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Patent Management as a Factor of Industrial Competitiveness in Emerging Economies: Strategic Approaches and Challenges

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Abstract: Patent management plays a critical strategic role in industrial competitiveness, especially in emerging economies that face challenges such as inadequate infrastructure and regulatory barriers. This study aims to fill the gap in the literature by analyzing how efficient patent management can boost innovation and technological development in these economies. The aim is to identify the most effective practices and the obstacles faced by companies in these markets in using patents as a competitive tool. Using the Methodi Ordinatio methodology, a systematic literature review was carried out, analyzing 26 relevant articles. The results highlight the importance of international collaboration, investment in green patents, and cooperation with universities to strengthen innovation and global competitiveness. However, barriers such as high R&D costs and inconsistencies in intellectual property protection continue to hinder the full exploitation of patents, highlighting the need for more robust policies and institutional support to maximize their competitive potential.

Keywords: Patent Management, Industrial Competitiveness, Emerging Economies, Technological Innovation.

Gestão de Patentes como Fator de Competitividade Industrial em Economias Emergentes: Abordagens Estratégicas e Desafios

Resumo: A gestão de patentes desempenha um papel estratégico fundamental para a competitividade industrial, especialmente em economias emergentes que enfrentam desafios como infraestrutura inadequada e barreiras regulatórias. Este estudo visa preencher a lacuna na literatura ao analisar como a gestão eficiente de patentes pode impulsionar a inovação e o desenvolvimento tecnológico nessas economias. O objetivo é identificar as práticas mais eficazes e os obstáculos enfrentados por empresas desses mercados no uso de patentes como ferramenta competitiva. Utilizando a metodologia Methodi Ordinatio, foi realizada uma revisão sistemática da literatura, analisando 26 artigos relevantes. Os resultados destacam a importância da colaboração internacional, do investimento em patentes verdes e da cooperação com universidades para fortalecer a inovação e a competitividade global. No entanto, barreiras como altos custos de P&D e inconsistências na proteção da propriedade intelectual continuam a dificultar o pleno aproveitamento das patentes, evidenciando a necessidade de políticas mais robustas e apoio institucional para maximizar seu potencial competitivo.

Palavras-chave: Gestão de Patentes, Competitividade Industrial, Economias Emergentes, Inovação Tecnológica.

1. Introduction

Patent management is widely recognized as an essential strategic mechanism for protecting innovations and strengthening industrial competitiveness. Patents confer temporary exclusivity on inventions, allowing companies to benefit financially from their investments in research and development (DENTER et al., 2023). In a global environment marked by rapid innovation and intense competition, the effective management of patent portfolios becomes crucial for the sustainability of innovative companies, ensuring their ability to protect themselves against competitors and consolidate market positions (JUREK, 2024).

In emerging economies, the role of patents is particularly relevant, as these regions face unique challenges in transforming their innovative potential into economic and industrial growth. In many cases, emerging market industries must deal with structural barriers, such as weak regulatory systems and difficulty accessing financial and technological resources (BOND; SAGGI, 2020). Efficient patent management thus emerges as a strategic tool for protecting innovations, attracting foreign investment, and forming technological partnerships that boost local development (KWON, 2020).

Although the potential of patent management to boost competitiveness is evident, many companies in emerging economies still need help fully capitalizing on their intellectual property assets. Studies show that although there are initiatives to strengthen the intellectual property regime in these economies, the concrete benefits of patents on industrial competitiveness still need to be improved (MARCO et al., 2017). The lack of a robust infrastructure and effective patent commercialization and protection strategies compromises the ability of these companies to exploit their innovations fully, hampering their performance in global markets (GAMBARDELLA, 2023).

This study examines the relationship between patent management and industrial competitiveness in emerging economies, focusing on how the protection of innovations can improve the position of these industries on the global stage. While the literature is extensive on the role of patents in developed economies, there is a significant gap in emerging economies, especially concerning patent management practices (DYER et al., 2024). This article addresses this gap by exploring how emerging market industries can optimize patent management to strengthen their international competitiveness and promote technological development.

