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Knowledge Management, Innovation And Leadership: A Bibliometric Analysis

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Abstract:
Knowledge management, leadership, and innovation are fundamental pillars for the development and competitiveness of organizations. They can directly influence performance and the ability to adapt to changes in the business environment. The study was carried out to map the research direction involving these three constructs and identify perspectives for future research. From a methodological point of view, a co-citation and coupling analysis was carried out using the Exploratory Factor Analysis (AFE) technique on a sample composed of 194 relevant articles extracted from the Web of Science database to investigate the topic in question. As a result, the bibliometric analysis highlighted the interconnection between leadership, knowledge management, and innovation. This emphasizes the need for integrated approaches that value leadership as a facilitator of these processes. Furthermore, our analysis revealed important trends, such as the impact of knowledge management on innovative performance and the role of leadership in promoting knowledge sharing and developing innovation. These findings provide valuable guidance for future research and organizational practice.

Keyword*: Knowledge management; Organizational innovation; Leadership.*

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I. Introduction

The knowledge economy highlights the crucial role of knowledge and information in producing value. This requires knowledge management skills to identify, develop, and apply intellectual assets[1]. The relationship between knowledge management, innovation, and leadership stands out. The Resource-Based View (RBV) and the Capability-Based View (VBC) highlight the importance of knowledge as a critical resource and effective knowledge management to boost competitiveness[2,3].

Knowledge management involves identifying, acquiring, disseminating, and applying knowledge[4]. Recent studies emphasize its positive influence on competitiveness, highlighting the importance of innovation, human capital, leadership, and organizational culture[5]. Leadership is vital in promoting knowledge management, knowledge sharing, and innovation[6]. Studies show that leadership positively influences knowledge sharing and innovation in organizations[7,8,9].

Despite studies on KM, innovation, and leadership, the literature still needs a complete understanding of their interrelationships. This article maps these constructs and identifies future research perspectives, contributing to theoretical and practical knowledge and assisting leaders, managers, and researchers interested in promoting knowledge management and innovation in organizations.

The structure of this article is made up of six distinct sections. The first is the introduction, followed by Section 2, which reviews the literature on knowledge management, innovation, and leadership. In Section 3, the method used is described, which includes data collection, sampling, and analysis procedures. In Section 4, the research results are presented, using techniques such as co-citation analysis, coupling and exploratory factor analysis. Section 5 presents a discussion of the current contributions and limitations of the study, as well as possible avenues for future research. Finally, in Section 6, the conclusions of the article are presented.

II. Theoretical Review

Knowledge management and innovation: Knowledge Management (KM) encompasses actions and processes related to creating, sharing, storing, disseminating, and applying knowledge in organizations. Different definitions highlight its various dimensions[4,10,11,12,13]. It involves the creation and sharing of knowledge, arising from the interaction between tacit and explicit knowledge[11].

It aims to maximize the company's knowledge-related effectiveness in three stages: identification and acquisition, development and storage, dissemination and use[10]. Identification, acquisition, storage, transfer and application of knowledge are fundamental parts of KM[4]. The importance of KM in improving the quality of decisions, process efficiency, competitiveness and innovation in organizations highlights an important relationship with innovation[13].

Innovation is a complex field, categorized into several dimensions: Product Innovation, Process Innovation, Incremental Innovation, Radical Innovation, Organizational Innovation, Strategic Innovation, and Market Innovation. KM is essential in promoting innovation and creating a work environment that stimulates creativity and supports innovation[14,15]. Research has demonstrated the relationship between KM, innovation, and organizational performance[16]. KM is essential to promote practices that encourage collaboration, continuous learning, and the exploration of new ideas, contributing to the long-term success of organizations in a competitive environment[15,17].

In summary, KM encompasses a series of practices that involve knowledge management in organizations, facilitating innovation in several dimensions. The creation and sharing of knowledge are fundamental for the emergence of innovations, boosting the success of organizations in the current competitive scenario.

Role of leadership in knowledge and innovation management: Leadership plays a crucial role in promoting KM and innovation, fundamental aspects for the competitiveness and success of organizations[11]. KM encompasses creating, acquiring, sharing, and applying knowledge, while innovation involves generating new ideas, products, processes, and services. In this context, leadership creates an environment conducive to KM and fosters innovation[12].

In the sphere of KM, leaders play a determining role in influencing, motivating, and guiding organizational members in creating, sharing, and applying knowledge. Leadership theories, such as transformational, transactional, and authentic, can be applied in KM to promote collaboration, learning, and innovation[18].

