



Developments in the knowledge-based economy research field: a bibliometric literature review

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Abstract

This study aims to synthesize and organize existing the knowledge in the knowledge-based economy (KBE) research field. Using the Web of Science Core Collection, this study conducts a bibliometric literature review of 1228 articles published from 1991 to 2020. The results reveal the research evolution and identify some of the field's most active and influential articles, journals, and authors. Moreover, this analysis enhances the understanding of the research field's conceptual and intellectual structure based on a global overview of the relevant literature and its authors. The bibliometric analysis also reveals seven thematic clusters: (1) KBE fundamentals, (2) knowledge management, (3) knowledge work, (4) knowledge generation, (5) knowledge environments, (6) new post-capitalism, and (7) KBE reconceptualization. These clusters provide a holistic view of the field and, in so doing, facilitate future research by providing a research map as to guide the advancement of the existing knowledge on this topic. Based on the bibliometric and content analyses, some future research avenues have been proposed to provide clues for this task.

Keywords Knowledge economy · Knowledge-based economy · Innovation system · Bibliometrics

JEL Classification I25: Education and economic development · I26: Returns to education · I28: Government policy · O1: Economic development · O31: Innovation and invention: processes and incentives · O36: Open innovation · R1: General regional economics

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1 Introduction

The notion of the knowledge-based economy (KBE) emerged toward the end of the 1990s, although Peter Drucker first coined the term in 1969 in his work *The Age of Discontinuity* (Drucker 1969). According to the Organisation for Economic Cooperation and Development (OECD 1996), the KBE or knowledge economy (KE) is a term that describes the trends in advanced economies toward greater reliance on knowledge, information, and highly-skilled labor. The rise of the KBE has, in many cases, been accompanied by a concomitant decline in traditional industrial activities (Baum et al. 2009). This transformation comprises changes to societies' technological, economic, political, and value bases. The intensive use of information and communication technologies (ICT) has had a big impact on society and the way in which new knowledge is produced and socialized, supporting the economic paradigm shift.

Based on this transformation, the role of human capital has been reinterpreted and is now seen to be of greater importance. There is a distinction between people who work with their hands and those who work with their minds. Teamwork skills and knowledge have become increasingly important for organizations (Graen et al. 2006). Another key to the transformation is that nations' international competitiveness in the KBE is founded on innovation (Lundvall 1992).

Although studies on knowledge's new position (the organized generation of knowledge) in economic systems are relatively recent, there is prolific academic literature, in addition to some popular contributions, such as Richard Florida's (2004) bestselling book *Cities and the Creative Class*, in which he explains the nascent "creative class" and how it will determine the future. With the aim of presenting a comprehensive study that synthesizes the existing literature and provides an overall knowledge structure applicable to the research area, this paper conducts a systematic review based on bibliometric analysis. Classifying a research area's literature based on the main trends in the discipline and presenting the most recent research developments is a means of advancing scientific knowledge (Bjork et al. 2014). There are several reviews of the KBE research field. Some provide a holistic view (Leppala 2015; Malecki 2007), while others are focused on a specific country or region, such as Africa (Asongu and Odhiambo 2020), China (Thomson et al. 2019), Brazil (Marques et al. 2015a), and Australia (Marques et al. 2015b). Others address a specific topic in the research field, such as creativity, human resource development (Joo et al. 2013), and the gender gap in the knowledge society (Walby 2011), or a specific subset of the creative industry, such as arts and crafts organizations (Latilla et al. 2018). Recently, with an evolutionary perspective, a critical review of the precursors of the KBE has been conducted in consideration of some phenomena that have transformed the contemporary economy (Choong and Leung 2020).

All these reviews are important contributions, but the rapid growth of publications in this research domain makes it necessary to systematize and organize existing research to include relevant new contributions and provide a structured global overview of the research area. Furthermore, many methodological scholars

have emphasized the need for a systematic review process to overcome the bias challenge facing scientific literature reviews (Van Oorschot et al. 2018). Bibliometric analysis contributes to the systematization of literature reviews, mainly because of its quantitative methodology in reporting the state of the art (Vogel and Güttel 2013). It structures the existing research according to a wide range of indicators. In so doing, it identifies research avenues that are potentially saturated, as well as those that deserve closer attention in future studies. From this perspective, bibliometric analysis can be regarded as complementary to traditional qualitative literature reviews, as it imposes organization and structure.

Bibliometrics is increasingly being used in specific areas of research in business and management academic literature reviews, such as finance (Arteche-Bueno et al. 2019; Kumar et al. 2020; Paule-Vianez et al. 2020), management (Albort-Morant et al. 2018), economics (Bonilla et al. 2015), innovation (Aparicio et al. 2019); and technology transfer (Bengoa et al. 2021), entrepreneurship (Baier-Fuentes et al. 2019; Block et al. 2020), and international business (Ferreira et al. 2014). To the best of our knowledge, no bibliometric review of the KBE field exists.

Our study contributes to the literature in several ways. First, we synthesize and organize existing knowledge in the KBE research field through a bibliometric literature review of 1,228 articles published from 1991 to 2020. The first objective is to highlight and provide an updated overview of KBE research using performance analysis and, in particular, certain productivity and impact indicators, thereby revealing patterns among journals, articles, and authors. The results reveal the research evolution of the KBE and identify some of the field's most active and influential articles, journals, and authors. The second objective is to detect groups of related documents that reveal the main topics studied in the KBE arena by establishing a scientific mapping analysis of articles. This analysis has resulted in the establishment of some main research lines and related topics. We contribute to the current discussion on KBE by synthesizing the existing knowledge base in the field and identifying knowledge gaps for future researchers. Therefore, this study enhances the understanding of the conceptual and intellectual structure of the KBE research field based on a global overview of the relevant literature and its authors. Bibliometric analysis reveals seven thematic clusters: (1) KBE fundamentals, (2) knowledge management, (3) knowledge work, (4) knowledge generation, (5) knowledge environments, (6) new post-capitalism, and (7) KBE reconceptualization.

The remainder of this paper is organized as follows. Section 2 describes the study design, along with the dataset of selected articles and the criteria used to obtain them. Section 3 details the bibliometric analysis procedures. Section 4 summarizes the KBE research field through thematic clusters. Finally, Sect. 5 presents the conclusions, including some future research questions, and outlines a research road map to support a global overview of the research field. The study's limitations are also considered.

2 Study design

There are several sources for accessing data, including Web of Science (WoS), Scopus, and Google Scholar. In this study, bibliographic records were obtained from the WoS database for the period 1991 to 2020. The material included in the WoS is generally expected to adhere to the highest quality academic standards. The database includes journal citation reports (JCRs), which indicate journals' relative importance within their thematic categories. Moreover, the simultaneous use of other databases has been shown to be unhelpful (Harzing and Alakangas 2016), largely due to the existence of duplications.

The period 1991–2020 was chosen because the basis for the paradigm shift (Kuhn 1962) took shape at the beginning of that period, with the shift finally occurring in the late 1990s, when the focal point of knowledge use turned to economic activity. Therefore, no articles published before 1991 were collected, although some books and press releases on the subject had been published by then.

The terms used for data retrieval were “knowledge economy” and “knowledge-based economy.” The search was conducted in the WoS Core Collection, comprising the Science Citation Index Expanded, the Social Sciences Citation Index (SSCI), and the Emerging Sources Citation Index (ESCI). An advanced search was performed through the TS operator (topic), as follows: TS = “knowledge econom*” or “knowledge based econom*” or “knowledge-based econom*” with the keyword “economy” truncated as “econom*” to obtain all possible associated records. The field “Topic” was chosen because it includes the fields “Title,” “Summary,” “Author’s Keywords,” and Keywords Plus®. All relevant articles about the KBE must have keywords in at least one of these fields. The search was conducted in September 2021 and it yielded 3,474 articles. Filters were then applied to select articles and reviews only from the categories of economics, management, business, political science, public administration, and international relations. This reduced the total number of selected publications for the literature review to 1,228.

3 Methodology

Bibliometric methods have two main uses: performance analysis and science mapping (Cobo et al. 2011). Performance analysis seeks to evaluate individuals' and institutions' research and publications. Science mapping aims to reveal scientific fields' structure and dynamics (Zupic and Carter 2015). Performance analysis is a compilation of some general quantitative indicators of scientific production and citations. Mapping analysis can take several forms of generation networks and their visualizations. We chose a bibliographic coupling of documents to identify the bibliographic clusters and then thematically examine each one in-depth. Different software tools facilitate the generation of the network and its visualization. In this study, we used VOSviewer (Van Eck and Waltman 2010). The following subsections describe the methodology of both bibliometric methods.

3.1 Performance analysis

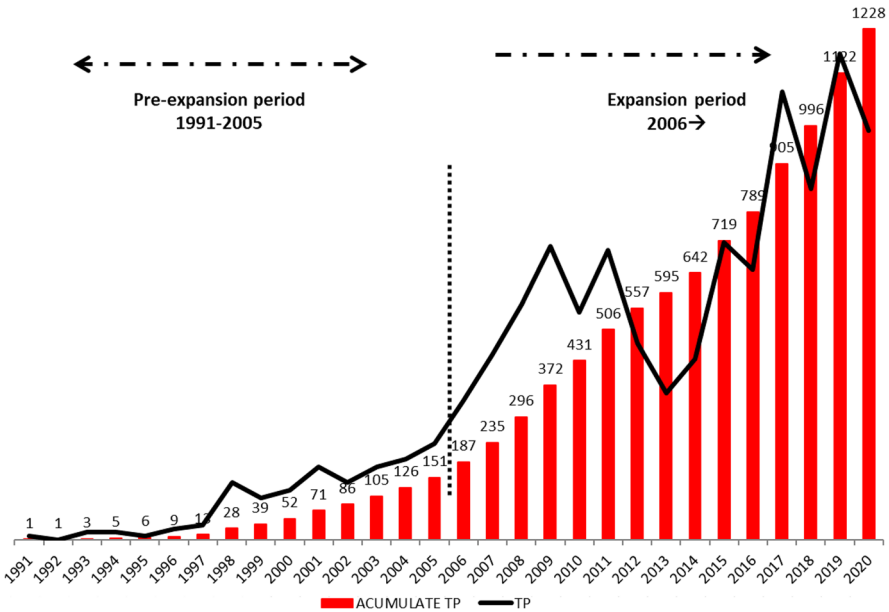
Bibliometric performance analysis uses bibliometric indicators based on different units of analysis to determine the research orientation and patterns among them. Based on these indicators, performance analysis aids in understanding the most relevant research in the KBE research field. Specifically, it evaluates the effect of the scientific product citations of the different actors that interact in a research field. These actors can be countries, universities, departments, and researchers. The most popular performance analysis indicators consider the number of publications and citations. The number of publications is related to the author's productivity, and the number of citations is related to a paper's influence in the scientific community (Cobo et al. 2011).

3.2 Bibliographic coupling

Bibliographic coupling is a well-established approach for measuring documents' shared intellectual background; a strength value is calculated between each document in the sample based on the number of references the two documents share (Suominen et al. 2019). Two publications are bibliographically coupled if a third publication is cited in both (Kessler 1963). In other words, bibliographic coupling is about the overlap in publications' reference lists. The larger the number of references two publications have in common, the stronger the bibliographic coupling relationship between the publications. In this study, bibliographic coupling was performed using the VOSviewer smart local moving algorithm (Waltman and Van Eck 2013).

4 Results

This section presents the results of bibliometric analysis. First, to report a global view of the KBE research field, the focus is on the number of documents published per year. Second, to identify patterns in the research field's intellectual structure, the performance indicators reveal the most prominent journals and the most influential articles in the KBE research field. Third, to identify the main topics in the KBE research field, science mapping enables the detection of groups of related articles. Once the article clusters were identified, we conducted a comprehensive reading (an in-depth full-text review) of the most significant articles in each cluster to provide an interpretation of the research line each cluster follows.



