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Knowledge Management and Education in the Context of Innovation: A Bibliometric Analysis

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ABSTRACT

Penelitian ini bertujuan untuk mensintesis korpus publikasi mengenai manajemen pengetahuan, pendidikan tinggi, dan inovasi melalui analisis bibliometrik guna memahami tren penelitian, hasil, dan dampaknya dalam bidang tersebut. Metode yang digunakan adalah analisis kuantitatif terhadap data bibliografi yang bersumber dari basis data Scopus.com untuk periode tahun 2013 hingga 2022. Pencarian menggunakan kata kunci "knowledge management," "higher education," dan "innovation" menghasilkan total 196 dokumen. Hasil penelitian menunjukkan bahwa publikasi mencapai puncaknya pada tahun 2019, namun mengalami penurunan selama pandemi COVID-19 antara tahun 2020 hingga 2022. Subjek "ilmu komputer" mendominasi kontribusi dalam penciptaan inovasi melalui manajemen pengetahuan. Analisis jaringan berhasil mengidentifikasi empat klaster utama penelitian yang mencakup elemen e-learning, kepemimpinan pendidikan, sistem informasi manajemen, dan manajemen sumber daya manusia. Simpulan utama dari penelitian ini adalah bahwa riset mengenai penerapan proses manajemen pengetahuan untuk menciptakan inovasi di bidang pendidikan masih jarang dilakukan dalam artikel yang terindeks Scopus, sehingga membuka peluang besar bagi peneliti untuk mengeksplorasi topik ini di masa mendatang.

This study aims to synthesize a corpus of publications on knowledge management, higher education, and innovation through bibliometric analysis to understand research trends, outcomes, and impacts in these fields. The method employed is a quantitative analysis of bibliographic data sourced from the Scopus.com database for the period from 2013 to 2022. A search using the keywords "knowledge management," "higher education," and 'innovation' yielded a total of 196 documents. The results indicate that publications peaked in 2019 but declined during the COVID-19 pandemic from 2020 to 2022. The subject of "computer science" dominated contributions to innovation through knowledge management. Network analysis successfully identified four main research clusters covering the elements of e-learning, educational leadership, management information systems, and human resource management. The main conclusion of this study is that research on the application of knowledge management processes to create innovation in the field of education is still rarely conducted in Scopus-indexed articles, thus opening up significant opportunities for researchers to explore this topic in the future.

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INTRODUCTION

Innovation has transformed production processes and capacity across many industries worldwide, including education. This rapidly evolving innovation has also posed challenges for policymakers, management professionals, researchers, and practitioners in maintaining worker productivity during the COVID-19 pandemic. Peter Drucker, often referred to as the founder of modern management theory, has highlighted this issue as a key factor in enhancing worker output. Since production is often the primary goal in many organizations, management is frequently oriented toward it. Therefore, knowledge management is one of the key techniques required to improve the productivity levels of academic researchers in terms of task and research efficiency (Costan et al., 2021; Yang, 2017).

In the modern scientific era, the service sector is largely driven by knowledge based technologies and the digital economy to deliver better service quality and enhance productivity during the COVID-19 pandemic. The main challenge for management practitioners is to enhance workers' productivity capacity so they become well informed, capable of solving problems and completing tasks, particularly in the academic sector during the COVID-19 pandemic (Fitrian et al., 2021; Ravšelj & Tomaževiˇ, 2020; Salma Sultana et al., 2021). As mentioned, management practitioners broadly focus on the need to improve the productivity of university researchers. Management practitioners also emphasize evaluating the impact of knowledge management processes on individuals. Evaluating the impact of knowledge management processes on the productivity of knowledge workers including academic researchers (individual workers) enables them to make new contributions to the academic environment.

To this end, the issues arising in this context are presented in the following sections. First, a significant effect of implementing knowledge management is the generation of innovation for competitive advantage (Costan et al., 2021; de Jong & den Hartog, 2010; Siguaw et al., 2006). Consequently, an interesting consequence of implementing knowledge management is the emergence of knowledge management processes that will be implemented in accordance with the organizational architecture (Nobre & Almeida, 2018). Research has documented a relationship between knowledge management processes, practices, and infrastructure, as well as the consequences of innovation demands (Costan et al., 2021; Petrova et al., 2015; Schiuma et al., 2020). However, there remains a gap in understanding regarding the role of knowledge management processes in fostering knowledge-based innovation among academic researchers.

