GESTÃO DO CONHECIMENTO COMO IMPULSIONADOR DA INOVAÇÃO: ESTUDO DE CASO NA INDÚSTRIA METALÚRGICA

KNOWLEDGE MANAGEMENT AS A DRIVER OF INNOVATION: A CASE STUDY IN THE METALLURGICAL INDUSTRY

CATIUSCA CHAVES PEIXOTO SPODE
UNISINOS - UNIVERSIDADE DO VALE DO RIO DOS SINOS

JOSÉ CARLOS DA SILVA FREITAS JUNIOR
UNISINOS - UNIVERSIDADE DO VALE DO RIO DOS SINOS

PAOLA RÜCKER SCHAEFFER
UNISINOS - UNIVERSIDADE DO VALE DO RIO DOS SINOS

PATRÍCIA MARTINS FAGUNDES CABRAL
UNISINOS - UNIVERSIDADE DO VALE DO RIO DOS SINOS

Comunicação:
O XIII SINGEP foi realizado em conjunto com a 13th Conferência Internacional do CIK (CYRUS Institute of Knowledge), em formato híbrido, com sede presencial na UNINOVE - Universidade Nove de Julho, no Brasil.

GESTÃO DO CONHECIMENTO COMO IMPULSIONADOR DA INOVAÇÃO: ESTUDO DE CASO NA INDÚSTRIA METALÚRGICA

Objetivo do estudo
Investigar como práticas estruturadas de gestão do conhecimento potencializam processos de inovação em uma indústria metalúrgica, analisando mecanismos formais e informais de criação, disseminação e aplicação do conhecimento no fortalecimento das capacidades dinâmicas e no alcance de vantagem competitiva sustentável.

Relevância/originalidade
O estudo contribui ao evidenciar, em contexto industrial tradicional, a relevância da gestão do conhecimento como elemento central para inovação contínua, ampliando a compreensão de sua aplicabilidade em setores com menor propensão tecnológica, por meio de integração entre teoria e evidências empíricas

Metodologia/abordagem
Pesquisa qualitativa, com estudo de caso único, triangulando entrevistas semiestruturadas, análise documental e observação direta. Utilizou-se o modelo SECI como estrutura analítica para mapear processos de conversão do conhecimento e suas implicações sobre resultados inovadores tangíveis e intangíveis.

Principais resultados
A adoção deliberada de práticas de gestão do conhecimento fortaleceu a inovação incremental e radical, aprimorando integração interdepartamental, reduzindo retrabalho e acelerando ciclos de desenvolvimento. O modelo SECI mostrou-se aplicável e adaptável ao contexto metalúrgico, potencializando resultados e sustentando vantagem competitiva.

Contribuições teóricas/metodológicas
Avança o debate sobre gestão do conhecimento em ambientes industriais, validando o modelo SECI como ferramenta analítica eficaz, além de oferecer evidências sobre o papel das interações sociais e tecnológicas na transformação do conhecimento em valor organizacional.

Contribuições sociais/para a gestão
Oferece subsídios práticos para gestores industriais estruturarem sistemas de gestão do conhecimento alinhados à estratégia, fomentando inovação, competitividade e sustentabilidade, bem como fortalecendo redes colaborativas internas e externas para responder a demandas complexas e dinâmicas do setor.

Palavras-chave: gestão do conhecimento, inovação, indústria metalúrgica, estudo de caso, Modelo SECI

KNOWLEDGE MANAGEMENT AS A DRIVER OF INNOVATION: A CASE STUDY IN THE METALLURGICAL INDUSTRY

Study purpose
To investigate how structured knowledge management practices enhance innovation processes in a metallurgical industry, analyzing formal and informal mechanisms of knowledge creation, dissemination, and application in strengthening dynamic capabilities and achieving sustainable competitive advantage.

Relevance / originality
The study highlights, in a traditional industrial context, the central role of knowledge management in fostering continuous innovation, expanding understanding of its applicability in low-tech-prone sectors through integration of theory and robust empirical evidence.