TP: Total articles per year, ACUMULATE TP: accumulated total papers until each year

Fig. 1 The evolution of scientific research on the KBE since 1991

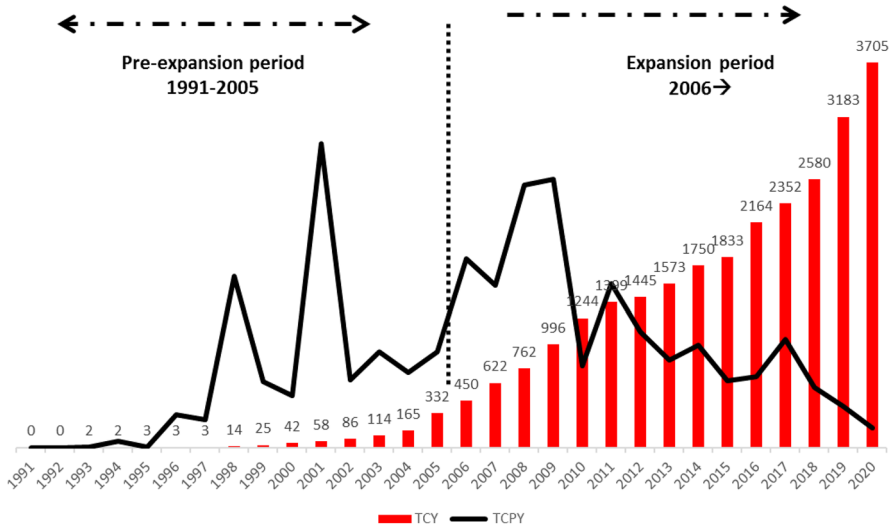
4.1 The evolution of scientific research on the KBE

Fig. 1 presents the evolution of scientific research on the KBE according to the number of publications and the cumulative percentage of articles over time. This graphical analysis visually structures the KBE research field.

We identified two periods after 1991 in the scientific evolution: the *initial period* (T1), spanning 1991 to 2005, and the *expansion period* (T2), spanning 2006 to 2020. The last 15 years (2006–2020) have seen the most significant article production, representing 87.7% (1077 publications) of the total volume (1228 publications).

This evolution can be explained in several ways. On the one hand, changes in the world economy that have occurred within the last decade are reflected in studies on the subject, such as innovation, which is relevant for companies seeking to become and remain competitive in world markets. On the other hand, researchers' interest in the KBE has prompted journals to put out calls for related articles. Furthermore, specialized journals have emerged, as will be discussed in Sect. 4.2.

To more clearly visualize the evolution of the KBE research field, Fig. 2 shows the evolution of the citations obtained. Total citations year (TCY) shows the citations obtained in each year, while total citations published year (TCPY) represents the citations obtained from the articles published in a given year. These data indicate the exponential growth of the impact of research in the KBE field, although the more recent articles have, of course, not yet had the opportunity to accumulate as many citations as the earliest articles.



TCY: Total citations obtained on KBE research field, TCPY: total of citations obtained by articles published in each year

Fig. 2 The evolution of citations of KBE articles since 1991

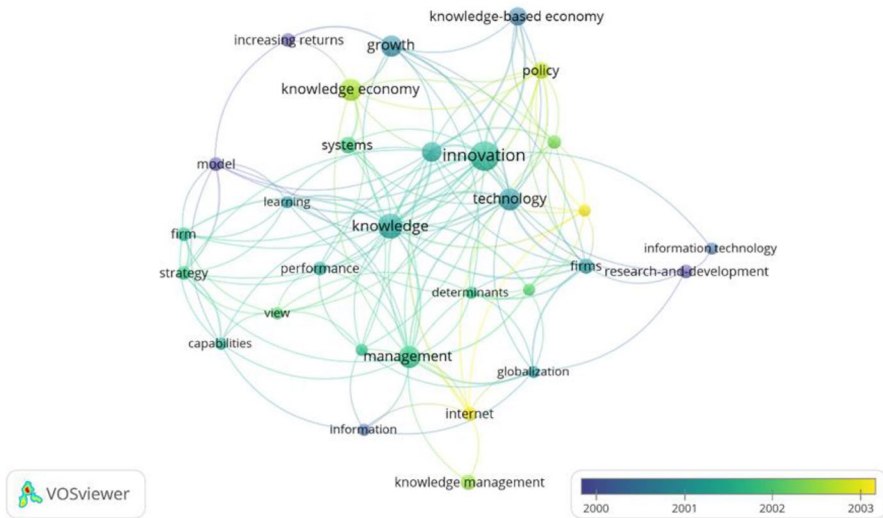


Fig. 3 Keywords T1: pre-expansion period (1991–2005)

For the two critical periods established for the longitudinal analysis of the samples T1 and T2 (Dividing T2 into two subperiods, T.2.1 and T.2.2), the co-word visualization with the VOSviewer software (Figs. 3, 4 and 5) showed the importance of basic themes in KBE. These included innovation, technology, growth, management,

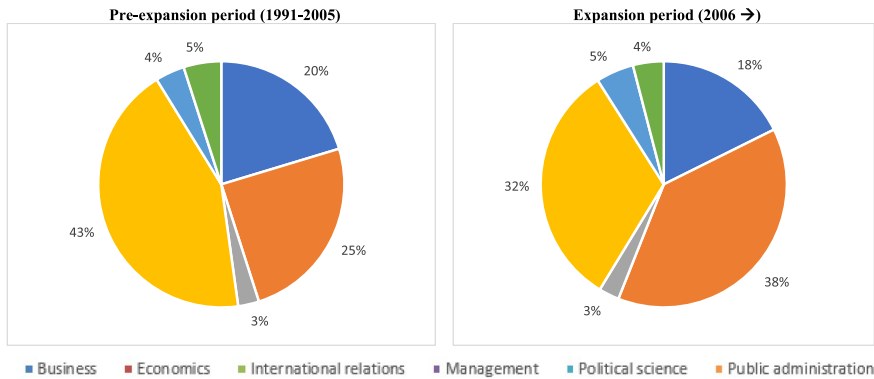


Fig. 6 Percentage of articles published in the different disciplines

and globalization. Similar transversal issues began to be considered in the T1 period (Fig. 3). During the T2 period, the richness of sub-themes grew considerably, with many nuances, such as new countries with KBE development different from that of the United States (European Union, China, India, Brazil, and Africa). At the beginning of the T2 period (T2.1), the essential issues in the KBE which determined the development of the expansion period included the triple helix model and the higher education role, issues concerning regional development, creativity, and human, social, and intellectual capital in relation to knowledge workers. The end of the T2 period (T2.2, Fig. 5) is marked by matters concerning issues related to the new economic paradigm. These include the importance of entrepreneurship, biotechnology development, sustainability challenges, income inequalities, digital economy and industry 4.0. Also considerations regarding KBE in SMEs (small and medium enterprises, the most representative kind of business in many countries) and their economic systems.

4.2 The most prominent journals, articles and authors in the KBE research field

Given that the KBE can be approached from many different disciplines, a wide variety of journals publish KBE-related articles. On the one hand, there are business and management studies on subjects such as organizational issues, product and process development, entrepreneurship, and human resource management. On the other hand, there are general economic studies, complemented by approaches from political science, public administration, and international relations that address topics such as regional and national economic development theories, technology and innovation systems, and university–industry links. Figure 6 shows the percentage of articles corresponding to the different disciplines in the pre-expansion and expansion periods. By comparing the two periods, Fig. 6 shows the growth of articles published in economics journals and a significant decrease in articles published in management journals. This is due to the new paradigm’s important economic implications and the need to reformulate academia’s

traditional conceptualizations and models to advance its study. The background of the research area focuses on understanding the changes that took place from the speedy generation of information alone to the greater emphasis placed on its transformation into knowledge. In this process, organizational matters such as teamwork skills and the development of intellectual capital have become increasingly important for organizations. These are business and management matters at the microeconomic level, published by this kind of journal. However, the technological and economic changes were allied with political and social changes, as characterized by the so-called great transformation to the market economy in the 1800s, supporting the paradigm shift. This macroeconomic perspective of the phenomenon later (T2 versus T1) attracted the interest of new researchers and general economic specialized journals (Fig. 6).

From a general perspective, research on the KBE has been published in a progressively higher number of journals. Specifically, in T1, the 152 articles identified were published in 70 journals, whereas in T2, the 1077 articles identified were published in 300 journals. This indicates an expansion of the research arena throughout all the previously mentioned thematic disciplines and approaches.

Table 1 shows the rankings of the most prominent journals in the KBE field. Specifically, the table shows the journals with an H-index of seven or more KBE papers (HKBE) and those with more than 300 citations.

It is necessary to note that the most prominent journals by number of articles are not totally correlated with the highest impact. In the T1 period, the *International Journal of Technology Management*, with 15 articles, accumulated only 199 citations, while *Organization Science*, with only four articles, accumulated 2,291 citations. The ranking of published articles in T2 was headed by the *Journal of the Knowledge Economy* (73 articles). Alongside the *Journal of Knowledge Management* (14 articles), the *Journal of the Knowledge Economy* emerged as a new specialized journal and exerted a notable impact on the research field. However, the number of citations for these journals is very low compared to others because the most significant number of publications are concentrated in the last five years, 2015–2020. Hence, *Research Policy* stands out with the largest number of total citations in T2 (1260 citations of 16 articles).

Table 2 presents the 15 most influential articles in the KBE research field. They are ranked according to the total number of citations received since the year of publication. It can be noted that the most cited and influential work is “Knowledge and Organization: A Social-Practice Perspective” (Brown and Duguid 2001). In addition, Brown and Duguid are the most influential authors, with only one co-authored article (TC=1,536, as shown in Table 3). Their article’s significant contribution is its attempt to find a perspective that resolves the paradox of sticky versus leaky knowledge by integrating organizations’ knowledge with that which is beyond their limits. The second most cited work is Harvard business administration professor Teresa Amabile’s (1998) “How to Kill Creativity.” Amabile is the second most cited author (Table 3), with this single article (TC=702). The article concerns creativity and its importance in companies. Amabile highlights that it is not enough to simply eradicate behavior that kills creativity; it is also important for managers to make a conscious effort to support creativity. Regarding the ranking of highlighted

Table 1 The most prominent journals in the KBE research field

RK	Journal	IF	HKBE	TPKBE	TC	≥ 150	≥ 100	≥ 50	≥ 1	TPKBE1	TC1	TPKBE2	TC2
1	RP	8.11	21	29	2057	3	6	12	27	13	797	16	1260
2	TFSC	8.593	18	37	636	0	0	0	37	7	100	30	536
3	JKE		14	73	568	0	0	2	58	0	0	73	568
4	JKM	8.182	14	14	509	1	1	2	14	0	0	14	509
5	T	6.606	13	17	783	1	2	5	17	7	167	10	616
6	RS	4.672	13	16	644	0	2	5	16	3	245	13	399
7	IJTM	1.667	10	27	695	1	1	2	26	15	199	12	496
8	TYBESG	2.125	10	17	264	0	0	1	16	2	21	15	243
9	HBR	6.87	10	11	1435	2	5	6	11	7	1247	4	188
10	IEE	1.292	9	22	245	0	0	0	21	0	0	22	245
11	MD	4.957	9	12	203	0	0	0	12	0	0	12	203
12	EPCP	1.771	8	10	355	0	0	3	9	1	70	9	285
13	AE	1.983	7	25	142	0	0	0	25	0	0	25	142
14	F	3.073	7	11	292	0	1	3	11	7	119	4	173
15	JIT	5.783	7	10	151	0	0	0	9	0	0	10	151
16	IJHRM	5.546	7	8	307	0	1	3	8	0	0	8	307
17	EDQ	1.696	7	8	258	0	1	2	8	0	0	8	258
18	CJE	2.156	7	7	257	0	0	2	7	0	0	7	257
19	JEG	4.862	6	7	588	2	3	4	7	0	0	7	588
20	JEE	2.343	5	6	334	0	1	3	5	4	327	2	7
21	OS	5	4	4	2291	2	2	3	4	4	2291	0	0
22	WES	5.116	4	4	384	1	2	3	4	1	168	3	216
23	QJE	15.563	3	3	384	1	2	3	3	0	0	3	384
24	MQ	7.198	3	3	351	1	1	2	3	0	0	3	351