Leadership styles, such as transformational leadership and participative leadership, are associated with higher levels of innovation, as they encourage autonomy, collaboration, and experimentation[1]. Leaders also play the role of change catalysts and innovation agents by defining a strategic vision, establishing challenging goals, and promoting innovation as part of the organizational culture[18].

Faced with these challenges, leaders must seek the continuous development of their leadership skills, including competencies related to knowledge management, creativity, and problem-solving, in order to effectively drive KM and innovation. In this way, effective leadership plays a fundamental role in promoting KM and innovation, strengthening the competitive advantage of organizations, and leading them to achieve positive and sustainable results[19,20].

Moving forward to the next section, we will explore the methodological procedures that will be adopted in this study, detailing the research approach, data collection and analysis methods, as well as the sample selection criteria. These elements are fundamental for conducting research and obtaining significant insights into the relationship between KM, leadership, and innovation in organizations.

III. Methodological Procedures

Sample: This study used bibliometric research based on statistical measurements of science, scientists, or scientific activity. Bibliometric research is beneficial for defining general productivity in each area and evaluating the productivity of individual researchers, journals, countries, or any other data type relevant to scholars[21]. Data were collected from the Web of Science core collection, an electronic database provided by Clarivate Analytics. It is one of the most used in applied social sciences due to its comprehensive coverage of scientific publications and citations[22].

In the first stage, search strategies were used that included the keywords and Boolean operators "leader*" and "knowledge management," and " innov*" and document types: article, early access, and review article. Using the asterisk allowed capturing all variations of these words in the titles, abstracts, and keywords of the selected articles, resulting in 590 articles. The second stage refers to checking these articles to ensure all results are related to the topic by reading the titles and abstracts. Manual selection was used as a criterion to ensure that the articles included in the analysis were directly related to the scope of the research. This approach was adopted to avoid the inclusion of studies that, despite containing key terms or words related to the topic of interest, contributed little to the understanding and investigation of the topic in question. At the end of this selection process, 194 articles were retained, representing an appropriate selection of studies that best aligned with the objectives and scope of the research.

Analysis procedures: Two citation-based methods were used to map scientific literature in the fields of study that have dominated bibliometrics in recent decades: co-citation analysis and bibliographic coupling. Co-citation analysis is based on examining the frequency with which a given pair of primary studies is cited by other works, seeking to show their interrelationships, allowing the identification of a community of authors based on their positions in the researched field, indicating which works are considered fundamental and influential within this context[23]. Widely used to identify paradigmatic changes and areas of research fields[24,25,26].

Bibliometric coupling is also considered a similarity measure based on the frequency with which two documents in the sample share at least one standard reference. The number of references affects the result. The greater the number of references shared by two documents in a sample, the greater the similarity between them. It is used to detect trends and possible paths related to publication trends in a field. It can also indicate the research fronts within a field[24,25,26].

BibExcel software was used to read files in standard citation formats such as ISI Web of Science and Scopus and allows users to analyze citation connections between articles and authors in different research fields. It provides features for identifying co-citations, key article themes, mapping co-authorship networks, and visually displaying citation connections[27].

In this research, BibExcel was used to extract references from the sample and produce the co-citation co-occurrence matrix, considered a similarity measure. The co-citation co-occurrence matrix is the Exploratory Factor Analysis (EFA) input. It is a multivariate data analysis technique that seeks to identify the relationship between variables and reduce them to a smaller set of unobserved factors[28].

The EFA was carried out with the SPSS software, as it is the most common grouping method in bibliometric studies to describe, summarize, and group correlated variables called Factors. In bibliometric research, a factor is considered a subfield and represents theoretical bases based on the analysis of authors with high loads on that factor[29].

To identify the most related subdisciplines, we used factor labeling by extracting keywords from the titles of the authors' articles[30]. Qualitative and interpretative techniques were used, such as a review of the contents of the articles, which compose each factor to identify emerging themes, concepts, and patterns[31]; Qualitative Analysis, observing the main focus areas, recurring topics and key concepts; and Word Clouds, which were used to identify the most frequent terms and concepts in documents[32]. In this way, researchers explore the themes, concepts, and patterns emerging in the documents of each factor, searching for keywords, central ideas, and conceptual connections to name them in a way that accurately represents the content and nature of these groups of documents, providing a clear understanding of the knowledge and research they represent.