Methodology / approach
Qualitative research using a single case study, triangulating semi-structured interviews, document analysis, and direct observation. The SECI model was applied as an analytical framework to map knowledge conversion processes and their implications for tangible and intangible innovation outcomes.

Main results
Deliberate adoption of knowledge management practices enhanced both incremental and radical innovation, improved interdepartmental integration, reduced rework, and accelerated development cycles. The SECI model proved applicable and adaptable to the metallurgical context, amplifying results and sustaining competitive advantage.

Theoretical / methodological contributions
Advances the debate on knowledge management in industrial environments, validating the SECI model as an effective analytical tool, and offering evidence of the role of social and technological interactions in transforming knowledge into organizational value.

Social / management contributions
Provides practical guidance for industrial managers to design knowledge management systems aligned with strategy, fostering innovation, competitiveness, and sustainability, while strengthening internal and external collaborative networks to address complex and dynamic sector demands.

Keywords: knowledge management, innovation, metallurgical industry, case study, SECI model

KNOWLEDGE MANAGEMENT AS A DRIVER OF INNOVATION: A CASE STUDY IN THE METALLURGICAL INDUSTRY

1 Introduction

In increasingly dynamic and uncertain environments, the ability of organizations to manage knowledge has become a key strategic asset for sustaining competitiveness and fostering innovation. Knowledge management (KM) encompasses a set of processes involving the acquisition, creation, sharing, retention, and application of knowledge, which collectively support decision-making, organizational learning, and the generation of new ideas (Alqhtani, 2025; Davenport & Prusak, 1998; Nonaka & Takeuchi, 1997). Additionally, recent studies point toward AI-enhanced KM and dynamic KM capabilities emerging as critical drivers of organizational performance and innovation (Cui, 2025).

In traditional industrial sectors such as the metallurgical industry, innovation typically assumes an incremental and process-oriented character rather than disruptive forms. Within this context, KM is critical for enabling continuous improvement, optimizing the flow of operational knowledge, and integrating experiences across teams (Bashir & Farooq, 2018; Almeida et al., 2016). Nonetheless, empirical studies reveal persistent challenges in embedding KM practices in these environments, including the lack of formalization, fragmented knowledge flows, and cultural resistance to sharing information (Asrar-ul-Haq & Anwar, 2016).

Within the knowledge economy, knowledge itself emerges as the primary source of competitive differentiation among organizations (Davenport, 2006; Nonaka & Takeuchi, 1997). Alshammari and Yusof (2024) emphasize that knowledge is a vital resource for organizational success, particularly in knowledge-intensive contexts. In this sense, knowledge sharing constitutes a continuous exchange of expertise aimed at solving organizational problems and generating new ideas (Yeboah, 2023). Effective KM allows companies to identify innovative opportunities and create new products through the diffusion of knowledge, thereby enriching their organizational repertoire and enabling breakthrough innovations (Hsiao et al., 2011; Lin, 2007).

In Brazil, the manufacturing industry continues to face significant challenges related to innovation and global competitiveness. Although recent reports from the Global Innovation Index (WIPO, 2022) indicate modest improvements in the country's innovation performance, data from the National Confederation of Industries (CNI, 2022) point to the need for increased innovative capacity to sustain international competitiveness. The Brazilian innovation survey – PINTEC – reinforces this concern, showing that the innovation rate in the national industry declined from 38.11% in 2008 to 33.88% in 2017. Furthermore, most innovative outcomes remain confined to the companies themselves, limiting their ability to enhance the global positioning of the national industry (IBGE, 2020).

The metallurgical sector holds strategic relevance in Brazil's industrial landscape, supplying critical components to high-value chains such as automotive, energy, and infrastructure. However, it faces structural barriers to adopting innovation and KM practices, due to traditional production processes and an incremental approach to technological change. Understanding how KM can be leveraged in this sector is vital for advancing competitiveness in core industries that underpin national economic development (Salvador et al., 2024).