Table 1 (continued)

RK	Journal	IF	HKBE	TPKBE	TC	≥ 150	≥ 100	≥ 50	≥ 1	TPKBE1	TC1	TPKBE2	TC2
25	AMA	16.438	2	2	641	1	2	2	2	0	0	2	641
26	OREP	3.908	1	1	474	1	1	1	1	1	474	0	0
27	JM	11.79	1	1	362	1	1	1	1	1	362	0	0

R, ranking (developed according to the HKE), HKE, h-index only KBE, TPKBE and TC: total papers and cites, IF: Impact Factor; ≥ 150, ≥ 100, ≥ 50, ≥ 1, number of papers with 150, 100, 50, 0, 10 and 1 or more citations. T1: The first initial period before 2006. T2: the expansion period after 2006. RP, Research Policy; TFSC, Technological forecasting and Social Change; JKE, Journal of the Knowledge Economy; JKM, Journal of Knowledge Management; T, Technovation; RS, Regional Studies; IJTM, International Journal of Technology Management; TVEESG, Tijdschrift Voor Economische En Sociale Geografie; HBR, Harvard Business Review; IIE, Inzinerine Ekonomika-Engineering Economics; MD, Management decision; EPCP, Environment and Planning C-Government and Policy; AE, Agricultural Economics; F, Futures; JTT, Journal of Technology Transfer; IJHRM, International Journal of Human Resource Management; EDQ, Economic development Quarterly; CJE, Cambridge Journal of Economics; JEG, Journal of Economic Geography; JEE, Journal of Evolutionary Economics; OS, Organization Science; WES, Work Employment and Society; QJE, Quarterly Journal of Economics; MQ, Mis Quarterly; AMA, Academy of Management Annals; OREP, Oxford Review of Economic Policy; JM, Journal of Management

Table 2 The most influential papers in the KBE research field

R	Title	Authors	Journal	Year	TC
1	Knowledge and organization: a social-practice perspective	Brown, J.S.; Duguid, P	OS	2001	1536
2	How to kill creativity	Amabile, T.M	HBR	1998	702
3	Market, hierarchy, and trust: the knowledge economy and the future of capitalism	Adler, P.S	OS	2001	677
4	Redesigning work design theories: the rise of relational and proactive perspectives	Grant, A.M.; Parker, S	AMA	2009	508
5	Agglomeration and the location of innovative activity	Audretsch, D.B	OREP	1998	474
6	'Mode 3' and 'Quadruple Helix': toward a twenty-first century fractal innovation ecosystem	Carayannis, E.G.; Campbell, D.F.J	IJTM	2009	398
7	Knowing in action: beyond communities of practice	Amin, A.; Roberts, J	RP	2008	374
8	Emerging issues in corporate entrepreneurship	Dess, G.G.; Ireland, R.D.; Zahra, S.A.; Floyd, S.W.; Janney, J.J.; Lane, P.J	JM	2003	362
9	The emergence of China as a leading nation in science	Zhou, P.; Leydesdorff, L	RP	2006	343
10	Understanding digital inequality: comparing continued use behavioral models of the socio-economically advantaged and disadvantaged	Hsieh, J.J.P.; Rai, A.; Keil, M	MQ	2008	289
11	Regional convergence clusters across Europe	Quah, D.T	EER	1996	295
12	Knowledge-based innovation: emergence and embedding of new practice areas in management consulting firms	Anand, N.; Gardner, H.K.; Morris, T	AMJ	2007	259
13	Procedural justice, strategic decision making, and the knowledge economy	Kim, W.C.; Mauborgne, R	SMJ	1998	249
14	The productivity gap between Europe and the United States: Trends and causes	Van Ark, B.; O'Mahony, M.; Timmer, M.P	JEP	2008	255
15	Procedural justice, strategic decision making, and the knowledge economy	Kim, W.C.; Mauborgne, R	SMJ	2005	1536

OS, Organization Science; HBR, Harvard Business Review; AMA, Academy of Management Annals; OREP, Oxford Review of Economic Policy; IJTM, International Journal of Technology Management; RP, Research Policy; JM, Journal of Management; MQ, Mis Quarterly; EER, Economics of Education Review; AMJ, Academy of Management Journal; SMJ, Strategic Management Journal; JEP, Journal of Economic Perspectives

Table 3 The most influential and productive authors in the KBE research field

R	Authors	TPKBE	TC	TPKBE1	TC1	PCKBE1	TPKBE2	TC2	PCKBE2
1	Asongu, SA	28	540	19.29	0	0	0.0	28	540
2	Melnikas, B	10	152	15.20	0	0	0.0	10	152
3	Carayannis, EG	8	609	76.13	1	19	19.0	7	590
4	Campbell, DFJ	6	446	74.33	1	28	28.0	5	418
5	Antonelli, C	6	124	20.67	2	100	50.0	4	24
6	Nwachukwu, JC	6	61	10.17	0	0	0.0	6	61
7	Cooke, P	5	376	75.20	3	307	102.3	2	69
8	Malecki, EJ	5	376	75.20	2	149	74.5	3	227
9	Garicano, L	5	341	68.20	1	12	12.0	4	329
10	Del Giudice, M	5	243	48.60	0	0	0.0	5	243
11	Yigitcanlar, T	5	74	14.80	0	0	0.0	5	74
12	Kim, WC	4	605	15.125	4	605	151.3	0	0
13	Mauborgne, R	4	605	15.125	4	605	151.3	0	0
14	Leydesdorff, L	4	499	124.75	0	0	0.0	4	499
15	Rossi-Hansberg, E	4	390	97.50	0	0	0.0	4	390
16	Audretsch, DB	3	635	211.67	3	635	211.7	0	0
17	Brown, JS	1	1536	1536.00	1	1536	1536.0	0	0
18	Duguid, P	1	1536	1536.00	1	1536	1536.0	0	0
19	Amabile, TM	1	702	702.00	1	702	702.0	0	0
20	Adler, PS	1	677	677.00	1	677	677.0	0	0
21	Grant, AM	1	508	508.00	0	0	0.0	1	508
22	Parker, SK	1	508	508.00	0	0	0.0	1	508
23	Amin, A	1	374	374.00	0	0	0.0	1	374
24	Roberts, J	1	374	374.00	0	0	0.0	1	374
25	Dess, GG	1	362	362.00	1	362	362.0	0	0
26	Floyd, SW	1	362	362.00	1	362	362.0	0	0
27	Ireland, RD	1	362	362.00	1	362	362.0	0	0
28	Janney, JJ	1	362	362.00	1	362	362.0	0	0
29	Lane, PJ	1	362	362.00	1	362	362.0	0	0
30	Zahra, SA	1	362	362.00	1	362	362.0	0	0
31	Zhou, P	1	343	343.00	0	0	0.0	1	343

R, ranking, TC and TPKBE, total citations and total papers only in KBE, PCKBE=TC/TPKBE

publications, Paul Alder (2001), a professor at the University of Southern California, holds third place. He analyzes the roles played by the state, the market, and the community principle in the organization of professional work and explains the challenges and foundations of a new post-capitalist form.

To identify the remaining influential authors in KBE research, Table 3 presents authors with five or more articles and authors that received more than 300 citations in the WoS. The authors are presented in descending order according to the

total number of papers they have published in the KBE field (TPKBE). In cases of a tie, we considered the total number of citations in the field (TC). Table 3 shows each author's total citations (TC), total citations per article (TCKBE), and total papers (TPKBE) for each period, that is, T1 and T2.

4.3 Results of bibliographic mapping analysis

Performance indicators provide a general overview of the various dimensions of the KBE research field and offer an up-to-date synthesis of the KBE literature. However, they do not display the field's structure. For this purpose, the bibliometric review uses science maps to describe how specific disciplines or research fields are conceptually, intellectually, and socially structured (Cobo et al. 2011). They provide a spatial representation of how different units of analysis (e.g., authors, documents, journals, and words) are interrelated through bibliometric networks.

To better understand the main KBE research subfields, the 1228 articles in this study were taken as the unit of analysis for bibliographic coupling using VOSviewer software (Van Eck and Waltman 2010) and the local moving algorithm introduced by Waltman and Eck (2013).

Due to the large number of documents related to the KBE concept and to improve the network's interpretability with a focus on key publications, we set thresholds to only include papers with at least 25 citations. We obtained a final sample of 241 publications for the bibliometric network. This analysis organized the dataset into ten groups, but only seven had coherent interpretations of essential themes in the KBE research field. The remaining three groups were very small and/or peripheral; therefore, they will be commented on in the context of a global overview (Belusi et al. 2019).

Reading the titles and keywords, and analysing the common content between the articles facilitated the assignment of a definitive heading to each cluster. An interpretative analysis was performed to identify common content in the documents by cluster, because there was neither a representative central keyword nor a specific reiteration of any keyword in the clusters that could function as the title. Therefore, this study labelled each group as a specific thematic cluster, as follows: (1) KBE fundamentals—included studies about the basic rules and essential approaches of the KBE; (2) knowledge management—referred to the strategic interventions in knowledge assets, enabling the accumulation and sustenance of competitive advantage; (3) knowledge work—included studies referring to the challenges in human resource management in the KBE; (4) knowledge generation—focused on studying how knowledge is generated and transmitted into and around territories; (5) knowledge environments—grouped studies concerned with identifying the optimal learning environments required for knowledge work; (6) new post-capitalism—referred to studies that adopt the evolutionary perspective from traditional capitalism, in the study of the KBE phenomenon; and (7) KBE reconceptualization—grouped some conceptual articles on new frameworks in essential economic themes.

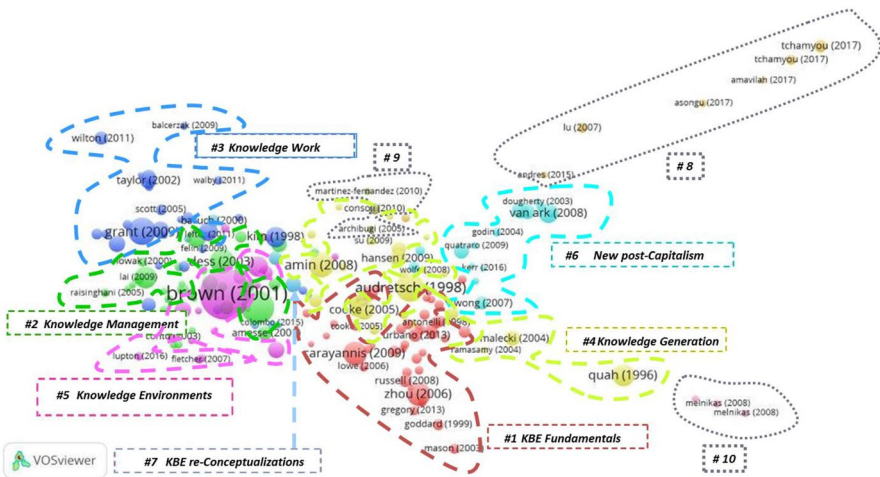


Fig. 7 Visualization of Thematic Clusters in the KBE Research Field

Visualization is an important component of network analysis. VOSviewer provides a distance-based visualization of bibliometric networks. The size of the sphere varies according to the citations of each work, the network connections represent the closeness of the links between the articles, and the colors of each circle and its location on the graph allow us to visualize the cluster. Figure 7 is a visual representation of the interrelated articles in the bibliometric network.

4.4 Thematic clusters in the KBE research field

In this subsection, we present the interpretation of the themes that the groups of related articles represent. We acknowledge that the descriptions do not fully capture the richness of each theme; however, they constitute a global organization and a general systematization of the research field's conceptual structure.

4.4.1 Cluster 1: KBE fundamentals

Since the 1980s, the KBE has been attracting significant attention from businesses, governments, and academics as a new economic development paradigm. The fundamentals of KBE research concern the mechanisms of knowledge creation and distribution, its role as a primary driver of economic growth and its role in income distribution, the importance of knowledge-based networks among firms, and the interface between government, businesses, and citizens.