This article analyzes how efficient patent management can contribute to industrial competitiveness in emerging economies. Through a systematic literature review, the aim is to identify the patent management practices adopted by companies in these markets and to assess the impact of these practices on innovation, investment attraction, and global expansion. By providing a comprehensive overview of the current state of the literature, this study also aims to highlight the main barriers these companies face and propose strategic solutions to improve the use of patents as a competitive tool. The methodology adopted is a systematic literature review using the *Methodi Ordinatio* method (PAGANI et al., 2015, 2017; CAMPOS et al., 2018), which allows the prioritization of articles with high scientific impact. The search was conducted in the Scopus and Web of Science databases, focusing on articles published between 2014 and 2024. Strict inclusion and exclusion criteria were applied to guarantee the relevance of the selected studies, ensuring that only the most significant articles for the analysis were considered.

The structure of this article is organized as follows: After the introduction, section 2 presents the literature review, discussing the main concepts of patent management and their implications for emerging economies. Section 3 details the methodology used, using the *Methodi Ordinatio* approach for the systematic literature review. In section 4, the results of the selected studies are presented and analyzed. Finally, section 5 concludes the article, highlighting the study's contributions and suggesting directions for future research.

2. Literature Review

2.1. Concepts of Patent Management

Patent management is the set of activities and strategies used to protect, monitor, and market technological innovations, guaranteeing the exclusive exploitation of inventions for a limited period (LUO et al., 2024). Patents grant exclusive rights to their holder and create barriers to entry for competitors, enabling innovative companies to obtain a return on investments made in research and development (KISHI, 2019). In the industrial context, patent management becomes a strategic asset that can be used to maximize competitive advantage and protect intellectual property in a globalized market.

In addition to its protective function, patent management is essential in creating economic value for companies. Companies that effectively manage their patent portfolios can protect their innovations and use these assets to enter into strategic partnerships, license technologies, or attract new investors (KWON, 2020). According to Hyde and Fu (2022), patents can facilitate technology transfer, allowing licensed companies to benefit from innovations without developing in-house technologies.

The relevance of patents as a strategic asset is directly related to their ability to generate and protect value in highly competitive markets. According to Kwon (2020), companies that develop innovations often depend on the protection provided by patents to ensure the commercial success of their creations. The author points out that efficient patent management can be decisive for business survival and growth in highly dynamic industrial sectors, such as pharmaceuticals and electronics.

Although patents are, in essence, instruments for protecting innovations, their management goes beyond simply obtaining exclusivity rights. Strategic patent management involves continuously monitoring competing markets, analyzing technological trends, and adapting intellectual property protection strategies according to changes in the regulatory environment and competitive behavior (KISHI, 2019). Companies that adopt a proactive approach to patent management tend to achieve better results regarding competitiveness and innovation.

In addition, it is essential to note that patent management is also associated with corporate governance, especially in protecting the interests of shareholders and investors. For Li et al. (2024), the adequate protection of intellectual property strengthens investor confidence by ensuring that the company's intangible assets are adequately protected, which can increase share value and, more remarkably, attract capital. Therefore, good patent governance strengthens companies' capital structure and ability to compete globally.

2.2. Implications of Patent Management in Emerging Economies

Patent management is critical in emerging economies as these countries consolidate their industrial and technological sectors. Although the innovation potential is high, the fragility of intellectual property protection systems and regulatory barriers often make it challenging to create a favorable environment for innovation (WHALEN, 2018). According to scholars such as Gambardella (2023), the need for a robust framework for patent protection prevents local industries from gaining a competitive advantage, limiting economic growth and industrialization.

The effectiveness of patent management in emerging economies is further hampered by structural issues, such as the need for adequate infrastructure for registering and enforcing patents. Studies indicate that the time required to register a patent in these countries can be significantly longer than in developed economies, discouraging innovation and the entry of new technologies (BOND; SAGGI, 2020). In addition, local companies often face difficulties

competing with multinationals with large patent portfolios, making intellectual property management an even more significant challenge (WOO et al., 2015).