Second, the impact of implementing knowledge management processes on employee productivity in terms of task efficiency has been tested in the information technology sector (Mogogole & Jokonya, 2018; Panpatte & Takale, 2019) but proves less suitable when applied to evaluate the effects of knowledge management processes on a researcher's productivity.

The COVID-19 pandemic has significantly impacted the learning environment, student teacher interactions, discussion sessions, participation in seminars and conferences aimed at generating new ideas, and the productivity of academic researchers at higher education institutions in Indonesia. Although the Ministry of Education and Culture regularly organizes various knowledge sharing sessions to promote research findings, the COVID-19 pandemic has significantly disrupted these events.

KNOWLEDGE MANAGEMENT

The Concept of Knowledge

Wiryana & Hasibuan (Nurjanah, 2015) offer a perspective on knowledge. They classify "knowledge" into three types, namely:

1. Tacit knowledge

   Information transforms into tacit knowledge when processed internally within an individual's mind. Because of its personal nature, this knowledge is generally undocumented and encompasses intuitive and cognitive aspects that are difficult to formalize. This knowledge typically develops organically through daily work experiences. However, tacit knowledge can become explicit knowledge once it has been systematically communicated through written, visual, or other structured formats.

2. Explicit Knowledge
   Explicit knowledge is a type of knowledge that has undergone a process of codification and structuring into a formal format. Because it is stored in a systematic written format, this knowledge is far more practical to document, manage, and disseminate to others for broader use.
3. Shared Knowledge
   Shared knowledge is defined as explicit knowledge that is collectively utilized within a community. To accelerate the development of insights, personal tacit knowledge is converted into explicit knowledge through documentation such as reports or written materials, although not all aspects can be formalized. This knowledge is then published to make it accessible to all and undergoes a peer-review process for refinement. Overall, knowledge creation is a continuous spiral process that arises from the interaction between tacit and explicit elements

Knowledge Management

In today's information age, knowledge is the key to an organization's success. Knowledge management is a relatively new concept in Indonesia. It focuses on the process of identifying and organizing information to enhance an organization's profitability and efficiency. According to Dimttia & Oder (in Hwang et al., 2018), this discipline involves systematic efforts to gather collective expertise whether stored digitally in databases, in physical documents, or in employees' minds and then strategically disseminate it to maximize organizational performance.

Objectives of Knowledge Management

1. Time and Budget Efficiency
   Through the systematic management of knowledge resources, organizations can easily reuse this information for various future needs. This directly results in operational time savings and minimized costs.
2. Enhancing the knowledge base
   The availability of accessible knowledge resources enables all staff to make the most of them. This increased utilization of knowledge within the company will ultimately stimulate broader creativity and innovation, while strengthening the individual competencies of each employee.
3. Adaptability
   The organization has the ability to respond quickly and adapt to the dynamics of the business environment, whether in terms of short term priorities or long term vision.
4. Increased Productivity
   Reusing existing knowledge assets for the development of new processes or products enables organizations to operate more efficiently, which directly contributes to an increase in overall productivity.

METHOD

The method used in this study is bibliometric analysis, a methodology for the quantitative study of bibliographic data from the field of information and library science (Su & Sun, 2020). It was first developed by Pitchard in 1969 as a methodology for the quantitative analysis of bibliographic data. This approach was chosen due to its effectiveness in exploring major trends, research outcomes, and impacts within a research field (Management & Centers, 2020; Schiuma et al., 2020; Su & Sun, 2020) as well as its impact within a specific research area, making it highly suitable for synthesizing a corpus of publications regarding the relationship between knowledge management, higher education, and innovation. The research procedure was conducted systematically following several stages, beginning with the identification of search keywords, the collection of initial results, the screening of research findings, the compilation of statistical data from the initial findings, and culminating in an in depth data analysis (Hudha et al., 2020).

The data search was conducted using the Scopus.com database, which was selected because it is the largest database of peer-reviewed scientific literature. The document search used a combination of the keywords "knowledge management," "higher education," and "innovation" in the title, abstract, and

keywords (TITLE-ABS-KEY) fields. The publication timeframe defined in this study spans a ten year period, from 2013 to 2022, yielding a total of 196 documents for analysis. Subsequently, the data was analyzed using network analysis techniques and visual maps to identify relationships between keywords. In these visualizations, the frequency of keyword occurrence is represented by the size of nodes or points, where stronger relationships between variables are indicated by larger points, which helps researchers map research clusters and identify novel areas for future studies.