Regarding knowledge creation and distribution, it is generally accepted that the KBE phenomenon emerges in advanced economies, but it is not a linear process, and there is no unique explanation for the KBE's economic implications. On the one hand, entrepreneurship is an important mechanism in creating knowledge diversity,

which, in turn, facilitates the spillover of knowledge. Audretsch and Keilbach (2004) provide empirical evidence that regions with higher levels of entrepreneurship exhibit stronger labor productivity growth. On the other hand, globalization has triggered a shift in developed countries' competitive advantage toward the increased importance of innovative activity (Shyu and Chiu 2002).

Authors in the KBE field promote a systemic view of business decision making and public policy development. In this cluster of articles, there are studies that report empirical evidence for different conceptual models of this systemic view, for instance, the interlocking network model for studying world-city networks (Derudder and Taylor 2018; Derudder and Parnreiter 2014); the model developed by the United Kingdom's Cambridge-MIT Institute (Acworth 2008), the agent-based simulating knowledge dynamics in innovation networks model for university–industry links (Ahrweiler et al. 2011), and the triple helix model (Guerrero and Urbano 2017; Marques et al. 2006;). There are interesting perspectives within this systemic view that have been studied in special contexts such as the marine environment (Gregory et al. 2013) and different political regimes. The latter includes dictatorial Asian regimes, such as that of Singapore (Low 2001), the UK Labour government's funding support to regions in order to close the regional equity gap (Mason and Harrison 2003), and the active labor market policies of the European Employment Strategy, a plan designed to achieve the employment objective (Franzese and Hays 2006).

The triple helix model (Leydesdorff and Fritsch 2006) is the most widely used conceptual structure to explain the interaction among the three sub-dynamics of economic exchange, technological innovation, and institutional control. The university is presented as playing a crucial role in a national innovation system, supporting university–industry knowledge–exchange linkages (Deiaco et al. 2012; McAdam et al. 2012; Jessop 2010; Secundo et al. 2017). Furthermore, the institution emerged as an “entrepreneurial university,” which is regarded as an important catalyst for regional economic and social development because it generates and exploits knowledge as entrepreneurial opportunities (Urbano and Guerrero 2013). In addition, universities, by promoting smart hybridity (Benneworth and Hospers 2014), can strengthen locked regional innovation systems and attract external investment in knowledge capital. Different countries' university systems and tertiary education sectors have been studied under this broad focus, including those of the United Kingdom (Goddard and Chatterton 1999; Charles et al. 2014), England and Sweden (Coenen 2007), Hong Kong (Mok 2005), Australia (Guthrie and Neumann 2007), and Spain (Sanchez-Barrioluengo 2014). Other complementary views state that the nature and effects of collaboration among universities and other higher education institutions on firms' innovation and growth vary significantly based on the types of firms involved and their location (Howells et al. 2012).

The extension of the triple helix model to the quadruple helix model (Carayannis and Campbell 2009) emphasizes the necessity of integrating the perspective of the media- and culture-based public. This fourth helix is associated with media, creative industries, culture, values, lifestyles, art, and, in a broad sense, the creative class (Florida 2004). The result is an emerging fractal knowledge and innovation ecosystem that is well configured, including with respect to the KBE and knowledge society.

Considering the systemic view, a trans-disciplinarity of research activities has been proposed (Russell et al. 2008), not only for the scientific areas of academia, but also among other knowledge organizations, in line with the new demand and opportunities for knowledge. Zhou and Leydesdorff (2006) reveal that the Chinese government has effectively used public sector research to boost China's KBE. Proposals to broaden developments include interdisciplinary work between social and natural scientists (Lowe and Phillipson 2006).

We make two suggestions for future research lines framed in this thematic cluster: the integration of the continuous advances in ICTs and the digitalization of the social and economic world in the study of the relationships among the three main sub-dynamics of economic exchange, technological innovation, and institutional control of the KBE, and very complementarily, the study of interrelationships among networks of countries with different political regimes toward a global context appropriate for a sustainable knowledge economy.

4.4.2 Cluster 2: knowledge management

In the KBE, intellectual capital (IC), also known as knowledge assets, constitutes the fourth factor of production, taking priority over the other factors, namely labor, land, and capital. McGaughey (2002) introduces the notion of strategic interventions in intellectual asset flows designed to influence the level and composition of intellectual asset scarcity, with implications for firm performance. In other words, an IC-based view of firm competition emerges (Martín-de Castro et al. 2011). Intangible assets, such as talented and committed workers, cultural values, and long-term firm–stakeholder relationships (i.e., between firms and their customers, allies, suppliers, and society in general), enable the accumulation and sustenance of competitive advantages, making IC management a key agenda issue.

Profiting from rapid innovations plays a central role in the KBE, and establishing an effective appropriability regime can crucially facilitate this endeavor (Hurmelinna 2007). Alder (2001) affirms that as knowledge becomes increasingly important in an economy, high-trust institutional forms are expected to proliferate, which ultimately challenges the foundations of capitalist society. There is also a new perspective on technology transfer in which it is essentially considered to be a specific knowledge transfer process that depends on the ways in which firms and other institutions manage knowledge, in particular the co-evolution of their absorptive capabilities and their knowledge transmission strategies (Amesse and Cohendet 2001; Castro et al. 2013; Wang and Han 2011). About the relationship between knowledge management, knowledge transfer and organizational performance for sustainable development there have been published two comprehensive academic literature reviews (Latilla et al. 2018; Secundo et al. 2020). Relationships are the foundation of organizational capabilities, which are an important source of sustained competitive advantage because they capitalize on individual differences and are relatively immobile since they are embedded within a firm's culture (Lengnick-Hall et al. 2004; Hafeez and Abdelmeguid 2003). The role of a knowledge sharing culture is highlighted throughout management systems and routines (Cao and Xiang 2012; Pandey and Dutta 2013). In addition, Dess et al. (2003) studied the potential contributions of

corporate entrepreneurship to knowledge creation and its effective exploitation. The fact is that human resources and human resources managers are a crucial driving force for building the kinds of relationships that turn social capital into a competitive advantage, especially for small- and medium-sized enterprises (SMEs) (Agostini and Nosella 2017) and innovation in start-ups (De Winne and Sels 2010) as well as social service non-profit organizations (Kong 2008).

Technologies such as enterprise resource planning software are a crucial enabler for building augmented social capital and IC (Lengnick-Hall et al. 2004) because they increase workforce agility, mostly when used for collaborative work (Breu et al. 2002). Human, technological, and relational assets are linked to technological innovation (Castro et al. 2013); therefore digital inequality and information infrastructure are critical issues in the knowledge economy (Hsieh 2008; Wierzbicka 2018).

Finally, knowledge integration across organizational boundaries and inter-organizational cooperation rather than competition lead to new knowledge management implications. Lin et al. (2006) and Nowak and Grantham (2000) studied the product innovation process from this perspective.

For social and human conditions to yield fluency in terms of knowledge creation and its effective exploitation, future research avenues for this thematic cluster could seek alternative explanations for why organizational support sometimes fails to motivate employees to share their knowledge in the workplace. In addition, in the new digital era, in order to study how to overcome these handicaps with or without technological support, researchers must consider strategies to direct the flow of knowledge from the bottom up in organizations and encourage two-way permeation between society and companies.

4.4.3 Cluster 3: knowledge work

The global shift toward KBEs has altered the nature of work in organizations. The types of work have changed, not only because they are more intensive in terms of intellectual capabilities, but also because they require more personal initiative and teamwork. There are new challenges in human resource management (Forde and Slater 2006; Felin et al. 2009; Kim and Ko 2014).

New work design contributions have emerged in the research arena. Fundamentally, there are two viewpoints on work design: one based on relational perspectives and the other on proactive perspectives (Grant and Parker 2009). Relational perspectives emphasize increased interdependence and interactions with co-workers, while proactive perspectives capture the growing importance of employees taking the initiative to anticipate and create changes in how work is performed. Hence, individual involvement in creative work is crucial for organizations in the KBE (Joo et al. 2013). Kark and Carmeli (2009) examine how psychological safety induces feelings of vitality and how those feelings influence involvement in creative work. Fulk et al. (2004) elaborate and empirically test the individual action component of the collective action model, as applied to individual contributions to common organizational information resources.

Other works build on critiques of the KBE to state that low-level service jobs, instead of knowledge jobs, are also key growth areas in the KBE, for example, in the interactive service sector. Thus, it is important to focus on the broader need for knowledge in work, and thus broaden the understanding of labor in the contemporary workplace (Taylor et al. 2002; Thompson et al. 2001). Alternatively, there could be new roles for employees, as it has been suggested that salespeople could function as knowledge brokers (Verbeke et al. 2011).

Teamwork skills and knowledge are becoming more important to organizations as they compete in the information age and the KBE (Seers 2004). As the use of workplace knowledge economies increases and motivational state variables such as employee engagement emerge and become more widely used, current leadership frameworks are undergoing changes in perspective and practice. Furthermore, new workplace scenarios, such as the growth of remote working (Felstead and Henseke 2017) and perceived organizational support (Yang et al. 2020), have consequences in this sense. Workplace dynamics have encouraged scholars to propose new perspectives on leadership. Shuck and Herd (2012) built a conceptual framework to link and understand employee needs, the use of emotional intelligence as a leadership competency, and transformational leadership (Burns 1978). Kim and Mauborgne (1998) developed intellectual and emotional recognition theory, which can explain why human behavior can go beyond outcome-driven self-interests. Moreover, Lee (2008) has identified special implications of this perspective for research and development managers.

Finally, the development of employability skills during undergraduate studies (Wilton 2011) and the business school curricula (Graen et al. 2006) have been examined in this research area alongside the development of an adequate workforce and level of leadership for organizations in the KBE.

Recent research literature on knowledge workers' leadership (Issahaka and Lines 2021) based on a critical literature review of this specific topic suggests that "(...) The literature to date is deficient in terms of theory and evidence for how knowledge workers are different from other classes of workers and argues that this deficiency stands in the way of developing ideas about how knowledge workers could be effectively led". Specifically, the authors propose that insights from educational psychology research should be used as a platform for theorizing how to lead in a KBE context. This is an amazing trans-disciplinary work for future research within this thematic cluster.

4.4.4 Cluster 4: knowledge generation

Following Florida's (2004) creative class theory, regions' ability to attract and retain talented people is a central element in contemporary regional development and the basis of competition in a global economy (Malecki 2004, 2007). Although this fact has been corroborated in different places, including rural contexts (Hansen and Niedomysl 2009), there is insufficient empirical evidence to support the theory (McGranahan et al. 2011).

Another central assumption in the KBE is that knowledge is generated and transmitted more efficiently via local proximity. Close spatial proximity to others, with

facial and social familiarity woven into shared work routines, can trigger social learning and tacit knowledge. For this reason, public policies move in the direction of efforts toward cluster initiatives as innovation poles (Audretsch 1998), with studies examining this policy in several cities of countries such as Austria (MacNeill and Steiner 2010), Australia (Mintrom et al. 2014), and Lithuania (Monni et al. 2017). Although this perspective can encapsulate knowledge about local spatial configurations as small communities and isolated regions or disempowered collectives, economic geographers offer a broader explanation. Following their regional development theories and the recognition of the importance of tacit knowledge, the focus can be extended to global geographies when knowledge management practices focus on reproducing rather than transferring knowledge across space (Faulconbridge 2006). Social capital promotes regional learning both within and beyond a region, as it reinforces openness to others' ideas. In this sense, innovative milieus, industrial districts, and knowledge economies are among the regions with extraordinary social capital pools (Malecki 2012).

Amin and Roberts (2008) note that spatial and relational proximity, which can be struck at a distance, should not be treated as the same. They show that relational proximity is not reducible to co-location. It is therefore necessary to have a more nuanced understanding of knowledge differentiation between different varieties of knowledge (e.g., crafts- or task-based knowledge, epistemic or highly creative knowledge, professional knowledge, and virtual knowledge). In addition, proposals to identify "bridging mechanisms" to reduce cognitive distance can increase connectivity in regional innovation systems (Asheim 2012; Suire and Vicente 2009).