Another factor that impacts patent management in emerging economies is the dependence on foreign technologies. According to Huang et al. (2023), many companies in these countries adopt a secondary role in the global innovation chain, which reduces their ability to compete fairly with companies from developed countries. The lack of financial and technological resources to develop local innovations results in an excessive dependence on technology licenses, which can compromise industrial autonomy and the ability to grow in global markets (MARCO et al., 2017).

Despite the challenges, patent management in emerging economies presents significant opportunities for industrial development, mainly when associated with international cooperation strategies and institutional strengthening. According to Whalen (2018), implementing more effective public policies and investing in adequate infrastructure for registering and enforcing patents can create a more favorable environment for innovation. In addition, the author argues that collaboration with foreign universities and companies can accelerate knowledge transfer and local technological development, allowing industries in these markets to use their patents more strategically and competitively on the global stage.

3. Methodology

This study aims to investigate the impact of patent management on industrial competitiveness in emerging economies, emphasizing strategic approaches and the challenges faced. To achieve this objective, a systematic literature review was carried out using the Methodi Ordinatio methodology, which classifies and selects articles based on factors such as impact factor (IF), number of citations (Ci), and year of publication (PAGANI et al., 2015, 2017; CAMPOS et al., 2018). The methodology followed nine stages, detailed below.

Stage 1. Definition of research intent: The main objective of this study is to analyze how efficient patent management can contribute to increasing industrial competitiveness in emerging economies. The research seeks to map patent management practices in these economies and identify the structural challenges that limit the full use of patents as strategic assets.

Stage 2. Preliminary database search: A preliminary search was carried out in the Scopus and Web of Science databases, using keywords directly associated with the topic, to understand the current state of the literature and identify a preliminary portfolio of relevant articles.

Stage 3. Definition and combination of keywords: To capture the most relevant studies, a strategic combination of keywords was used, maximizing the precision of the search. The following combinations of terms were used: ("patent" OR "intellectual property" OR "technology transfer") AND ("industrial competitiveness" OR "industrial competitive advantage" OR "industrial performance"). Boolean operators made it possible to increase the scope of the searches, guaranteeing the inclusion of articles dealing with both patent management and industrial competitiveness.

Stage 4. Searching the databases: The initial search resulted in 4,107 articles in Scopus and 50 in Web of Science. To refine, a filter was applied for "Title, Abstract, and Keywords," reducing the results to 323 in Scopus and 46 in Web of Science. Next, to ensure that the analysis was up-to-date, the selection was limited to articles published in the last decade, resulting in 190 in Scopus and 26 in Web of Science. After filtering to include only research articles, 176 remained in Scopus and 18 in Web of Science. Finally, by excluding papers that were not in English, a total of 170 articles were obtained from Scopus and 18 from Web of Science, giving a total of 188 articles, as shown in Table 1.

Table 1 – Database searches

Item	Scopus	Web of Science	Total
All fields	4.107	50	4.157
Title, abstract, and keywords	323	46	369
Articles published in the last decade	190	26	216
Research articles	176	18	194
Articles in English	170	18	188

Source: Authors (2024)

Stage 5. Filtering procedures: Next, strict criteria were applied to ensure that the articles were relevant to the topic of study. Eight articles without complete data (such as year, author, or title), 15 duplicate articles, and 100 articles that did not directly address the relationship between patent management and industrial competitiveness were excluded. After this filtering, 65 articles remained directly relevant to the analysis.

Stage 6. Identification of variables: The variables used to classify the articles included the impact factor (IF), the number of citations (Ci), and the year of publication. This information was extracted from the Scopus and Web of Science databases, supplemented by data from Google Scholar, to ensure an accurate assessment of citations.