IV. Results

Co-citation analysis: Studies with a factorial load greater than or equal to 0.60 were retained based on the results obtained with co-citations. Studies highlight that when grouping primary studies into factors, only those with principal loadings are considered, while those studies with cross-loadings, which signify interrelationships between different research streams, are not considered[25]. For the exploratory factorial analysis of co-citation, adjustments were observed for the values of Communalities>0.5, KMO (Kaiser-Meyer- Olkin)>0.5, Bartlett $p<0.05$, and Explained variance>60%[33].

The results of the co-citation factorial analysis highlighted the four most significant factors, the titles attributed to each of them, and the articles that compose them are presented in Table no1. Each set of articles composes a factor, where the articles have a relationship of similarity, and each article belongs to a specific factor with a factorial loading[34].

Table no1: Co-citation factor analysis

Factor 1 – Leadership, knowledge management and Innovation.	Authors	Value factorial	Factor 2- Transformational leadership, Knowledge sharing and innovation capability	Authors	Value factorial
	Darroch (2005)	0,788		Armstrong (1977)	0,686
	Podsakoff (2003)	0,773		Yang (2018)	0,683
	Gold (2001)	0,772		Hair (2006)	0,678
	Donate (2015)	0,762		Nunnally (1978)	0,645
	Grant (1996)	0,749		Bass (1990)	0,642
	Rosing (2011)	0,729		Birasnav (2011)	0,638
	Chen (2009)	0,727		Vandeven (1986)	0,630
	Ribiere (2003)	0,715		Xiao (2017)	0,624
	Ho (2009)	0,712		Le (2019)	0,620
	Davenport (1998)	0,708		Bass (2000)	0,603
	Podsakoff (1986)	0,697			
	Yahya (2002)	0,696			
	Zack (2009)	0,695			
	Donate (2010)	0,688			
	Du plessis (2007)	0,686			
	Williams (2011)	0,685			
	Singh et al. (2019)	0,683			
	Lin (2007)	0,681			
	Wang (2012)	0,674	Factor 3 – Tacit knowledge transfe	Szulanski (1996)	0,688
	Podsakoff (2012)	0,667		Polanyi (2009)	0,607
	Kogut (1992)	0,661			
	Bavik (2018)	0,661			

	Chin (1998)	0,660			
	Lee (2003)	0,659			
	Gumusluoglu (2009)	0,658			
	Nguyen (2011)	0,657			
	Andreeva (2011)	0,656			
	Bagozzi (1988)	0,655	**Factor 4 – Transformational Leadership, organizational learning and innovation.**	Garcia-morales (2008)	0,753
	Baron (1986)	0,655		Burns (1978)	0,702
	Naqshbandi (2018)	0,646		Aragon-correa (2007)	0,661
	Detienne (2004)	0,645		Bass (1999)	0,636
	Yang (2007)	0,632			
	Anderson (1988)	0,619			
	Jansen (2006)	0,615			
	Darroch (2002)	0,612			
	Henseler (2015)	0,606			

Source: Prepared by the authors.

Factor 1: Entitled "Leadership, Knowledge Management, and Innovation" received this name due to the nature of the articles that make up this group. These articles highlight and explore various interconnections and complex relationships between the fundamental concepts of leadership, knowledge management, and innovation. Through this designation, it is clear that the studies gathered in this factor focus on identifying the dynamics involving leadership as a catalyst, knowledge management as a facilitator, and innovation as a desired result.

The results of the articles that make up this factor indicate relationships between the three concepts. Studies examine the role of knowledge-oriented leadership in knowledge management and innovation-seeking initiatives in technology companies. Identifying that this type of leadership encourages the development of knowledge management processes such as creation, storage, transfer, and application, which result in organizational performance and innovation[7]. Also discussed are the links between knowledge-driven leadership, open innovation, and knowledge management in international business, inferring that higher levels of knowledge-driven leadership can lead to improved knowledge management capability and better results of open innovation[35].

Other authors point out that leadership is often considered critical in shaping the results of effective collaboration, confrontation the specific challenges of learning and knowledge management. Leadership is fundamental and essential to propel an organization toward a culture that values knowledge and innovation. Leaders who recognize the importance of knowledge as a strategic asset are well-positioned to guide their teams in pursuing excellence, solving complex challenges, and developing innovative solutions to contemporary organizations' problems. Therefore, leadership plays a critical role in shaping a knowledge-supportive culture and the success of knowledge management initiatives aimed at innovation[36,37,38,39,40,41].