The new focus of learning and knowledge generation in the KBE extends to the political economy's new focus. It has been proposed that cluster policies must be increasingly attuned to positioning within a global network environment (Cooke 2005; Huggins 2008). Therefore, knowledge cluster development is shifting from internal reliance to models based on wider connectivity and consolidation (Huggins 2008; Quah 1996).

Future developments in this thematic cluster are framed in the implications of the KBE for technology policy, highlighting not only academics' role, but also that of practitioners and policy makers. A research action methodology for the development of this thematic cluster is the key clue to advance its research agenda.

4.4.5 Cluster 5: knowledge environments

Individuals, teams, and companies need to develop the necessary competencies to participate in a work life that is mainly based on knowledge productivity. However, traditional approaches to management, training, and development will not provide the learning environment that is required for knowledge work (Kessels 2001). In this sense, intergenerational knowledge transfer in the academic environment is a principal matter in the KBE, as treated by some articles in this cluster (Garrick 2001, Fletcher 2007; Lefter et al. 2011; Musselin 2013). At the same time, changes in institutional structures are necessary for enabling universities to transform from single-discipline-based schools to multidisciplinary institutes, encouraging academics to develop new knowledge for industry and societal problems (Mosey et al. 2012).

In organizational management, perspective knowledge is necessary to improve, develop, and maintain business processes. The central question in this arena is how knowledge management systems can conduct and support the assimilation and diffusion of hidden knowledge. The transmission of such knowledge will require certain conditions to identify, formalize, abstract, and improve knowledge (Sedziuviene and Veinhardt 2010). Restricted network access prevents involvement in the exchange and creation of tacit knowledge, and ultimately, organizational resources and power. This is an argument aimed at understanding women's inclusion and exclusion from knowledge creation in organizations (Durbin 2011). There are also emerging theories that analyze communication visibility at work in organizations. These theories suggest that once invisible communication that occurs between others in the organization becomes visible to third parties, those third parties can improve their meta-knowledge (Leonardi 2014). In this research arena, communities of practice, a form of cooperative relationship in organizations (Nahapiet et al. 2005), have attracted much attention as innovative knowledge-based structures in organizations (Anand et al. 2007).

With a more general and global view of the knowledge environment, culture has been presented as a knowledge resource (Holden 2004), micro-theories of knowledge creation have been developed (Wierzbicki 2007), and learning concepts have also been applied in the field of entrepreneurship (Harrison and Leitch 2005). In addition, the implementation of information technology-based productivity improvements has been profusely presented as a means of catalyzing and accelerating social, political, and economic development, thereby enabling the transition to the KBE (Carayannis et al. 2006). However, the essence of the KBE's political economy, which constitutes the promise of a learning society, also has its detractors (Contu and Gray 2003). Brown and Duguid's (2001) seminal article, referenced in Sect. 4.2, solves the paradox of sticky versus leaky knowledge and offers social-practice perspectives on knowledge and organization. Henry and Stiglitz (2010) reflected on the intellectual property regime and, more broadly, how the ways we finance, organize, and incentivize innovation would increase the pace of innovation and its utilization thereof, contributing to the development of a KBE.

Some relevant implications for policymakers, university managers, and society, as well as best practices, emerge from this research topic. However, academics, as the main actors who are deeply embedded in a country's innovation systems, have the responsibility to advance this research agenda by considering studies on how universities' missions affect countries' and regions' economic development at different stages, specifically at the factor efficiency and innovation-driven stages.

4.4.6 Cluster 6: new post-capitalism

Knowledge growth is a complex evolutionary process. Knowledge is a socially distributed process, the growth of which is dependent on systemic context and the way a given set of individuals interact to share information and further develop their idiosyncratic knowledge. Hence, economic activity, which is necessarily social, depends on shared understanding, that is, correlated knowledge (Metcalf and Ramlogan 2005). In economic evolution, markets are knowledge-structuring mechanisms

(Potts 2001a,b), and as Harris (2001) points out, the very basic concepts of an economy, such as how to define a market and a firm, need to be reconsidered. In addition, measures from intangible investments and intangible capital provide new perspectives of TFP growth (Dal Borgo et al. 2013).

The organization of work in an economy where knowledge is an essential input in production and agents are heterogeneous in terms of their skills needs to be revised with new theories (Garicano and Rossi-Hansberg 2006). Thus, Antras et al. (2006) propose equilibrium theories involving the assignment of heterogeneous agents to hierarchical teams, so that there are less skilled agents specializing in production and more skilled agents specializing in problem solving. With a global vision, the mobility of skilled workers is critical to enhancing productivity in today's knowledge economy. Therefore, people's, firms', and countries' capacity to successfully navigate the tangled web of global talent is critical to their success (Kerr et al. 2016). Hence, Europe's knowledge economy has emerged at a slower rate than the United States' (Van Ark et al. 2008; Ortega-Argiles 2012). Finally, supporting this new knowledge system, the entrepreneurial university model (Wong et al. 2007) stands up for the future of the university and the university of the future in the KBE. The general idea of thematic clusters is that, too often, in innovation studies, novelty is considered to be pure knowledge creation, but in the new economic approach, creativity has revealed the importance of ingredients other than knowledge, namely entrepreneurship, serendipity, imagination, and so on. Therefore, it is necessary to investigate the means of constructing creative organizations (Abecassis-Moedas et al. 2012) and creative territories. According to Heralud (2021), "It is not enough to build knowledge infrastructures and to promote human capital or attract creative people. It underlines the necessity to be creative in policy design as well." Therefore, there are two levels of study in the future research agenda. At the macroeconomic level, there are recipes for the creative governance of geographical entities and new policy paradigms such as the smart specialization strategy. At the microeconomic level, entrepreneurs and creative organizations must deal with exploration/exploitation issues and find an acceptable trade-off.

4.4.7 Cluster 7: KBE reconceptualization

Academia has identified corporate foresight and innovation as key success factors in the KBE, but current models for the study of these topics represent today's reality poorly.

On the one hand, this cluster of articles addresses some reformulations of the traditional conceptual frameworks to adapt them to the reality of open innovation (Berkhout et al. 2006; Yun et al. 2016), as well as reformulations of the classification frameworks to include new typologies of innovation intermediaries (Colombo et al. 2015). It has been proposed that academic technology transfer performance should be evaluated by how well a technology transfer officer (TTO) avails access to knowledge (Sorensen and Chambers 2008); and how project management offices (PMOs) reuse good practices, support innovative practice, and prevent the reinvention of the wheel as mechanisms to share knowledge (Aubry et al. 2011).

On the other side, as the development of people's careers in organizations is a key ingredient in the KBE (Baruch and Peiperl 2000), Von der Gracht et al. (2010) developed a "Future-Fitness-Portfolio" that enables companies to qualitatively compare themselves to others and identify organizational improvement potential. For modern workers, the nature of organizational citizenship behavior is also likely to have changed; therefore, the evolution of its conceptualization has emerged (Dekas et al. 2013). In this arena, Arthur (2008) proposes three topics for future interdisciplinary research collaboration: a more accessible definition of career, the application of contrasting methodologies, and the adoption of broader research agendas.

There is no specific future research agenda for this thematic cluster because this agenda emerges as the specific development of previous clusters' themes.

In general, the publications in Clusters 1 to 7 are authored by scholars with British and American affiliations. The other three article groupings that appear in the bibliographic network are directly related to KBE issues in other countries or in a specific sector. This is, Cluster 8 concerns KBE research topics in Africa and includes very prominent authors' publications (Amavilah 2017; Andres et al. 2015; Asongu 2017; Millar et al. 1997); Cluster 9 addresses knowledge-intensive business services (Consoli 2010; Creplet et al. 2001; Martinez-Fernandez 2010; Niosi 2002); and Cluster 10 contains Melnikas' (2008a, b, 2010) publications, which focus on countries in the European Union.

4.4.8 Cluster evolution analysis

For each cluster, Table 4 shows the number of articles, total citations, and the five main contributions. Figure 8 complements this information with a longitudinal view of clusters to present a dynamic perspective of the distribution of the main publications per cluster over time, with distinctions to indicate the pre-expansion (T1) and expansion (T2) periods.

The dates in Table 4 show that the number of articles per cluster decreased between Cluster 1 and Cluster 7. The largest cluster by number of articles is Cluster 1 (54 articles), but Cluster 5 is highlighted for its average number of citations: with only 28 articles, there are 3,478 citations (124,2 average citations per article). This means that Cluster 1, which concerns KBE fundamentals, represents a recurrent theme and is comprised of several research topics that have been independently developed and deepened through other research lines. Therefore, each article accumulated fewer citations than other topics. On the other end, Cluster 5, which addresses knowledge environments, reflects a more specific research theme that concentrates on the basis of the topic, thereby generating more intra-citations in the research line. This justifies Brown and Duguid's (2001) seminal article's membership to this group.

Figure 7 shows that most (78%) of the KBE research articles that have more than 25 citations are concentrated in the central period within the bibliometric study's range of reference years. In addition, Fig. 7 shows the differences between the two general periods (pre-expansion and expansion), represented by the number of published papers in each cluster over time. For all seven of the main thematic clusters, over 75% of the publications with more than 25 citations are concentrated in the

Table 4 Number of articles, citations and main contributions by cluster

C1 KBE Fundamentals	C2 Knowledge Management		C3 Knowledge Work	
54 articles, 3803 citations	47 articles, 4136 citations	29 articles, 3234 citations	29 articles, 3234 citations	
Zhou and Leydesdorff (2006)	Adler (2001)	708	Grant and Parker (2009)	555
Carayannis and Campbell (2009)	Dess et al. (2003)	383	Kim and Mauborgne (1998)	261
Audretsch and Keilbach (2004)	Hsieh et al. (2008)	311	Verbeke et al. (2011)	259
Urbano and Guerrero (2013)	Day and Montgomery (1999)	205	Del Giudice and Maggioni (2014)	235
Leydesdorff and Fritsch (2006)	Martin-de-Castro et al. (2011)	167	Kark and Carmeli (2009)	224
C4 Knowledge Generation	C5 Knowledge Environments	C6 New post-Capitalism		C7 KBE re-Conceptualizations
33 articles, 3164 citations	28 articles, 3478 citations	18 articles, 1466 citations	12 articles, 751 citations	
Audretsch (1998)	Brown and Duguid (2001)	1587	267	Chandra et al. (2009)
Amin and Roberts (2008)	Leonardi (2014)	277	186	Arthur (2008)
Quah (1996)	Anand et al. (2007)	273	155	Baruch and Peiperl (2000)
Cooke (2005)	Harrison and Leitch (2005)	184	136	von der Gracht et al. (2010)
Hanse and Niemann (2006)	Carayannis et al. (2006)	122	125	Berkhout et al. (2006)

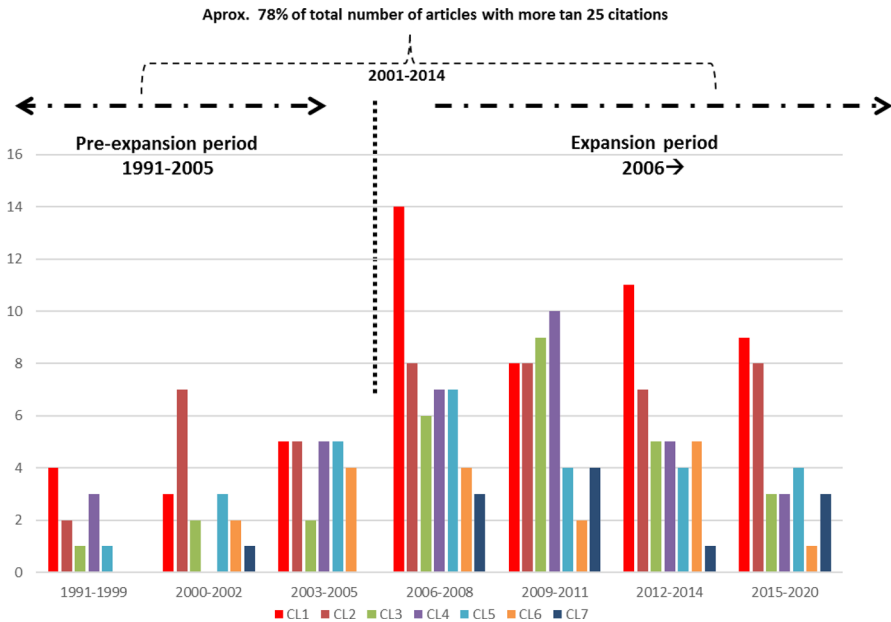


Fig. 8 Evolution of article proliferation in each cluster over time

expansion period. Looking more closely at the details, only Cluster 2, which is concerned with knowledge management, and Cluster 6, which addresses new post-capitalism, have 35% of their publications with more than 25 citations concentrated in the pre-expansion period. This means that both topics were developed early, although Cluster 2 contains more impactful articles in the pre-expansion period, for example, Alder (2001) with 702 citations and Dess et al. (2003) with 362 citations. Cluster 6 has only one highlighted article in the first pre-expansion period: Harris (2001), with 133 citations. Cluster 7, which addresses KBE reconceptualization, is highlighted because its content is nearly fully concentrated in the expansion period (92% of publications). In this sense, following the change in the brought about by the new economic paradigm, the academic content of Cluster 7 addresses the necessary reformulation of the traditional conceptual frameworks to adapt them to the nascent economic reality. Cluster 3, which concerns knowledge work, Cluster 1, which concerns KBE fundamentals, and Cluster 4, which addresses knowledge generation, all have high concentrations of published articles in this last expansion period (82, 78, and 76%, respectively).