Stage 7. Classification of articles using InOrdinatio: The articles were classified using the InOrdinatio equation (Equation 1), which allows for a weighted combination of impact factor, number of citations, and year of publication. For this study, the α value was set at 10, given the importance attributed to the year of publication for the topic covered. Only articles with an InOrdinatio of 100 or more were selected. After this stage, the portfolio was reduced from 65 to 26 highly relevant articles, forming the study's basis.

$$InOrdinatio = \left(\frac{IF}{1000} \right) + \alpha * [10 - (ResearchYear - PublishYear)] + \left(\sum C_i \right) \quad (1)$$

Stage 8. Search for complete articles: The 26 articles selected after the InOrdinatio classification were obtained in their full versions through academic databases and organized in tools such as Mendeley, ensuring efficient and complete access for the analysis.

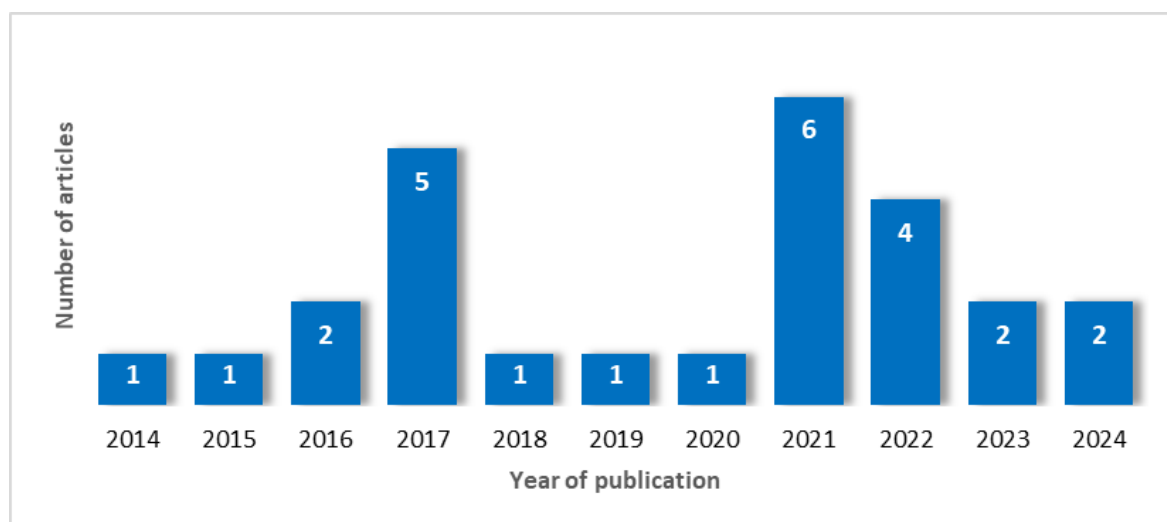
Stage 9. Final reading and systematic analysis of the articles: The articles were systematically analyzed using tools such as Excel and VOSviewer to identify patterns, trends, and gaps in the literature, providing a solid basis for conclusions on patent management and industrial competitiveness in emerging economies.

4. Results and Discussion

4.1 Analysis of Results

Analysis of the 26 articles selected reveals an evolution in academic interest in patent management and its relationship with industrial competitiveness in emerging economies. As illustrated in Figure 1, between 2014 and 2024, there was a gradual upward trend, with 2017 and 2021 standing out, with 19.2% and 23.1% of publications, respectively. These peaks suggest that the topic gained greater academic relevance in these years, driven by increased interest in intellectual property protection strategies in emerging markets. The year 2021, in particular, marks the peak of academic production, reflecting a renewed interest in the topic in the context of the post-pandemic economic recovery.

Figure 1 – Number of publications per year



Source: Authors (2024)

Despite a slight decline in publications in 2022 (15.4%) and stabilization at 7.7% in 2023 and 2024, the topic continues to attract significant attention, suggesting that new research is being conducted and awaits publication. The constancy in the number of publications between 2023 and 2024 indicates that, although the pace of growth has slowed, the topic's relevance remains strong in academic literature, with potential for further exploration in the coming years.