Based on the analysis, it becomes evident that the interconnection between knowledge management and transformational leadership in organizations encompasses a series of predecessor factors and developments that can significantly influence organizational performance and culture. The antecedents of this relationship include the presence of transformational leaders within organizations, those who inspire and motivate their teams by sharing a common vision and promoting high values. Additionally, the organizational culture that fosters constant learning and innovation plays a crucial role as an antecedent factor, as it creates an environment conducive to effective knowledge management.

Transformational leadership is an essential precursor to knowledge management, as leaders who value their employees' learning and personal development actively encourage the creation, sharing, and use of knowledge within the organization. This scenario encourages the development of a culture of continuous learning, where employees feel encouraged to contribute their ideas and experiences, thus promoting effective knowledge management.

On the other hand, knowledge management also generates several developments related to transformational leadership. When organizations implement effective knowledge management practices, leaders have access to valuable information and insights they can use to make more informed and strategic decisions.

This process, in turn, strengthens your ability to lead based on evidence and promotes a shared vision among employees. Additionally, knowledge management contributes to organizational innovation, since ideas and knowledge are shared and amalgamated efficiently. Transformational leaders can leverage this innovative environment to lead change and transformation initiatives that drive the organization's growth and competitiveness.

Factor 2: Choosing the name "Transformational Leadership, Knowledge Sharing, and Innovation Capability" is justified by the articles that make up this factor and the evident connections between these concepts. In addition to being composed of 3 articles on quantitative methods[42,43,44] which not only reflect the interconnection between transformational leadership, knowledge sharing, and innovation capacity but also highlights the importance of a robust methodological basis to support investigations in this area of research.

The results of the articles that make up this factor indicate some relationships between the three concepts. Bass (1999) studies on the evolution of leadership from transactional to transformational align with leadership transformation. Furthermore, the articles by Birasnay et al. (2011) and Xiao et al. (2017) explore the relationship between transformational leadership and knowledge sharing, indicating that this leadership style can play an essential role in promoting knowledge sharing within an organization. Studies by Yang et al. (2018) and Le and Lei (2019) examine the connection between collaborative culture, knowledge sharing, and innovation capacity, highlighting how transformational leadership can positively influence an organization's ability to innovate[45,46,47,48,49].

The composition of this factor, which includes both theoretical and quantitative articles, not only reflects the intrinsic interconnection of these concepts but also emphasizes the need for a solid methodological basis to advance research in this area. When analyzing the results of the studies, we identified valuable relationships between the three elements, highlighting how transformational leadership plays a fundamental role in promoting knowledge-sharing and innovation capacity within organizations. These insights reinforce the relevance and complexity of the topic, pointing to future research directions.

Factor 3: Was called "Tacit knowledge transfer" as it emphasizes tacit knowledge as an essential part of organizational knowledge and its importance in knowledge transfer, in addition to addressing philosophical issues related to knowledge. This name captures the essence of the themes covered in the factor and provides a solid foundation for research related to tacit knowledge transfer.

Szulanski (1996) states that the ability to transfer the organization's best internal practices helps a company's ability to build a competitive advantage through the appropriation of internal knowledge. Just as a company's capabilities can be complex for other companies to imitate, its best practices can also be challenging to imitate internally. Thus, the main barriers to internal knowledge transfer are knowledge-related factors such as the recipient's lack of absorptive capacity, causal ambiguity, and an arduous relationship between the source and recipient[50].

Polanyi (2009) in his book "The tacit dimension" states that people who are part of knowledge collectivities (basically through tacit mechanisms) carry emerging knowledge from the cultural tradition where they were born and raised. Thus, tacit knowledge – tradition, inherited practices, implicit values, and prejudices – is relevant. The study has relevance in the context of a philosophy of science and a deeper understanding of the foundations of knowledge, raising questions about the nature of knowledge, its importance, and how knowledge is transmitted or suppressed[51].

Szulanski (1996) and Polanyi (2009) work addresses the complexity of knowledge transfer in different contexts. Szulanski emphasizes the importance of internal transfer of best practices to build competitive advantage, highlighting knowledge-related barriers such as recipient absorptive capacity and causal ambiguity. On the other hand, Polanyi explores tacit knowledge rooted in cultural traditions and inherited practices, underlining its philosophical relevance and raising questions about knowledge's nature, importance, and transmission. Both authors emphasize the complexity of knowledge and its transfer, whether in the organizational context or the philosophy of science. They emphasize the continuous need to understand this multifaceted dimension of knowledge[50,51].