RESULTS AND DISCUSSION

Result

The scopus.com website was used to search for bibliographic sources from the database to be used. Scopus was chosen because it is considered the largest database containing peer-reviewed literature and publications. For this study, a search on the scopus.com website using the keywords “knowledge management,” “higher education,” and “innovation” yielded 196 documents. Using a combination of TITLE-ABS-KEY KEY ("knowledge management" AND "higher education" AND innovation) AND (LIMIT-TO (PUBYEAR , 2022) OR LIMIT-TO (PUBYEAR , 2021) OR LIMIT- TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT- TO (PUBYEAR , 2018) OR LIMIT-TO (PUBYEAR , 2017) OR LIMIT- TO (PUBYEAR , 2016) OR LIMIT-TO (PUBYEAR , 2015) OR LIMIT- TO (PUBYEAR , 2014) OR LIMIT-TO (PUBYEAR , 2013)), and a search for articles from 2013 to 2022. When presented in diagram form, it looks like Figure 1.

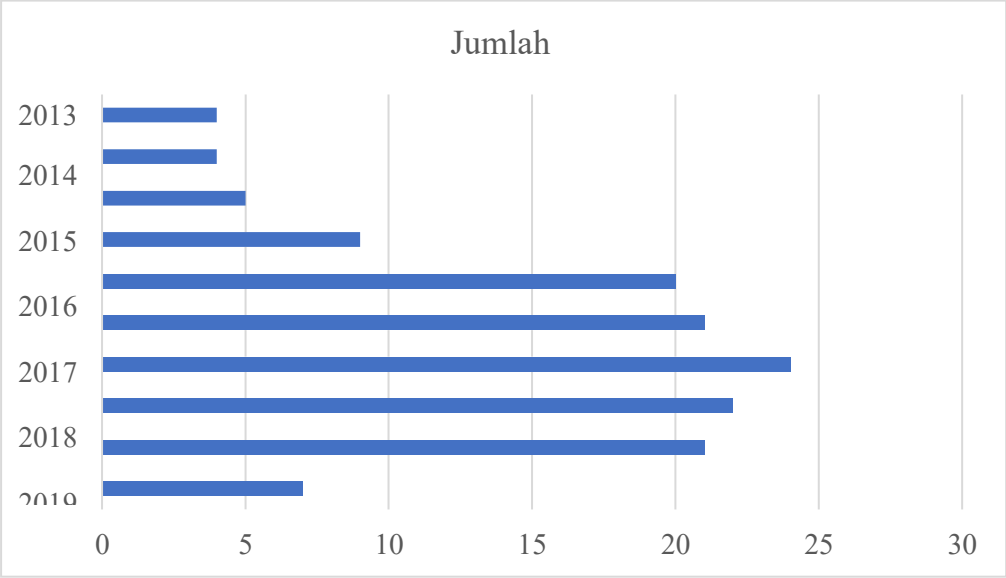

Figure 1. Distribution of publication years of the articles included

The distribution of research subjects corresponding to the keywords “knowledge management higher education innovation” is shown in Figure 2.