An analysis of the distribution of the 26 articles among the journals reveals a significant concentration of publications in vehicles specializing in the impact of technology and industrial management. Technological Forecasting and Social Change stands out as the leading journal, with 11 articles, consolidating its position as the primary source of publications on patent management and industrial competitiveness in emerging economies. This highlight reflects the journal's focus on forecasting and analyzing technological trends, which is directly aligned with the theme of the study.

Table 2 – Distribution of articles among journals

Journal	Impact Factor	Number of publications
Technological Forecasting and Social Change	12.9	11
Business Strategy and the Environment	12.5	2
Technology Analysis and Strategic Management	2.9	2
Technology in Society	10.1	2
Energy Policy	9.3	1
European Economic Review	2.8	1
Industrial and Corporate Change	2.8	1
International Review of Applied Economics	1.4	1
Journal of Development Economics	5.1	1
Organization and Environment	4.2	1
Resources Policy	10.2	1
Resources, Conservation and Recycling	11.2	1
Sustainability	3.3	1

Source: Authors (2024)

In addition, the journals *Business Strategy and the Environment*, *Technology Analysis and Strategic Management* and *Technology in Society* contributed two articles each, demonstrating their relevant role in the discussion on business strategies and the impact of technology on sustainability and industrial management. All the other journals in the analysis contributed just 1 article each, showing the diversity of vehicles dealing with the subject, but with a lower concentration. This distribution, highlighted in Table 2, reflects the multidisciplinary nature of research into patents and competitiveness, which permeates different areas of knowledge.

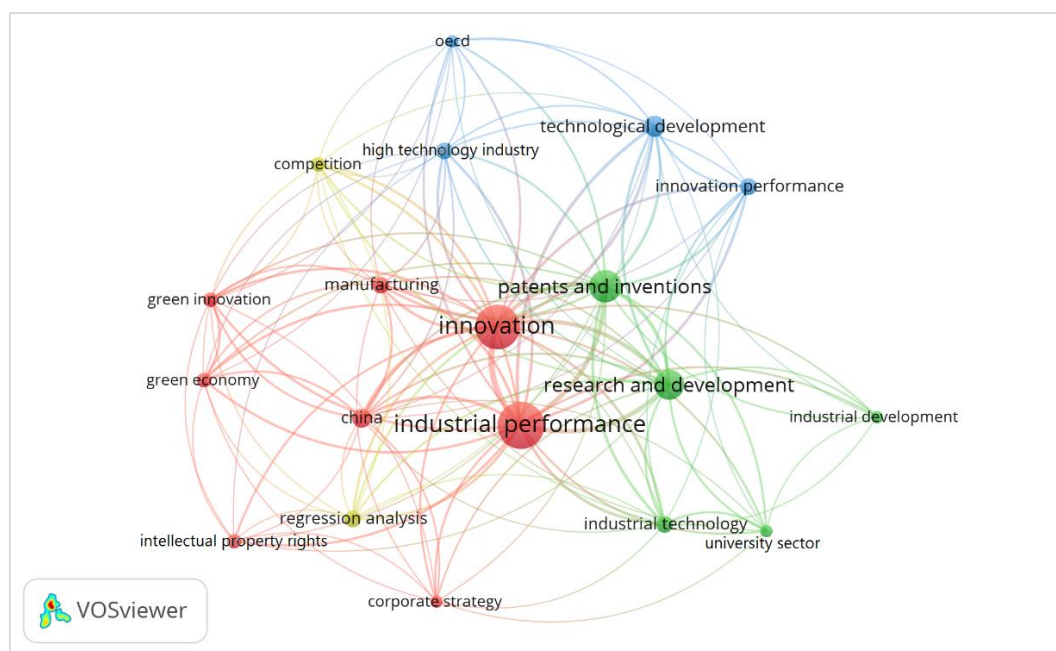
An analysis of the most cited articles in the portfolio reveals the significant impact that certain studies have had on patent management and industrial competitiveness. The most influential article in the portfolio is by Zhang et al. (2019), entitled "Green Innovation and Firm Performance: Evidence from Listed Companies in China," published in *Resources, Conservation, and Recycling*, which has accumulated a remarkable 551 citations. This study highlights the positive relationship between green patenting and firm performance. It is a critical reference in the debate on how sustainable innovation can boost company growth, especially in emerging economies like China.