Despite the known importance of KM for innovation, empirical evidence on how KM specifically fosters incremental innovation in traditional manufacturing contexts—especially in emerging economies—remains scarce. Addressing this gap, the present study analyzes how knowledge management contributes to fostering innovation in a metallurgical industry. The central research question is: *How does knowledge management support innovation within the*

context of a traditional industrial organization? This research contributes to the literature by reinforcing the strategic role of KM in enabling incremental innovation in sectors where technological progress is gradual and heavily reliant on operational knowledge, and it offers actionable insights by identifying key barriers and enablers for institutionalizing KM aligned with innovation goals.

The remainder of this article is organized as follows: the next section presents the theoretical foundations on knowledge management and its relationship with innovation. Then, the methodological procedures of the qualitative case study are described. The fourth section discusses the results, and the final section summarizes the findings, contributions, limitations, and directions for future research.

2 Theoretical Review

2.1 Knowledge Management

KM involves continuous processes of creating, sharing, and applying knowledge, forming a cycle of collective learning that increases competitiveness and value generation, in addition to supporting decision-making (Chaithanapat & Rakthin, 2021; Macedo et al., 2021). A study by the Atlas Intel Institute, in partnership with the startup Tractian, carried out in 2023 with around two hundred Brazilian industries, reinforces this perspective by revealing that the lack of technical knowledge (28.4%) is one of the main obstacles to the adoption of new technologies. This points to the critical need to develop KM in organizations so that they can implement technological improvements and evolve. As mentioned by Ribeiro and Izquierdo (2017, p. 15), "corporate knowledge represents the set of informational elements that can generate the way of doing things by the members of an organizational environment according to the concrete objectives of their activity". This recognition of the importance of knowledge makes companies more aware of the strategic value of information, leading them to manage and focus the processes of creation, use and dissemination of knowledge to generate advantages.

Nonaka and Takeuchi (2008) define knowledge as comprising two main forms: explicit knowledge, which can be easily formalized and shared through documents and procedures, and tacit knowledge, which is subjective, experiential, and embedded in personal values and actions. To enhance knowledge creation, they propose five enabling conditions: intention, autonomy, fluctuation, creative chaos, and redundancy. The process of organizational knowledge creation unfolds through the knowledge spiral, which involves four modes of conversion: socialization (sharing tacit knowledge through experience), externalization (articulating tacit knowledge into explicit concepts), combination (integrating explicit knowledge into systems), and internalization (absorbing explicit knowledge through practice). This dynamic cycle fosters organizational learning and drives innovation.

Knowledge management helps organizations integrate new technologies, build learning capabilities, and develop new products and processes. Toyota exemplifies this through KM practices embedded in lean manufacturing, illustrating how continuous innovation can emerge from structured knowledge flows. Table 1 highlights the main KM processes:

Table 1 - Main Knowledge Management Processes

KM Processes	Synthesis	Reference
Identification	Identification of relevant sources of knowledge inside and outside the company	Dalkir (2005, 2013), Hislop et al. (2018)
Creation	How knowledge is generated	Nonaka, I. Takeuchi, H. (1995, 1997, 2008), Loon (2020)
Storage	How information and knowledge is preserved	Davenport (2006)

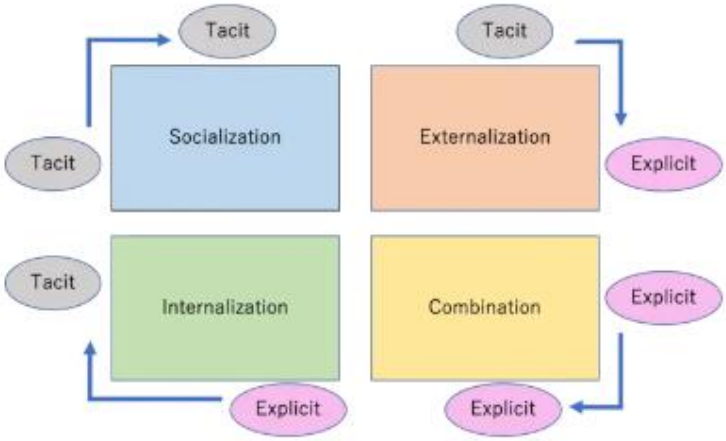
Sharing	How knowledge is disseminated within the organization	Dalkir (2005, 2013) and Nonaka, I. Takeuchi, H. (1995, 1997, 2008), Hislop et al. (2018)
Application	How this knowledge is used for problem solving, decision making, innovation and organizational improvements	Dalkir (2005, 2013) Nonaka, I. Takeuchi, H. (1995, 1997, 2008), Loon (2020)

Source: Prepared by the authors.