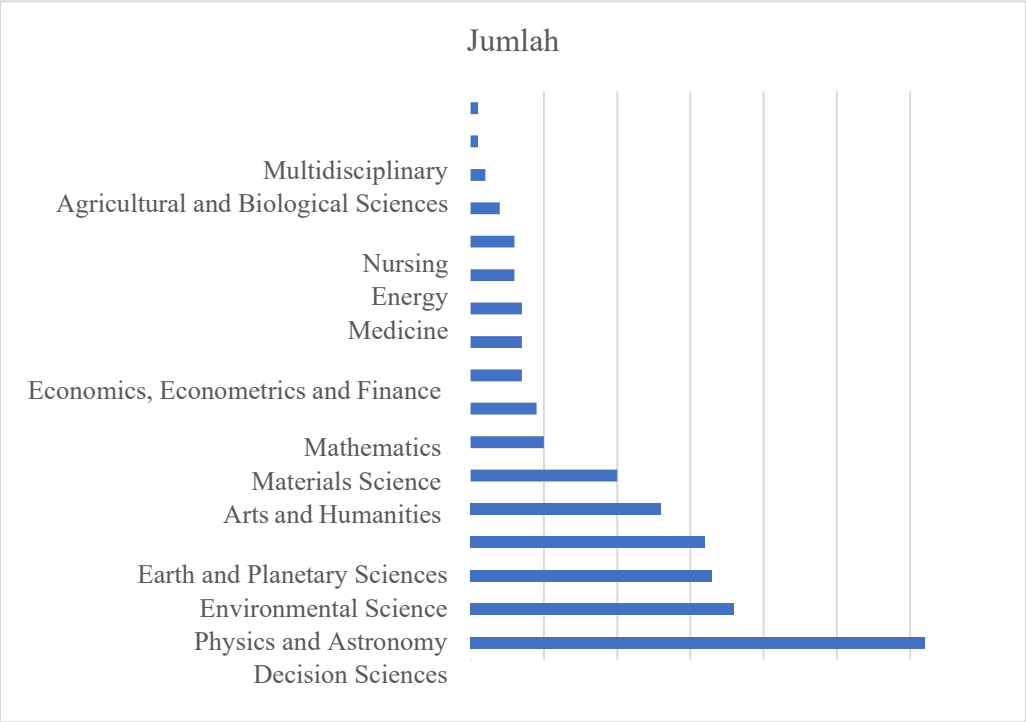

Figure 2. Distribution of Education Subjects

Table 1 presents the most relevant contributions related to the specified keywords, which have the highest citation counts (the top 10 most cited articles).

Table 1. Top 10 most cited articles

Author	Title	Year	Number of Citations	Publisher
Deem R., Hillyard S.,Reed M.	Knowledge, Higher Education, and theNew Managerialism: The Changing Management of UK Universities	2007	523	Oxford Universit yPress
Hidalgo A., Albors J.	Innovation management techniques andtools: A review from theory and practice	2008	171	Wiley
Sánchez M.P., ElenaS.	Intellectual capital in universities: Improving transparency and internal management	2006	120	Emeral d Insight
Elrehail H., Emeagwali O.L., Alsaad A., AlzghoulA.	The impact of Transformational and Authentic leadership on innovation in higher education: The contingent role ofknowledge sharing	2018	109	Elsevier Ltd
Gibb A.	Concepts into practice: Meeting the challenge of development of entrepreneurship educators around an innovative paradigm: The case of the International Entrepreneurship Educators' Programme (IEEP)	2011	105	Emeral d Insight

García Peñalvo F.J., García Figuerola C., Merlo J.A.	Open knowledge: challenges and facts	2010	96	Emerald Insight
Iqbal A., Latif F.,Marimon F., Sahibzada U.F.,Hussain S.	From knowledge management to organizational performance: Modelling themediating role of innovation and intellectual capital in higher education	2019	81	Emerald Group Holdings Ltd.
Fidalgo-Blanco A., Sein-Echaluce M.L.,García-Peñalvo F.J.	Knowledge spirals in higher educationteaching innovation	2014	54	IGI Global
Miller K., Alexander A., Cunningham J.A., Albats E.	Entrepreneurial academics and academicentrepreneurs: A systematic literature review	2018	51	Inderscience Publishers
Brescia F., ColomboG., Landoni P.	Organizational structures of KnowledgeTransfer Offices: an analysis of the world's top-ranked universities	2016	47	Springer NewYork LLC

A visualization of the data network based on the keywords "knowledge management higher education innovation" is shown in Figure 3.