Factor 4: Was called "Transformational Leadership, Organizational Learning, and Innovation." Bass (1999) reviews two decades of research and development in transformational leadership. Aragón-Correa et al. (2007) studied the role of leadership and organizational learning in innovation and performance. García-Morales et al. (2008) study the effects of transformational leadership on organizational performance through knowledge and innovation. The mentioned authors contribute to understanding the relationships between leadership, innovation, and organizational performance in their research[52,53,54].

The name of the factor precisely reflects the central themes and relationships discussed in the grouped studies, highlighting the importance of leadership, innovation, and organizational performance in the research in question.

The results of the studies reveal several relevant conclusions: firstly, transformational leadership, as outlined by Bass (1999), demonstrates its ability to inspire, intellectually stimulating, and consider those led individually[45].

Furthermore, Aragón-Correa et al. (2007) highlight that transformational leadership can manifest itself in a directive or participatory way, further expanding its spectrum of influence. Notably, research points to the importance of organizational learning as a critical factor, with Aragón-Correa et al. (2007) showing that it exerts a more robust direct influence on innovation than the CEO's transformational leadership. Still, on this topic, leadership is seen as a fundamental link in promoting organizational learning, exerting an indirect influence on the innovative process of companies[53].

The same study emphasizes innovation's positive and significant influence on performance[53], corroborating the relevance of this factor. Garcia-Morales et al. (2008) contribute to understanding by highlighting

how transformational leadership impacts organizations' dynamic learning and innovation capabilities. Finally, tacit knowledge is essential for improving organizational performance consolidating the connection between learning, innovation, and business effectiveness[54].

These findings reflect the complex network of interactions between the critical elements in our study and provide a solid foundation for subsequent investigation. These results point to an intricate network of relationships between transformational leadership, organizational learning, and innovation. Transformational leadership is examined in its inspiring and stimulating potential, with an emphasis on the importance of considering those led individually. Furthermore, the relationship between leadership and organizational learning is explored, highlighting its indirect impact on innovation and company performance.

Innovation is identified as a critical factor in improving performance, while organizational learning emerges as a catalyst for this process. Finally, tacit knowledge is recognized as an element that improves organizational performance. These results highlight the complexity of the interactions between leadership, learning, innovation, and performance and provide valuable insights for future research in this interdisciplinary area.

Bibliographic coupling: Coupling analysis is based on the frequency with which two articles in the sample share at least one standard reference. As Narin and Rozek (1988) highlight, it seeks to identify intellectual connections between articles, as "the more references shared between two documents, the greater the probability that these documents deal with related topics or themes." This technique is widely used in scientific research to map the intellectual proximity between studies and identify areas of convergence in academic knowledge[55,56].

Tables no.2 and no.3 present the results of the bibliographic coupling factor analysis, highlighting the three most relevant factors and the titles attributed to each of them, together with the list of articles that make up these factors. Each set of articles forms a factor characterized by a similarity relationship between them, and each is associated with a specific factor with its corresponding factorial load[33].

Table no.2 presents the first factor, identifying the authors and values of the factor analysis of bibliographic coupling.