5 Concluding remarks, future research questions, and limitations

In this literature review, we adopted a bibliometric analysis approach to synthesize and organize existing knowledge in the KBE research field. In so doing, the research facilitates an understanding of how the literature in this scientific area has evolved.

Along with the top contributors to the field, we identified the flow of knowledge and research themes related to the KBE by analyzing seven clusters obtained from bibliographic coupling analysis. This study will serve as a foundation for understanding research on the KBE, its current developmental stage, and the existing pathways for future researchers to enhance the knowledge about this economic paradigm.

Despite more than 50 years elapsing since the term “knowledge economy” first appeared in academic literature, there are still new challenges to understanding this kind of economy for facilitating a paradigm shift. The common ground in advancing the research on the subject is the study of entrepreneurial ecosystems to analyze the process of the generation of knowledge and its role in improving economic competitiveness and societal development. The evolution of the environments characterized by the spread of knowledge provides the rules of the interaction between enterprises and the higher education and government sectors. New challenges to these relationships focus on the discussion of the future trajectories in the research field. To provide a guide for future research endeavors, the authors make some projections concerning advancement in each thematic cluster.

1. **KBE Fundamentals:** The notion of the KBE must be viewed and studied from some phenomena that have transformed the contemporary economy—such as technological progress and digital transformation, globalization, and political agendas, as discussed in the light of the Sustainable Development Goals.
2. **Knowledge Management:** Human resources professionals are expected to become more involved in knowledge management and facilitate conditions within organizations to ensure the exchange of knowledge. However, some questions remain, particularly about why organizational support often fails to motivate employees to share their knowledge in the workplace.
3. **Knowledge Work:** The literature to date is deficient in terms of theory and evidence on how knowledge workers are different from other classes of workers and how they can be effectively led.
4. **Knowledge Generation:** The geopolitics of KBEs is a broad research topic given that the paths taken by countries for moving toward the paradigm shift are neither equal nor uniform in terms of the process; however, there are many lessons nations can learn from one another.
5. **Knowledge Environments** Universities have evolved from being accumulators of knowledge, largely separated from society to knowledge hubs and key partners of governments. They are now helping policymakers in tailoring policies for combating inequality in the process of developing KBEs. Therefore, academics have new research challenges in developing universities to create and promote an institution deeply embedded in systems of innovation.
6. **New post-capitalism:** Alternative and peripheral theories describe the contours of a global future mainly in non-market, non-capitalist, and, possibly, non-liberal categories. In addition, new formats for the distribution of public resources are less connected with the market, democracy, and hegemony of the West, but increasingly with rental mechanisms, distributive political regulation, and differentiated values of different social groups for the national state.

Table 5 Future research questions*Thematic cluster 1: KBE fundamentals*

How can digital technologies support the creation of transnational partnerships for environmental sustainability?

How can ICTs be used to promote the creation of organizational ecosystems in the interest of high-tech small and medium-size enterprises' sustainable competitiveness in emerging economies?

How can new emerging technologies enable access, connectivity, and efficiency in the innovation processes supporting (social, economic, and environmental) sustainability?

Thematic cluster 2: knowledge management

How can interdependent and independent self-construal be linked with tacit knowledge articulation?

What factors can affect knowledge sharing from participants' perspective through a qualitative approach, focusing on an in-depth examination of roles at the micro level?

Expose the role of individuals and how their actions can affect the effectiveness of collaborative efforts in partnerships, joint ventures, and strategic alliances

Thematic cluster 3: knowledge work

How can IC be a key driver in creating value in manufacturing firms?

How can knowledge work personality shape preferences and responses to leadership's understanding of knowledge work?

How do self-motivation, intellectual and occupational attitudes and values, and personality integration enhance knowledge work?

Thematic cluster 4: knowledge generation

How does politics influence the mismatch between the knowledge economy's rhetoric and reality?

Explore the political ramifications of the shortcomings of knowledge-based growth

Understand how differing ideas about the knowledge economy have informed public policy in other countries and examine the differences between countries' experiences of knowledge-based growth

Thematic cluster 5: knowledge environments

Conduct empirical studies on the existing relationship between university–industry collaborations, funding, and universities' innovation performance, and identify the antecedents of and influences on these activities

Study the impact of universities in the context of developing and transition countries, rather than developed countries

Thematic cluster 6: new post-capitalism

Is international openness detrimental or advantageous to the development of domestic knowledge firms and knowledge workers?

What role does interpersonal trust play in the absorption and adaptation of knowledge obtained by exchange and what is its role in organizations?

Thematic cluster 7: KBE reconceptualization

Focus on emergent concepts, models, and frameworks from advances in previous thematic clusters

7. KBE Reconceptualization: The academy proposes new theory-building frameworks, which identify assumptions and theoretical pillars for explaining and constructing the paradigm shift.

Some specific research questions to direct future forays into the topic are suggested in Table 5. These suggested future research questions are not a closed list, and the questions are not formulated in a definitive form for researchers. They were collected and organized from proposed developments in recent articles of the discipline, according to each thematic cluster. The authors have specified

the questions with nuances from the original questions formulated by other researchers.

This study has some limitations. First, the dataset only considered articles in which terms derived from KE or KBE appear in the title or abstract, or among the keywords. Therefore, some articles with related themes were not considered in the literature review, while books and other types of documents were also excluded. Second, data from other sources (e.g., Scopus and Google Scholar) were omitted. Therefore, some documents with a lesser or limited impact might not have been considered in the review, even though they may have made very interesting contributions. Third, in attempting to identify the main KBE research lines, we narrowed our attention to articles with 25 citations or more; therefore, our descriptions of each thematic cluster could not fully capture the richness of each theme.

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Declarations

Conflict of interest This manuscript has not been published or presented elsewhere, and is not under consideration by another journal. All study participants provided informed consent, and the study design was approved by the appropriate ethics review boards. All the authors have approved the manuscript and agree with submission to your esteemed journal. There are no conflicts of interest to declare.

Consent to participate The authors consent to participate.

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References

- Abecassis-Moedas C, Ben Mahmoud-Jouini, S, Dell'Era C, Manceau D, Verganti R (2012), Key resources and internationalization modes of creative knowledge-intensive business services: the case of design consultancies. *Technol Forecast Soc Chang* 146:403–412
- Acworth EB (2008) University-industry engagement: the formation of the knowledge integration community (KIC) model at the Cambridge-MIT Institute. *Res Policy* 37(8):1241–1254
- Adler PS (2001) Market, hierarchy, and trust: the knowledge economy and the future of capitalism. *Organ Sci* 12(2):215–234
- Agostini L, Nosella A (2017) Enhancing radical innovation performance through intellectual capital components. *J Intellect Cap* 18(4):789–806
- Ahrweiler P, Pyka A, Gilbert N (2011) A new model for university-industry links in knowledge-based economies. *J Prod Innov Manage* 28(2):218–235
- Albort-Morant G, Leal-Rodríguez AL, Fernández-Rodríguez V, Ariza-Montes A (2018) Assessing the origins, evolution and prospects of the literature on dynamic capabilities: a bibliometric analysis. *Eur Res Manage Bus Econ* 24:42–52
- Amabile TM (1998) How to kill creativity. *Harv Bus Rev* 76(5):77–87
- Amavilah V, Asongu SA, Andres AR (2017) Effects of globalization on peace and stability: implications for governance and the knowledge economy of African countries. *Technol Forecast Soc Chang* 122:91–103
- Amesse F, Cohendet P (2001) Technology transfer revisited from the perspective of the knowledge-based economy. *Res Policy* 30(9):1459–1478
- Amin A, Roberts J (2008) Knowing in action: beyond communities of practice. *Res Policy* 37(2):353–369
- Anand N, Gardner HK, Morris T (2007) Knowledge-based innovation: emergence and embedding of new practice areas in management consulting firms. *Acad Manag J* 50(2):406–428
- Andres AR, Asongu SA, Amavilah V (2015) The impact of formal institutions on knowledge economy. *J Knowl Econ* 6(4):1034–1062
- Antras P, Garicano L, Rossi-Hansberg E (2006) Offshoring in a knowledge economy. *Q J Econ* 121(1):31–77
- Aparicio G, Iturralde T, Sánchez-Famoso V (2019) Innovation in family firms: a holistic bibliometric overview of the research field. *Eur J Fam Bus* 9(2):71–84
- Arteche-Bueno L, Prado-Román C, Fernández-Portillo A (2019) Private equity focused on family firms & small and medium sized companies: review and science mapping analysis of the recent scientific field. *Eur J Fam Bus* 9(2):146–158
- Arthur MB (2008) Examining contemporary careers: a call for interdisciplinary inquiry. *Hum Relat* 61(2): 163–186.
- Asheim B (2012) The changing role of learning regions in the globalizing knowledge economy: a theoretical re-examination. *Regl Stud* 46(8):993–1004
- Asongu S (2017) Knowledge economy gaps, policy syndromes, and catch-up strategies: fresh South Korean lessons to Africa. *J Knowl Econ* 8(1):211–253
- Asongu SA, Odhiambo NM (2020) Building knowledge-based economies in Africa: a systematic review of policies and strategies. *J Knowl Econ* 11:1538–1555
- Aubry M, Muller R, Gluckler J, (2011) Exploring PMOs through community of practice theory. *Int Proj Manag J* 42(5): 42–56
- Audretsch DB (1998) Agglomeration and the location of innovative activity. *Oxf Rev Econ Policy* 14(2):18–29
- Audretsch DB, Keilbach M (2004) Entrepreneurship and regional growth: an evolutionary interpretation. *J Evol Econ* 14(5):605–616
- Baier-Fuentes H, Merigó JM, Amorós JE, Gaviria-Marin M (2019) International entrepreneurship: a bibliometric overview. *Int Entrepr Manag J* 15(2):385–429
- Baruch Y, Peiperl M (2000) Career management practices: an empirical survey and implications. *Hum Resour Manag* 39(4):347–366
- Baum S, O'Connor K, Yigitcanlar T (2009) The implications of creative industries for regional outcomes. *Int J For Innov Policy*, 5(1/2/3): 44–64
- Belusi F, Orsi L, Savarese M (2019) Mapping business model research: a document bibliometric analysis. *Scandinavian J Manag* 35: 101048