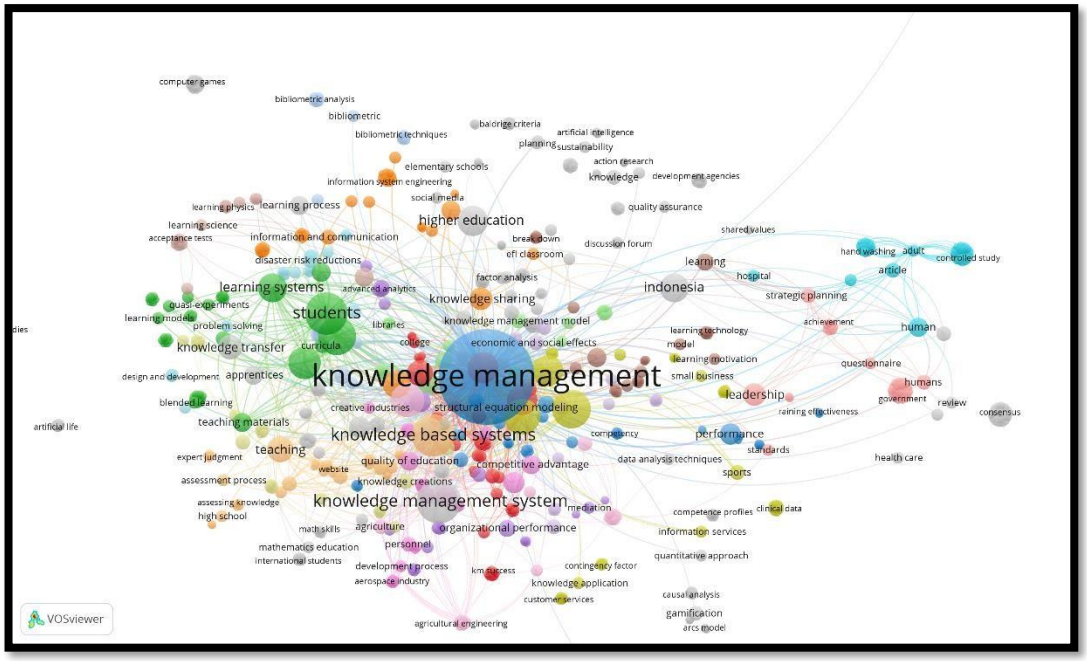

Figure 3. Visual representation of the network based on keywords

If we take the top ten keywords found in the 196 documents, the results are shown in the graph in Figure 4.