Table no.2: Factor 1 - analysis of bibliographic coupling

	Author	factor value	Author	factor value
Factor 1 - Precedents and Consequences of the Relationship between Knowledge Management and Transformational Leadership in Organizations	Di Vaio et al. (2021)	0,841	Chaithanapat e Rakthin (2021)	0,685
	Ugwu (2019)	0,833	Oparaocha (2016)	0,682
	Asiedu et al. (2020)	0,829	Rafiq et al. (2021)	0,682
	Reinmoeller e Van Baardwijk (2005)	0,821	Chaithanapat et al. (2022)	0,682
	Konno e Schillaci (2021)	0,813	Koloniari et al. (2018)	0,680
	Muhammed e Zaim (2020)	0,808	Thi Minh Ly et al. (2023)	0,680
	Attour e Barbaroux (2021)	0,788	Supermane (2019)	0,679
	Bhatti et al. (2021)	0,777	Pellicer et al. (2014)	0,676
	Ngah e Wong (2020)	0,774	Xue et al. (2011)	0,669
	Adhikari e Shrestha (2023)	0,763	Santos et al. (2020)	0,662
	Al-husseini et al. (2021)	0,752	Singh et al. (2019)	0,662
	Fachrunnisa et al., 2020	0,748	Gonzalez e De Melo (2018)	0,658
	Masood e Afsar (2017)	0,736	Crespo et al. (2022)	0,654
	Galeazzo e Furlan (2019)	0,731	Kharazmi et al. (2023)	0,649
	Ogunmokun et al. (2020)	0,729	Astuti et al. (2022)	0,647
	Zia (2020)	0,728	Lee e Yew (2022)	0,646
	Ballesteros-Rodríguez et al. (2022)	0,726	García-Morales et al. (2006)	0,642
	Rocha e Pinheiro (2021)	0,721	Lartey et al. (2021)	0,638
	Dhamija et al. (2021)	0,719	Donate e Guadamillas (2011)	0,637
	Alan e Köker (2021)	0,715	Yadav et al. (2020)	0,636
	Kharazmi et al. (2023)	0,712	Kaewsaeng-on et al. (2022)	0,636
	Gürlek e Cemberci (2020)	0,711	Micic e Tufegdzic (2021)	0,635
	Barua (2021)	0,707	Birasnav et al. (2011)	0,635
	Sung e Choi (2012)	0,705	Ngoc-tan e Gregar (2018)	0,634
	Nguyen (2023)	0,698	Riana et al. (2023)	0,631
	Abbas e Kumari (2021)	0,692	Rose et al. (2016)	0,631
	Noruzy et al. (2013)	0,692	Rong e Liu (2023)	0,615
	Duan et al. (2022)	0,689	Darwish et al. (2020)	0,610
	Kodama (2019)	0,687	Ben-ahmed et al. (2020)	0,605
	De oliveira costa et al. (2022)	0,687	Gu et al. (2022)	0,601
	Nyame e Qin (2020)	0,686	Nabi et al. (2023)	0,601

Source: Prepared by the authors.

Table no.3 presents factors 2 and 3, identifying the authors and values of the factor analysis of bibliographic coupling.

Table no.3: Factors 2 and 3 - Factor analysis of bibliographic coupling

Factor 2 - Knowledge Management and Organizational Innovation	Author	factor value	Factor 3 - Knowledge management in the business ecosystem life cycle	Author	factor value
	Santos (2020)	0,731		Attour e Barbaroux (2021)	0,675
	Sanchez e Manzanares (2018)	0,674		Chong et al. (2019)	0,616
	Sahban (2019)	0,663		Jing (2018)	0,602
	Cai et al. (2023)	0,659			
	Kodama (2019)	0,646			
	Allal-cherif (2022)	0,645			
	Rocha e Pinheiro (2021)	0,645			
	Auernhammer (2014)	0,643			
	Vaid e Honig (2020)	0,623			
	Roy e Mitra (2018)	0,611			
	Nyame e Qin (2020)	0,609			

Source: Prepared by the authors.

Factor 1: Was titled "Precedents and Consequences of the Relationship between Knowledge Management and Transformational Leadership in Organizations" Based on the trends and patterns presented in the 62 articles analyzed, recurring themes were identified related to the precedents and consequences of the relationship between knowledge management and transformational leadership.

Through structural equation modeling, Noruzy et al. (2013) identified the relationships between transformational leadership, organizational learning, knowledge management, organizational innovation, and organizational performance among manufacturing companies. Transformational leadership directly influences organizational learning and knowledge management. Organizational learning directly and positively influenced the knowledge management of manufacturing companies. Transformational leadership positively influences organizational innovation and organizational performance in manufacturing companies[57].

Organizational learning and knowledge management directly influenced organizational innovation, while organizational learning and innovation directly influenced organizational performance among industrial companies. Birasnay et al. (2011) explored the leadership and KM literature to examine the interrelationship between transformational leadership, KM, and the creation of benefits of human capital perceived by employees. They inferred that transformational leaders can affect their employees' perceptions regarding the benefits of human capital. They also have the most significant potential to amplify these benefits by involving them in the KM process, establishing an organizational culture, and encouraging employee communication[46].

Based on the analysis, it is clear that the relationship between knowledge management and transformational leadership in organizations involves a series of precedents and consequences that can significantly influence performance and organizational culture. The precedents for this relationship include the presence of transformational leaders in organizations, who are those who inspire and motivate their teams. Furthermore, an organizational culture that promotes continuous learning and innovation is an important precedent, as it creates the enabling environment for effective knowledge management. Transformational leadership is an important precedent for knowledge management since leaders who value their employees' learning and personal development tend to actively promote the creation, sharing, and use of knowledge within the organization. This leads to the development of a culture of continuous learning, where employees feel encouraged to contribute their ideas and experiences, promoting effective knowledge management.

