being the driving force in the development of these economies. Innovations and industrial advancements over the last decades globally have been the result of innovative activities of small innovative and knowledge-based businesses. As knowledge-based businesses comprise a collection of skills, abilities, and specialists, creativity and innovation peak in these businesses, leading to economic growth, development, and prosperity of societies.

This study, like many others, faced limitations during the research process. One of these limitations was that only the Scopus citation database was used to gather research data, and other databases were not considered. Therefore, it is recommended that the field of knowledge-based business development with a bibliometric approach be examined in other citation databases such as Web of Science and Google Scholar. Another suggestion is that future research should use other citation databases for comparative studies. Additionally, the PRISMA protocol was used for data screening in the present study, which has its own limitations and prevents many studies from entering the analysis basket. Therefore, future researchers are advised to use other protocols and systematic review methods such as meta-analysis and meta-synthesis in their research. The findings of this study have many practical implications for specialists and planners of knowledge-based businesses, and they can take effective steps to improve and develop knowledge-based businesses based on these findings. In other words, the results of this study on the development of knowledge-based businesses with a bibliometric approach can play an effective role in designing and implementing programs for the improvement of knowledge-based businesses.

### **Ethical Considerations**

The present study was committed to adhering to ethical considerations such as honesty in reporting findings.

### **Acknowledgments**



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### Authors' Contributions

The authors of this article had a roughly equal share in its preparation.

### Conflict of Interest

The authors hereby declare that there was no conflict of interest.

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