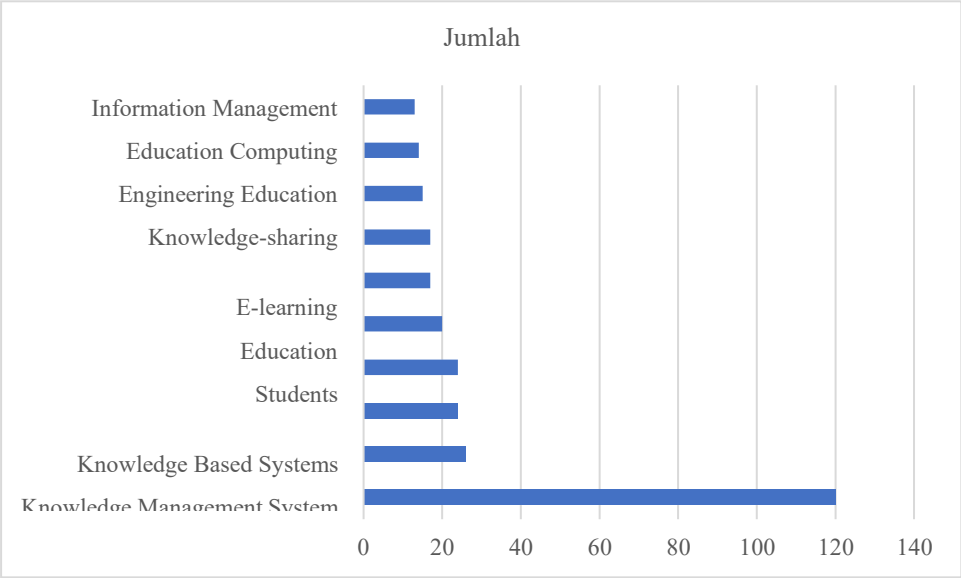

Figure 4. Distribution of the top 10 keywords

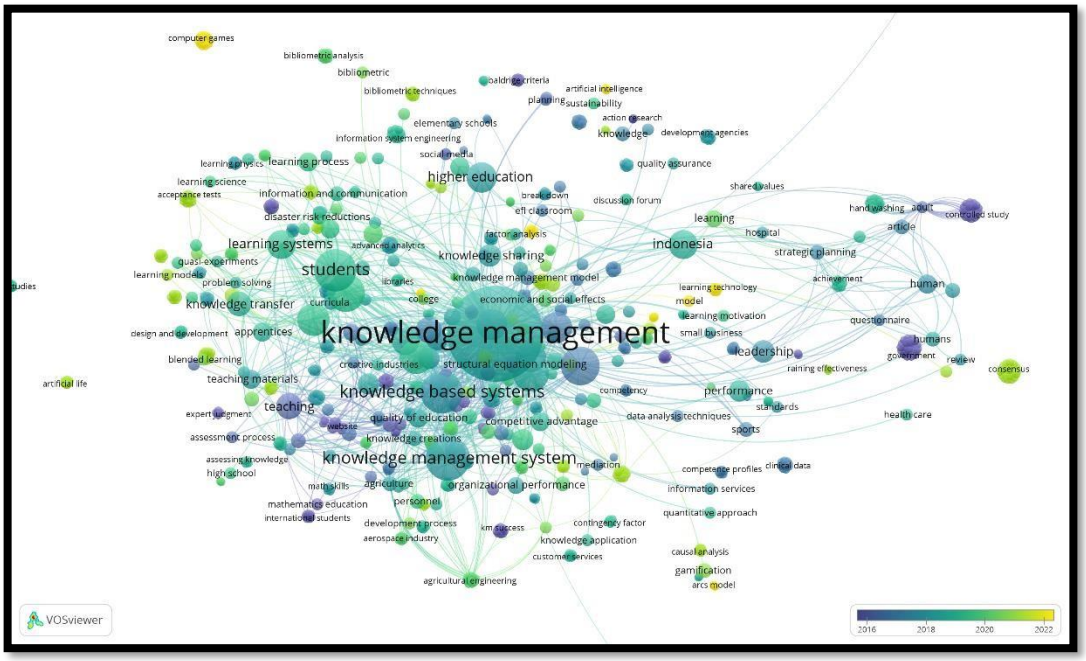

Figure 5. Visual representation of the network based on the year the articles were published

Figure 6 shows the types of publications in which the research findings were published.

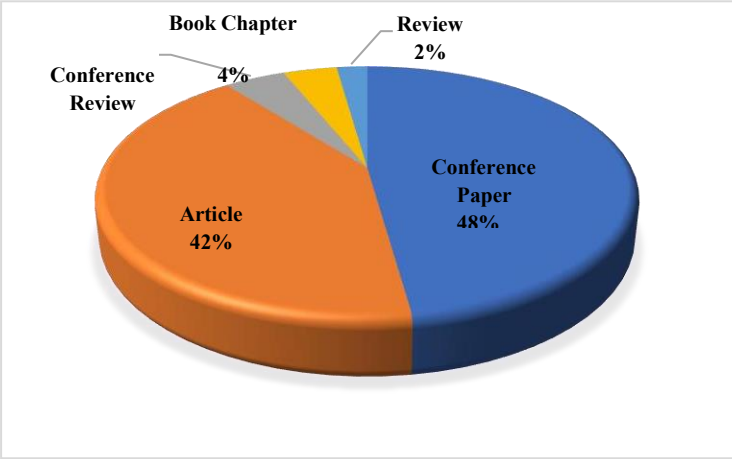

Figure 6. Published research findings

These results were derived from 196 articles identified using keywords, titles, and abstracts, with counts ranging from a minimum to a maximum. Generic terms were excluded, so the identified items represent node sizes. Node size indicates the frequency of keyword co occurrence. Four major clusters were successfully identified. The keywords appearing in each cluster represent the research streams of "knowledge management higher education innovation" and can be seen in Table 2.

Table 2. Keywords representing each cluster

No	Cluster	Element
1	1 (green)	students (24), e-learning (19), engineering education (15), learning systems (11), education computing (14), teaching (9), personnel training (6), apprentices (5), teaching materials (5), learning process (5), transfer knowledge (5)
2	2 (blue - grey)	knowledge management (120), education (20), knowledge-sharing (17), information management(13), Indonesia (11), higher education (12), knowledge sharing (7), competitive advantage (5), leadership (7), university (5), human (5)
3	3 (orange)	knowledge based system (24), knowledge management system (26), information systems (9),information use (10), management information systems (6), knowledge acquisition (6), knowledge transfer (6), educational institutions (6), explicit knowledge (6)
4	4 (light purple)	surveys (13), human resource management (12), quality of education (5), higher education institutions (6), computer aided instruction (5), regression analysis (5), performance (6)

Discussion

The year 2019 saw the highest number of studies conducted on these keywords. From 2020 to 2022, during the COVID-19 pandemic, there was a decline in the number of articles published using these keywords. This may be because there were limited opportunities for work from home activities related to scientific development and innovation creation (Fitrian et al., 2021).

The application of knowledge management to create innovations in the field of education is still dominated by the subject of "computer science." Work involving machines particularly computers and information technology makes a significant contribution to the creation of innovations.