- Bengoa A, Maseda A, Iturralde T, Aparicio G (2021) A bibliometric review of the technology transfer literature. *J Technol Transfer* 46:1514–1550
- Benneworth P, Hospers GJ (2014) The new economic geography of old industrial regions: universities as global-local pipelines. *Environ Plan C-Gov Policy* 25(6):779–802
- Berkhout AJ, Hartmann D, van der Duin P, Ortt R (2006) Innovating the innovation process. *Int J Technol Manage* 34:390–404
- Bjork S, Offer A, Söderberg G (2014) Time series citation data: the nobel prize in Econ. *Scientometrics* 98(1):185–196
- Block J, Fisch C, Rehan F (2020) Religion and entrepreneurship: a map of the field and a bibliometric analysis. *Manag Rev Quarterly* 70:591–627
- Bonilla C, Merigó JM, Torres-Abad C (2015) Econ in Latin America: a bibliometric analysis. *Scientometrics* 105(2):1239–1252
- Breu K, Hemingway CJ, Strathern M, Bridger D (2002) Workforce agility: the new employee strategy for the knowledge economy. *J Infor Technol* 17(1):21–31
- Brown JS, Duguid P (2001) Knowledge and organization: a social-practice perspective. *Org Science* 12(2):198–213
- Burns JM (1978) *Leadership*, Harper & Row, New York
- Cao Y, Xiang Y (2012) The impact of knowledge governance on knowledge sharing. *Manag Decis* 50:591–610
- Carayannis EG, Campbell DFG (2009) “Mode 3” and “Quadruple Helix”: toward a 21st century fractal innovation ecosystem. *Int J of Technol Manag* 46(3–4):201–234
- Carayannis EG, Popescu D, Sipp C, Stewart M (2006) Technological learning for entrepreneurial development (TL4ED) in the knowledge economy (KE): case studies and lessons learned. *Technovation* 26(4):419–443
- Castro GMD, Delgado-Verde M, Amores-Salvado J, Navas-Lopez JE (2013) Linking human, technological, and relational assets to technological innovation: exploring a new approach. *Knowl Manag Res Pract* 11(2):123–132
- Chandra Y, Styles C, Wilkinson I (2009) The recognition of first time international entrepreneurial opportunities Evidence from firms in knowledge-based industries. *Int Market Rev* 26(1):30–61
- Charles D, Charles D, Kitagawa, FF, Uyarra E, (2014) Universities in crisis?-new challenges and strategies in two English city-regions. *Camb J Regions Econ Soc* 7(2):327–348
- Choong KK, Leung PW (2020) A critical review of the precursors of the knowledge economy and their contemporary research: implications for the computerized new economy. *J Knowl Econ*. <https://doi.org/10.1007/s13132-021-00734-9>
- Cobo M, López-Herrera A, Herrera-Viedma E, Herrera F (2011) An approach for detecting, quantifying, and visualizing the evolution of a research field: a practical application to the Fuzzy sets theory field. *J of Inform* 5:146–166
- Coenen L (2007) The role of universities in the regional innovation systems of the North East of England and Scania, Sweden: Providing missing links? *Environ Plan C-Gov Policy* 25(6):803–821
- Colombo G, Dell’Era C, Frattini F (2015) Exploring the contribution of innovation intermediaries to the new product development (NPD) process: a typology and an empirical study. *R D Manage* 45(2):126–146
- Consoli D, Elche-Hortelano D (2010) Variety in the knowledge base of knowledge intensive business services. *Res Policy* 39(10):1303–1310
- Contu A, Grey C (2003) Against learning. *Hum Relat* 56(8):931–952
- Cooke P (2005) Regionally asymmetric knowledge capabilities and open innovation exploring ‘Globalisation 2’—a new model of industry organisation. *Res Policy* 34(8):1128–1149
- Creplet F, Dupouet O, Kern F, Mehmanpazir B, Munier F (2001) Consultants and experts in management consulting firms. *Res Policy* 30(9):1517–1535
- Dal Borgo M, Goodridge P, Haskel J, Pesole A (2013) Productivity and growth in UK industries: an intangible investment approach. *Oxf Bull Econ Stat* 75(6):806–834
- Day GS, Montgomery DB (1999) Charting new directions for marketing. *J Mark* 63:3–13
- De Winne S, Sels L (2010) Interrelationships between human capital, HRM and innovation in Belgian start-ups aiming at an innovation strategy. *Int J of Hum Resour Manag* 21(11):1863–1883
- Del Giudice M, Maggioni V (2014) Managerial practices and operative directions of knowledge management within inter-firm networks: a global view. *J Knowl Manag* 18(5):841–846
- Deiaco E, Hughes A, McKelvey M (2012) Universities as strategic actors in the knowledge economy. *Cambr J Econ* 36(3):525–541

- Dekas KH, Bauer TN, Welle B, Kurkoski J, Sullivan S (2013) Organizational citizenship behavior, version 2.0: a review and qualitative investigation of OCBs for knowledge workers at google and beyond. *Acad Manag Perspect* 27(3):219–237
- Derudder, B, Christof, C (2014) Introduction: the interlocking network model for studying urban networks: outline, potential, critiques, and ways forward. *Tijdschr Econ Soc Geogr* 105(4):373–386
- Derudder B, Taylor PJ (2018) Central flow theory: comparative connectivities in the world-city network. *Reg Stud* 52(8):1029–1040
- Dess GG, Ireland RD, Zahra SA, Floyd SW, Janney JJ, Lane PJ (2003) Emerging issues in corporate entrepreneurship. *J Manag* 29(3):351–378
- Drucker PF (1969) *The age of discontinuity: guidelines to our changing society*. Heinemann, London
- Durbin S (2011) Creating knowledge through networks: a gender perspective. *Gend Work Organ* 18(1):90–112
- Faulconbridge JR (2006) Stretching tacit knowledge beyond a local fix? Global spaces of learning in advertising professional service firms. *J Econ Geogr* 6(4):517–540
- Felin T, Zenger TR, Tomsik J (2009) The knowledge economy: emerging organizational forms, missing microfoundations, and key considerations for managing human capital. *Hum Resour Manage* 48(4):555–570
- Felstead A, Henseke G, (2017) Assessing the growth of remote working and its consequences for effort, well-being and work-life balance. *New Technol Work Employ* 32(3):195–212
- Ferreira MP, Pinto CF, Serra FR (2014) The transaction costs theory in international business research: a bibliometric study over three decades. *Scientometrics* 98(3):1899–1922
- Fletcher C, Boden R, Kent J, Tinson J (2007) Performing women: the gendered dimensions of the UK new research economy. *Gend Work Organ* 14(5):433–453
- Florida R (2004) *The rise of the creative class: and how it's transforming work, leisure, community and everyday life*. Basic Books, Cambridge
- Forde C, Slater G (2006) The nature and experience of agency working in Britain—What are the challenges for human resource management? *Pers Rev* 35(2):141–157
- Franzese RJ, Hays JC (2006) Strategic interaction among EU governments in active labor market policy-making—subsidiarity and policy coordination under the European Employment Strategy. *Eur Union Polit* 7(2):167–189
- Fulk J, Heino R, Flanagan AJ, Monge PR, Bar F (2004) A test of the individual action model for organizational information commons. *Org Sci* 15(5):569–585
- Garicano L, Rossi-Hansberg E (2006) Organization and inequality in a knowledge economy. *Q J Econ* 121(4):1383–1435
- Garrick J, Clegg S (2001) Stressed-out knowledge workers in performative times: a postmodern take on project-based learning. *Manage Learn* 32(1):119–134
- Goddard JB, Chatterton P (1999) Regional development agencies and the knowledge economy: harnessing the potential of universities. *Environ Plan C Gov Policy* 17(6):685–699
- Graen GB, Hui C, Taylor EA (2006) Experience-based learning about LMX leadership and fairness in project teams: A dyadic directional approach. *Acad Manag LearnEduc* 5(4):448–460
- Grant AM, Parker SK. (2009) Redesigning Work Design Theories: The Rise of Relational and Proactive Perspectives. *Academy of Manag Annals* 3(3): 317–375.
- Gregory AJ, Atkins JP, Burdon D, Elliott M (2013) A problem structuring method for ecosystem-based management: the DPSIR modelling process. *Eur J Oper Res* 227(3):558–569
- Guerrero M, Urbano D (2017) The impact of Triple Helix agents on entrepreneurial innovations' performance: an inside look at enterprises located in an emerging economy. *Technol Forecast Soc Chang* 119:294–309
- Guthrie J, Neumann R (2007) Economic and non-financial performance indicators in universities - The establishment of a performance-driven system for Australian higher education. *Public Manag Rev* 9(2):231–252
- Hafeez K, Abdelmeguid H (2003) Dynamics of human resource and knowledge management. *J Oper Res Soc* 54(2):153–164
- Hansen HK, Niedomysl T (2009) Migration of the creative class: evidence from Sweden. *J Econ Geogr* 9(2):191–206
- Harris RG (2001) The knowledge-based economy: intellectual origins and new economic perspectives. *Int J Manag Rev* 3(1):21–40
- Harrison R, Leitch CM (2005) Entrepreneurial learning: researching the interface between learning and the entrepreneurial context. *Entrepr Theory and Prac* 29(4):351–371

- Harzing AW, Alakangas S (2016) Google scholar, scopus and the web of science: a longitudinal and cross-disciplinary comparison. *Scientometrics* 106:787–804
- Henry C, Stiglitz JC (2010) Intellectual property, dissemination of innovation and sustainable development. *Glob Policy* 1(3):237–251
- Herauld JA (2021) A new approach of innovation: from the knowledge economy to the theory of creativity applied to territorial development. *J Knowl Econ* 12(1):201–217
- Holden N (2004) Why marketers need a new concept of culture for the global knowledge economy. *Int Market Rev* 21(6):563–572
- Howells J, Ramlogan R, Cheng SL (2012) Innovation and university collaboration: paradox and complexity within the knowledge economy. *Cambr J Econ* 36(3):703–721
- Hsieh JJPA, Rai A, Keil M (2008) Understanding digital inequality: comparing continued use behavioral models of the socio-economically advantaged and disadvantaged. *MIS Q* 32(1):97–126
- Huggins R (2008) The evolution of knowledge clusters progress and policy. *Econ Dev Q* 22(4):277–289
- Hurmelinna P, Kyläheiko K, Jauhiainen T (2007) The Janus face of the appropriability regime in the protection of innovations: theoretical re-appraisal and empirical analysis. *Technovation* 27(3):133–144
- Issahaka AW, Lines R (2021) Research literature on leadership of knowledge workers: where are we, and where should we be heading? *J Intellect Cap* 22(1). Doi: <https://doi.org/10.1108/JIC-10-2019-0240>
- Jessop B (2010) On academic capitalism. *Crit Policy Stud* 12(1):104–109
- Joo BK, McLean GN, Yang BY (2013) Creativity and human resource development: an integrative literature review and a conceptual framework for future res. *Hum Resour Dev Rev* 12(4):90–421
- Kark R, Carmeli A (2009) Alive and creating: the mediating role of vitality and aliveness in the relationship between psychological safety and creative work involvement. *J Org Behav* 30(6):785–804
- Kerr SP, Kerr W, Ozden C, Parsons C (2016) Global talent flows. *J Econ Perspect* 30(4):83–106
- Kessels JWM (2001) Learning in organisations: a corporate curriculum for the knowledge economy. *Futures* 33(6):497–506
- Kessler M (1963) An experimental study of bibliographic coupling between technical papers. *IEEE Trans Infor Theory* 9(1):49–51
- Kim WC, Mauborgne R (1998) Procedural justice, strategic decision making, and the knowledge economy. *Strateg Manage J* 19(4):323–338
- Kim YW, Ko J (2014) HR practices and knowledge sharing behavior: focusing on the moderating effect of trust in supervisor. *Public Personnel Manage* 43(4):586–607
- Kong E (2008) The development of strategic management in the non-profit context: intellectual capital in social service non-profit organizations. *Int J Manag Re* 10(3):281–299
- Kuhn T (1962) *The structure of scientific revolutions*. The University of Chicago Press, Chicago
- Kumar S, Sureka R, Colomage S (2020) Capital structure of SMEs: a systematic literature review and bibliometric analysis. *Manag Rev Quarterly* 70:535–565
- Latilla VM, Frattini F, Petruzzelli AM, Berner M (2018) Knowledge management, knowledge transfer and organizational performance in the arts and crafts industry: a literature review. *J Knowl Manag* 22(6):1310–1331
- Lee J (2008) Effects of leadership and leader-member exchange on innovativeness. *J Manage Psychol* 23(6):670–687
- Lefter V, Bratianu C, Agapie A, Agoston S, Orzea I (2011) Intergenerational knowledge transfer in the academic environment of knowledge-based economy. *Amfiteatru Econ* 13(30):392–403
- Lengnick-Hall CA, Lengnick-Hall ML, Abdinnour-Helm S (2004) The role of social and intellectual capital in achieving competitive advantage through enterprise resource planning (ERP) systems. *J Eng Technol Manage* 21(4):307–330
- Leonardi PM (2014) Social media, knowledge sharing, and innovation: toward a theory of communication visibility. *Inf Syst Res* 25(4):796–816
- Leppala S (2015) Economic analysis of knowledge: the history of thought and the central themes. *J Econ Surv* 29(2):263–286
- Leydesdorff L, Fritsch M (2006) Measuring the knowledge base of regional innovation systems in Germany in terms of a Triple Helix dynamics. *Res Policy* 35(10):1538–1553
- Lin BW, Chen CJ (2006) Fostering product innovation in industry networks: the mediating role of knowledge integration. *Int J Hum Resour Manage* 17(1):155–173
- Low L (2001) The Singapore developmental state in the new economy and polity. *Pac Rev* 14(3):411–441
- Lowe P, Phillipson J (2006) Reflexive interdisciplinary research: the making of a research programme on the Rural Economy and Land Use. *J Agric Econ* 57(2):165–184