Another noteworthy study is that of Stefan and Bengtsson (2017), "Unravelling appropriability mechanisms and openness depth effects on firm performance across stages in the innovation process," with 160 citations, which analyzes the complex relationship between intellectual property protection and collaboration throughout the innovation process. The article by Albahari et al. (2017), "Technology Parks versus Science Parks: Does the University Make the Difference?" with 152 citations, offers a valuable analysis of how the involvement of universities in technology parks directly influences the innovative performance of companies. The study by Lee et al. (2016), "Determinants of ICT innovations: A cross-country empirical study," with 151 citations, identifies the main factors that drive technological innovations in the ICT sector in different countries, emphasizing the role of network infrastructure and R&D collaboration. These articles are key references in the field, demonstrating how the interaction between patents, innovation, and academic collaboration drives industrial competitiveness in different contexts.

The analysis of keywords, shown in Figure 2, identifies four main clusters that reflect the central research themes of patent management and industrial competitiveness. The Red Cluster stands out for its emphasis on "industrial performance" (26 occurrences) and "innovation" (24 occurrences), indicating the crucial relationship between innovation and industrial performance. Terms such as "green economy" and "green innovation" (4 occurrences each) reinforce the focus on sustainability, especially in the context of economies such as China (6 occurrences). The Green Cluster focuses on "patents and inventions" (14 occurrences) and "research and development" (13 occurrences), highlighting the importance of patents and research for industrial competitiveness.

The Blue Cluster explores the role of "technological development" (7 occurrences) and the "high technology industry" (5 occurrences) in innovation, highlighting the relevance of advanced technologies for industrial performance. The Yellow Cluster, meanwhile, focuses on "competition" (4 occurrences) and "regression analysis" (5 occurrences), underlining the importance of competitiveness and quantitative analysis in formulating business strategies. These clusters provide an overview of the current research profile and point to directions that could guide future research in patent management and industrial innovation.

Figure 2 – Final Portfolio Keywords



Source: Authors (2024)

4.2. Discussion

4.2.1. Strategic Approaches to Patent Management in Emerging Economies

The patent management practices adopted by industries in emerging economies have the central objective of strengthening their international competitiveness and promoting technological development. One of the most common practices involves international collaboration in technological development, highlighted by Ahmad (2021), who emphasizes the importance of continuous investment in R&D and the protection of knowledge generated by patents, both national and international. This collaboration allows companies in emerging economies to integrate technologies from different markets, which helps them compete globally.

In addition, cooperation with universities is widely seen as an essential practice. Albahari et al. (2017) note that industries located in science and technology parks benefit from their proximity to academic institutions, which facilitates the innovation process and patent protection. Similarly, Liu et al. (2023) point out that cooperation with heterogeneous partners, such as universities, is a central strategy for absorbing advanced knowledge, especially in cutting-edge technological areas. Collaboration between companies, universities, and research institutions improves innovation capacity and protects the knowledge generated, strengthening competitiveness.

Green innovation is also emerging as an essential practice to strengthen the competitiveness of industries in emerging economies. Hao et al. (2022) show that investing in green patents increases the value of companies, especially in the most polluting industries. Marín-Vinuesa et al. (2020) point out that companies that invest in eco-innovation, protected by green patents, gain financial and sustainable advantages. In addition, Zhang et al. (2019) indicate that registering green patents improves operational efficiency and positions companies as leaders in sustainable innovation. Yuan et al. (2021) add that these patents make it easier to attract investment and promote technological development, bringing companies into line with the environmental requirements of the global market.