When organizations implement effective knowledge management practices, leaders have access to valuable information and insights they can use to make more informed and strategic decisions. This, in turn, strengthens your ability to lead based on evidence and promotes a shared vision among employees. Furthermore, knowledge management contributes to organizational innovation as ideas and knowledge are shared and combined effectively. Transformational leaders can leverage this innovative environment to lead change and transformation initiatives that drive the organization's growth and competitiveness.

Factor 2: Was called "Knowledge Management and Organizational Innovation". Santos (2020) studied the state of organizational learning in Latin America and the Caribbean, looking to find research methods and themes. Sanchez and Manzanares (2018) researched the effects of the organizational context in terms of knowledge exploration and exploitation. Sahban (2019) warns about the effect of transformational leadership, knowledge management, and organizational support in predicting innovation capacity. Transactional leadership is essential in green creative behavior through workplace learning and knowledge management, emphasizing the moderating role of social networking sites[61]. Kodama (2019) studied the creation of new knowledge through a leadership-

based strategic community, studying the development of new products in the IT and multimedia business areas[58,59,60,61,62].

Open social innovation, multifunctional team management, and collaborative governance promote sustainable growth in aeronautics[63]. Rocha and Pinheiro (2021) study the gaps in leaders' awareness of organizational phronesis. Auernhammer (2014) thinks about transformational leadership and frugal innovation based on the mediating role of sharing tacit and explicit knowledge. Vaid and Honig (2020) analyze the influence of investors' opinions about human capital and multitasking on company performance through knowledge management. Roy and Mitra (2018) study the management of tacit and explicit knowledge and evaluation of R&D quality performance in emerging economies. Nyame and Qin (2020) propose a five-factor knowledge management model to empirically test these factors' presence, support, and effectiveness[64,65,66,67,68].

These insights highlight the complexity of relationships and underline the importance of considering mediating and moderating factors in developing practical knowledge management and innovation strategies in organizations. The issues explored cover the management of tacit and explicit knowledge, the evaluation of performance in research and development (R&D), and the influence of investors' opinions on company performance through knowledge management. In summary, factor 2 addresses a wide range of interconnected topics, emphasizing the importance of knowledge management across multiple dimensions such as strategy, governance, sustainability, and organizational capabilities. Relevant mediators and moderators were identified, and it was possible to observe how variables such as innovative employee behavior, knowledge sharing, organizational culture, information technology, collaboration, and trust play significant roles in these interactions.

Factor 3: The analysis of Factor 3, called "Knowledge management in the business ecosystem life cycle" reveals an essential connection between knowledge management, innovation, and the life cycle of business ecosystems. The fact that Attour and Barbaroux (2021) address the role of knowledge processes in the life cycle of business ecosystems indicates an understanding of the importance of knowledge management at different stages of this cycle[69].

The study by Chong et al. (2019) highlights the importance of knowledge management practices in research and product development companies. In the development phase, it highlights how knowledge management can be critical in contexts where innovation plays an essential role in R&D. This demonstrates how knowledge management practices can be adapted and applied in specific environments to promote innovation at different life cycle stages.

Furthermore, research by Jiang (2018) highlights the influence of integrating knowledge activities on team innovation through transformational leadership, suggesting that knowledge management is not just an isolated activity but is intertwined with leadership. Moreover, team dynamics which is particularly relevant when companies are growing and face scaling and expansion challenges. At this stage, companies seek ways to expand and improve their products and services, and innovation plays a vital role[70,71].

In short, Factor 3 indicates that knowledge management plays a critical role at different stages of the life cycle of business ecosystems and in varied contexts, including R&D (research and development) companies. Furthermore, the interaction between knowledge management, leadership, and innovation is a relevant aspect to be considered in knowledge management research and practice. These findings demonstrate how knowledge management is a versatile tool that can be adapted to promote innovation at different moments in the life cycle of business ecosystems, contributing to their success and evolution.

V. Discussion of Results

This study used bibliometric analysis to map critical themes and trends in academic literature related to knowledge management, innovation, and leadership. Through co-citation and bibliographic coupling analysis, we identified four and three factors that reflect the interconnections between these constructs. Each factor represents a set of related articles that address specific topics within those research areas.