The most relevant aspect of the findings in this paper is the number of citations. According to Table 1, the most cited work indexed by Scopus.com is the article by Deem R., Hillyard S., and Reed M., published in 2007. This article was published in a book titled Knowledge, Higher Education, and the New Managerialism: The Changing Management of UK Universities and has been cited 523 times. This book addresses issues of change that can be driven by higher education, such as the knowledge management process carried out by knowledge workers one of whom is a librarian as well as the knowledge management process managed by an academic manager. Table 2 also shows that the article published in Emerald Insight has been cited by many other researchers.

The discussion also outlines the tangible contributions of the research findings to relevant fields, particularly in the areas of educational administration and management, including: educational leadership, policy and planning, the economics of education, and educational policy. The discussion also addresses the study's limitations and their implications for practice as well as opportunities for future research.

Subject analysis indicates that the field of Computer Science dominates contributions to innovation through knowledge management. This reflects the fact that, in the digital age, services in the education sector are heavily driven by knowledge based technologies and the digital economy to improve service quality. The use of knowledge based systems and knowledge management systems (KMS) serves as the primary infrastructure enabling organizations to manage collective expertise, whether stored in digital databases or within employees' minds.

The core of innovation in higher education lies in the ability to manage three types of knowledge: Tacit Knowledge (personal and intuitive knowledge gained from daily work experience and difficult to formalize); Explicit Knowledge (knowledge that has been codified into a formal format, making it easy to document and disseminate); and Shared Knowledge (the result of converting personal knowledge into material that is collectively accessible and undergoes a peer-review process).

Knowledge creation in higher education is described as a continuous spiral process. Innovation emerges when the tacit knowledge of researchers or instructors is successfully transformed into systematic explicit knowledge, which is then reused to stimulate broader creativity within the organization.

Network analysis identifies four main clusters indicating current research directions: Cluster 1 (Education & E-learning), which focuses on learning processes, e-learning systems, and knowledge transfer among students; Cluster 2 (Management & Leadership), which highlights the importance of knowledge management for competitive advantage, leadership within universities, and its relevance in the Indonesian context; Cluster 3 (Information Systems) relates to technical aspects such as knowledge acquisition and information systems management. Cluster 4 (Human Resources & Quality) links human resource management with educational quality and institutional performance.

Although important, research specifically addressing the application of knowledge management processes to foster educational innovation in Scopus indexed journals remains relatively scarce. Most of the current literature focuses more on examining the impact of KM on task efficiency in the IT sector rather than on researchers' specific productivity in generating innovation. This creates a significant opportunity for future researchers to explore how knowledge management architectures can be adapted to university organizational structures to foster a stronger culture of innovation. To enhance productivity, universities must not only manage documents but also create an environment that supports time and budget efficiency through the reuse of existing knowledge assets.

Network analysis and visual overlays are used to identify keywords and their relationships with other keywords. The closer the relationship, as indicated by a larger dot, the more researchers have

studied that field. The smaller the dot and the longer the connecting line, the fewer researchers have studied that field. This can serve as a basis for identifying novel research topics for future studies.

This study is based solely on a limited keyword search and draws exclusively from the Scopus.com database. Furthermore, although this study employs recognized formal software, the author's subjectivity may introduce errors. Nevertheless, research on the application of knowledge management processes in the field of education aimed at creating educational innovations is still rarely conducted by researchers based on articles published on scopus.com. This opens up opportunities for researchers to publish their manuscripts in journal databases affiliated with scopus.com.

CONCLUTION

This study successfully identified 196 documents from the Scopus database covering the period 2013–2022 that integrate the concepts of knowledge management (KM), higher education, and innovation. The findings indicate that publication trends peaked in 2019 but experienced a significant decline during the COVID-19 pandemic (2020–2022), attributed to limitations in social interaction and scientific development activities resulting from work from home policies.

Data analysis reveals that the subject "Computer Science" plays a dominant role in contributing to the creation of educational innovation through knowledge management systems. Additionally, this study successfully mapped four main clusters in the literature, covering aspects of digital learning (e-learning), leadership and management in educational institutions, information system development, and human resource management focused on educational quality.

In conclusion, this study confirms that while knowledge management is crucial for researcher productivity and institutional efficiency, research specifically addressing the application of KM processes to create educational innovations remains scarce in Scopus-indexed literature. This indicates a significant opportunity for future researchers to explore in greater depth how knowledge management architectures can be effectively implemented to drive competitive advantage in the higher education sector

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