Another common practice among such industries is the internationalization of R&D activities, as emphasized by Rahko (2016). Creating international innovation networks allows these companies to access foreign scientists and integrate into global technological ecosystems, expanding their innovation capacity. Liu et al. (2023) and Lin (2014) corroborate that this international collaboration increases the diversity and quantity of patents and promotes technological development by exchanging knowledge in different regions.

Using originality metrics to assess technological diversity is also a relevant strategic practice. Harrigan et al. (2017) highlight the measure of technological distance as an effective tool for identifying disruptive innovations, allowing companies to explore new technological frontiers. In addition, Hall (2024) and Stefan and Bengtsson (2017) reinforce that these radical innovations are vital to protecting strategic knowledge through patents and ensuring competitive advantage in global markets. By adopting this approach, industries in emerging economies ensure their ability to innovate continuously, remaining competitive in sectors of rapid technological development.

Finally, internal R&D management, primarily through employee collaboration, is essential in promoting innovation. Zhang and Tang (2017) point out that technological diversity among employees, combined with the combination of different technologies within the company, results in more excellent innovative performance. Capaldo and Petruzzelli (2015) add that this internal synergy promotes an environment conducive to developing new patents, ensuring that industries in emerging economies stand out in global markets.

4.2.2. Challenges in Patent Management in Emerging Economies

Industries in emerging economies face a series of barriers related to patent management, one of the main ones being the difficulty in transforming scientific production into commercially viable innovations. According to Chen et al. (2021), the high initial costs of R&D limit the innovation potential, especially in companies with fewer resources. In this context, strengthening subsidies and encouraging partnerships between universities and industries can favor the more effective use of patents as a competitive tool.

Another significant barrier is the lack of R&D infrastructure and unequal access to advanced technologies, as discussed by Bhattacharya et al. (2022). Less technologically developed companies need help in using patents efficiently. Broader collaborations between companies of different technological levels can help overcome these limitations, promoting innovation and facilitating access to cutting-edge technologies.

Integrating organizational and geographically distant knowledge also represents a challenge for these companies. Capaldo and Petruzzelli (2015) point out that companies find it difficult to adequately exploit the potential of innovations that arise in distant geographical contexts. Broadening the scope of international alliances can improve the absorption of external knowledge and contribute to developing more innovative patents.

Furthermore, the inconsistent protection of intellectual property in different regions, as highlighted by Fang and Li (2024), represents an additional barrier. Companies in regions with low patent protection need help capitalizing on their innovations. Policies that seek to improve intellectual property protection can thus facilitate the more effective use of patents as a competitive tool.

Finally, the high cost and complexity of the patenting process are frequent challenges in emerging economies, according to Fernandez (2022). These obstacles increase the risks in the innovation process and discourage the adoption of new technologies. Simplifying processes and offering tax incentives can effectively reduce these costs and boost innovation in the long term.

5. Conclusions

This study reveals that patent management in industries in emerging economies plays a crucial role in consolidating international competitiveness and technological progress. The main strategies identified are international collaboration, investment in green patents, and cooperation with universities, all essential for leveraging innovation and protecting the knowledge generated. In addition, the use of metrics to measure technological originality and the internationalization of R&D activities have proven to be effective practices for diversifying patent portfolios and expanding the reach of these companies in global markets.

The analysis of the results suggests that, despite the challenges faced, industries in emerging economies can turn patents into strategic competitive tools by adopting innovative and collaborative approaches. This study makes a significant contribution by demonstrating that strengthening international innovation networks, combined with policies to encourage green innovation and technological development, can position these companies as protagonists on the global stage. However, overcoming barriers such as high R&D costs, insufficient infrastructure, and inconsistent intellectual property protection is crucial to maximizing the use of patents and ensuring innovation sustainability.

Future research could explore the impact of digital transformation on patent management, analyzing how this change can further integrate companies from emerging economies into global markets. Another promising line would be to investigate the use of green patents in sectors other than traditionally polluting ones, expanding their role in promoting industrial sustainability. Comparative studies between different emerging economies would also be valuable in understanding regional and sectoral variations in the effectiveness of patent management and its contribution to industrial competitiveness.

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