The results of the co-citation analysis revealed that leadership, knowledge management, innovation, and organizational performance are intrinsically intertwined and are often addressed together in academic literature. This interconnection highlights the importance of adopting an integrated approach to knowledge management and innovation, recognizing the critical role of leadership in facilitating these processes.

Furthermore, the bibliographic coupling analysis revealed additional trends in the research, such as the influence of knowledge management on employees' innovative behavior, the importance of organizational culture in promoting innovation, and the role of knowledge management practices in specific contexts, such as research and development companies.

The mentioned articles present several gaps and areas of future research mainly related to leadership, knowledge management, innovation, and their interactions in different organizational and geographic contexts. Although the specific themes of each article vary, some common relationships and themes can be established between them:

Generalization and Geographic Context: Several articles mention geographic limitations in their research, such as focusing on a specific country (Ugwu (2019) in Nigeria, Asiedu (2020) in Ghana, Muhammed and Zaim (2020) in Turkey, Zia (2020) in Pakistan) or in specific sectors (Ogunmokun et al. (2020) in restaurants, Zia (2020) in software companies, Rafiq (2021) in renewable energy). They highlight the need to evaluate the applicability of their findings in different contexts[8,72,73,74,75,76].

Gender Differences: Muhammed and Zaim (2020) note that the impact of peer knowledge sharing may differ between men and women but do not explore these differences in depth. This suggests the importance of further investigating how gender affects these dynamics in organizations[8].

Knowledge Sharing: Many articles address knowledge sharing between peers as an essential factor[8,75,77] and suggest the need to study how this affects organizational performance, as well as the mechanisms and obstacles that influence it.

Leadership Strategies: Some articles explore the role of leadership[72,73,77] in promoting innovation and facilitating knowledge sharing. They suggest investigating leadership strategies that can promote these processes.

Innovation and Knowledge Management: The relationship between innovation and knowledge management is a common theme in several articles[5,72,73,78]. They emphasize the need to explore how knowledge management can drive innovation across different sectors and contexts.

Research in Developing Countries: Alhusseini et al. (2021) highlight the need for more research in developing countries on transformational leadership, knowledge sharing, and innovation in higher education institutions. He suggests expanding this research to better understand the dynamics in these contexts[79].

Longitudinal: Some articles mention the importance of longitudinal studies[8,78] to understand how relationships between variables evolve.

Moderating Variables: Astuti et al. (2022) suggest investigating moderating variables influencing the relationships between leadership, knowledge management, innovation, and performance. This study contributes a more comprehensive understanding of the complex relationships between knowledge management, innovation, and leadership[78]. The findings highlight the need for strategic and integrated approaches that consider the specific context of the organization and the dynamics of the business environment. These findings also have practical implications for organizations that want to promote innovation and improve their knowledge management practices.

However, it is crucial to recognize that research in this area constantly evolves, and new trends and themes may emerge as the field develops. Therefore, researchers and professionals must be aware of changes and innovations in knowledge management, innovation, and leadership to stay current and continue to contribute to advancing these areas of study. Knowledge management, innovation, and leadership are crucial in contemporary organizational success. As organizations face increasingly complex and dynamic challenges, adapting, constantly learning, and innovating becomes essential.

VI. Conclusion

The bibliometric analysis carried out in this study provided a comprehensive view of the interconnections between knowledge management, innovation, and leadership in academic literature. The results revealed the intrinsic relationship between these constructs and emphasized the importance of adopting an integrated approach to promoting organizational performance. It was highlighted that leadership, knowledge management, innovation, and organizational performance are topics frequently discussed together in academic literature. This interconnection highlights that these elements cannot be addressed in isolation; they are interconnected and exert mutual influence within organizations.

Furthermore, co-citation and bibliographic coupling analysis revealed additional trends in the research, such as the importance of managing knowledge sharing in promoting innovation, the influence of knowledge sharing on innovative performance considering the moderation and mediation of transformational leadership, and the need to consider different organizational and geographic contexts. The gaps and areas of future research identified in the articles provide valuable guidance for researchers and practitioners interested in these topics. Issues related to generalizability and geographic context, leadership strategies, knowledge sharing, innovation, research in developing countries, and longitudinal studies highlight the diversity of perspectives and research needs in this constantly evolving field.

Ultimately, this study contributes to a more comprehensive understanding of the complex relationships between knowledge management, innovation, and leadership. Their findings have practical implications for organizations that wish to improve their practices and strategies, recognizing the critical importance of these elements for organizational success in an increasingly dynamic and challenging business environment.

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