- Lundvall BA (1992) National systems of innovation: towards a theory of innovation and interactive learning. Pinter Publisher, London
- MacNeill S, Steiner M (2010) Leadership of cluster policy: lessons from the Austrian province of Styria. *Policy Stud* 31(4):441–455
- Malecki EJ (2007) Cities and regions competing in the global economy: knowledge and local development policies. *Environ Plan C Gov Polic* 25(5):638–654
- Malecki EJ (2012) Regional social capital: why it matters. *Reg Stud* 46(8):1023–1039
- Malecki EJ (2004) Jockeying for position: What it means and why it matters to regional development policy when places compete. *Reg Stud* 38(9):1101–1120
- Marques JPC, Caraca JMG, Diz H (2006) How can university–industry–government interactions change the innovation scenario in Portugal?—The case of the University of Coimbra. *Technovation* 26(4):534–542
- Marques JS, Yigitcanlar T, da Costa EM (2015a) Incentivizing innovation: a review of the Brazilian Federal innovation support programs. *Asia Pac J Innov Entrepr* 9(1):31–56
- Marques JS, Yigitcanlar T, da Costa EM (2015b) Australian innovation ecosystem: a critical review of the national innovation support mechanisms. *Asia Pac J Innov Entrepr* 9(2):3–28
- Martin-de-Castro G, Delgado-Verde M, Lopez-Saez P, Navas-Lopez JE (2011) Towards “an intellectual capital-based view of the firm”: origins and nature. *J Bus Ethics* 98(4):649–662
- Martinez-Fernandez C (2010) Knowledge-intensive service activities in the success of the Australian mining industry. *Serv Ind J* 30(1):55–70
- Mason C, Harrison R (2003) Closing the regional equity gap? A critique of the department of trade and Industry’s regional venture capital funds initiative. *Reg Stud* 37(8):855–868
- McAdam R, Mille K, McAdam M, Teague S (2012) The development of University Technology Transfer stakeholder relationships at a regional level: lessons for the future. *Technovation* 32(1):57–67
- McGaughey SL (2002) Strategic interventions in intellectual asset flows. *Acad Manag Review* 27(2):248–274
- McGranahan DA, Wojan TR, Lambert DM (2011) The rural growth trifecta: outdoor amenities, creative class and entrepreneurial context. *J Econ Geog* 11(3):529–557
- Melnikas B (2010) Sustainable development and creation of the knowledge economy: the new theoretical approach. *Technol Econ Dev Econ* 16(3):516–540
- Melnikas B (2008a) Integration processes in the baltic region: the new form of regional transformations in the European Union. *Inz Ekon* 5:54–64
- Melnikas B (2008b) The knowledge-based economy in the european union: innovations, networking and transformation strategies. *Transform Bus Econ* 7(3):170–192
- Metcalfe JS, Ramlogan R (2005) Limits to the economy of knowledge and knowledge of the economy. *Futures* 37(7):655–674
- Millar J, Demaid A, Quintas P (1997) Trans-organizational innovation: a framework for research. *Technol Anal Strateg Manage* 9(4):399–418
- Mok KH (2005) Fostering entrepreneurship: changing role of government and higher education governance in Hong Kong. *Res Policy* 34(4):537–554
- Monni S, Palumbo F, Tvaronaviciene M (2017) Cluster performance: an attempt to evaluate the lithuanian case. *Entrep Sustain Iss* 5(1):43–57
- Mosey S, Wright M, Clarysse B (2012) Transforming traditional university structures for the knowledge economy through multidisciplinary institutes. *Cambr J Econ* 36(3):587–607
- Musselin C (2013) How peer review empowers the academic profession and university managers: changes in relationships between the state, universities and the professoriate. *Res Policy* 42(5):1165–1173
- Nahapiet J, Gratton L, Rocha HO (2005) Knowledge and relationships: when cooperation is the norm. *Eur Manag Rev* 2(1):3–14
- Niosi J (2002) National systems of innovations are “x-efficient” (and x-effective)—why some are slow learners. *Res Policy* 31(2):291–302
- Nowak MJ, Grantham CE (2000) The virtual incubator: managing human capital in the software industry. *Res Policy* 29(2):125–134
- OECD (Organization for Economic Co-operation and Development) (1996) The knowledge-based economy. OECD Publications, Paris
- Ortega-Argiles R (2012) The transatlantic productivity gap: a survey of the main causes. *J Econ Surv* 26(3):395–419

- Pandey SC, Dutta A (2013) Role of knowledge infrastructure capabilities in knowledge management. *J Knowl Manag* 17(3):435–453
- Paule-Vianez J, Gómez-Martínez R, Prado-Román C (2020) A bibliometric analysis of behavioural finance with mapping analysis tools. *Eur Res Manag Bus Econ*. <https://doi.org/10.1016/j.iedeen.2020.01.001>
- Potts J (2001a) Knowledge and markets. *J Evol Econ* 11(4):413–431
- Quah DT (1996) Regional convergence clusters across Europe. *Eur Econ Rev* 40:951–958
- Russell AW, Wickson F, Carew AL (2008) Transdisciplinarity: context, contradictions and capacity. *Futures* 40(5):460–472
- Sanchez-Barrionuengo M (2014) Articulating the “three-missions” in Spanish universities. *Res Policy* 43(10):1760–1773
- Secundo GG, De Beer C, Schutte CSL, Passiante G (2017) Mobilising intellectual capital to improve European universities’ competitiveness The technology transfer offices’ role. *J Intellect Cap* 18(3):607–624
- Secundo G, Ndou V, Del Vecchio P, De Pascale G (2020) Sustainable development, intellectual capital and technology policies: a structured literature review and future research agenda. *Technol Forecast Soc Chang* 153:119917
- Sedziuviene N, Vveinhardt J (2010) Competitiveness and innovations: role of knowledge management at a knowledge organization. *Inz Ekon* 21(5):525–536
- Seers A (2004) Interpersonal workplace theory at a crossroads. In Graen (ed) *New frontiers of leadership, LMX leadership: the series, 2*, pp 1–31. Greenwich, CT: Information Age
- Shuck B, Herd AM (2012) Employee engagement and leadership: exploring the convergence of two frameworks and implications for leadership development in HRD. *Hum Resour Dev Rev* 11(2):156–181
- Shyu JZ, Chiu YC (2002) Innovation policy for developing Taiwan’s competitive advantages. *R D Manag* 32(4):369–374
- Sorensen JAT, Chambers DA (2008) Evaluating academic technology transfer performance by how well access to knowledge is facilitated—defining an access metric. *J Technol Transf* 33(5):534–547
- Suire R, Vicente J (2009) Why do some places succeed when others decline? A social interaction model of cluster viability. *J Econ Geogr* 9(3):381–404
- Suominen A, Seppanen M, Dedehayir O (2019) A bibliometric review on innovation systems and ecosystems: a research agenda. *Eur J Innov Manag* 22(2):335–360
- Taylor P, Hyman J, Mulvey G, Bain P (2002) Work organization, control and the experience of work in call centres. *Work Employ Soc* 16(1):133–150
- Thompson P, Warhurst C, Callaghan G (2001) Ignorant theory and knowledgeable workers: Interrogating the connections between knowledge, skills and services. *J Manag Studies* 38(7):923–942
- Thomson SB, Wei WX, Swallow P (2019) Equality and harmony: diversity management in China. *Chin Manag Stud* 13(1):113–127
- Urbano D, Guerrero M (2013) Entrepreneurial Universities: socioeconomic impacts of academic entrepreneurship in a European Region. *Econ Dev Q* 27(1):40–55
- van Ark B, O’Mahony M, Timmer MP (2008) The productivity gap between Europe and the United States: trends and causes. *J Econ Perspect* 22(1):25–44
- Van Eck N, Waltman L (2010) Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84(2):523–538
- Van Oorschot JAWH, Hofmanb E, Johannes IM, Halmana JIM (2018) A bibliometric review of the innovation adoption literature. *Technol Forecast Soc Chang* 134:1–20
- Verbeke W, Dietz B, Verwaal E (2011) Drivers of sales performance: a contemporary meta-analysis. Have salespeople become knowledge brokers?. *J Acad Mark Sci* 39(3):407–428
- Vogel R, Gütel W (2013) The dynamic capability view in strategic management: a bibliometric review. *Int J of Manag Rev* 15(4):426–446
- von der Gracht HA, Vennemann CR, Darkow IL (2010) Corporate foresight and innovation management: A portfolio-approach in evaluating organizational development. *Futures* 42(4):380–393
- Walby S (2011) Is the Knowledge Society Gendered? *Gend Work Org* 18(1):1–29
- Waltman L, Van Eck NJ (2013) A smart local moving algorithm for large-scale modularity-based community detection. *Eur Physical J* 86:471
- Wang CF, Han Y (2011) Linking properties of knowledge with innovation performance: the moderate role of absorptive capacity. *J Knowl Manag* 15(5):802–819

- Wierzbicka W (2018) Information infrastructure as a pillar of the knowledge-based economy - an analysis of regional differentiation in Poland. *Equilibrium* 13(1):588–606
- Wierzbicki AP (2007) Modelling as a way of organising knowledge. *Eu J Oper Res* 176(1):610–635
- Wilton N (2011) Do employability skills really matter in the UK graduate labour market? The case of business and management graduates. *Work Employ Soc* 25(1):85–100
- Wong PK, Ho YP, Singh A (2007) Towards an “Entrepreneurial university” model to support knowledge-based economic development: the case of the national university of Singapore. *World Dev* 35(6):941–958
- Yang HD, van Rijn MB, Sanders K (2020) Perceived organizational support and knowledge sharing: employees’ self-construal matters. *Int J Hum Resour Manag* 31(7):2217–2237
- Yun JJ, Won D, Jeong E, Park K, Yang J, Park J (2016) The relationship between technology, business model, and market in autonomous car and intelligent robot industries. *Technol Forecast Soc Chang* 103:142–155
- Zhou P, Leydesdorff L (2006) The emergence of China as a leading nation in science. *Res Policy* 35(1):83–104
- Zupic I, Čater T (2015) Bibliometric methods in management and organization. *Organ Res Methods* 18(3):429–472

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