Socialization, externalization, combination and internalization - SECI model (Nonaka & Takeuchi, 1995) remains widely applied to illustrate the conditions under which KM effectively drives innovation, emphasizing the need for an environment that supports knowledge exchange across individuals and teams. In broader contexts, such as universities, KM also contributes to research-based innovation and sustainable development, reinforcing its strategic relevance across sectors (Alqhtani, 2025). Thus, KM not only fosters innovation but also enables organizations to adapt and remain resilient in increasingly competitive environments.

Figure 1 exemplifies a framework for understanding how knowledge is created and shared within organizations. It describes the dynamics between tacit knowledge (that which is personal and difficult to formalize) and explicit knowledge (that can be easily documented and shared). These four processes form a continuous cycle, known as the knowledge spiral, which allows for the continuous creation and expansion of knowledge within the organization.

Figure 1- The Knowledge Spiral



Source: Adapted from Nonaka and Takeuchi (2008).

The knowledge spiral arises when these four modes of knowledge conversion interact continuously and dynamically, resulting in the expansion of knowledge at increasingly broader and higher levels. As interactions occur, tacit knowledge is externalized, combined with other explicit knowledge and internalized, enriching the cycle.

2.2 Knowledge Management as a Driver of Innovation

Innovation goes far beyond an idea to be adopted by a company; it involves the union of different knowledge and resources to create something new and valuable for the market or society (Gonzalez; Martins, 2017). Knowledge management (KM) plays a fundamental role in this process, as it provides the necessary mechanisms to transform information and knowledge into relevant products and services. For Almeida et al. (2016), any product, process,

tool or business model can be modified or transformed to the point of generating significant improvements. The Oslo Manual (2018) defines innovation as the implementation of a new organizational method in business practices, work organization or external relations.

In addition to a favorable environment, innovation depends on people's ability to acquire and share knowledge. Nisembaum (2000) argues that organizational competitiveness is directly linked to continuous learning and innovation. Schumpeter (1934), in turn, proposed the concept of "creative destruction", explaining that innovation breaks with the traditional economic cycle, causing profound changes and generating new development cycles.

KM plays a central role in this process, as it efficiently manages knowledge within the organization, allowing it to be applied in a way that maximizes its impact. Inkinen (2016) states that structured KM practices help companies achieve their goals by promoting more effective use of knowledge resources. Darroch (2005) adds that companies with good KM practices are more innovative and perform better because they are able to use knowledge as a strategic resource. In addition, Chesbrough (2003) introduces the concept of open innovation, emphasizing the importance of seeking external knowledge and collaborating with partners to co-create value and accelerate innovation.

Therefore, innovation is an ongoing process that requires the integration of knowledge, the building of core competencies, and effective knowledge management for a company to remain competitive. Innovation is the driving force behind economic growth, driving new products, methods, and markets, as well as generating jobs and income. For organizations, innovation is essential to remain competitive in a volatile global market.

Open innovation, according to Chesbrough (2003), involves a collaborative approach, where companies share ideas with external partners and even competitors, in contrast to the closed model, in which development is done internally. This approach improves the combination of internal and external ideas, allowing companies to grow collaboratively. Organizations that embrace open innovation recognize the value of external innovations and the importance of new business models. They also view knowledge transfer to competitors as a profit opportunity and use intellectual property acquisition as a strategy to improve their performance.

In the industrial sector, innovation is not limited to the development of new technologies but also involves the reengineering of processes and practices that promote efficiency, sustainability, and continuous improvement. For example, in the steel industry, companies have adopted waste heat recovery systems to reuse energy from high-temperature production processes, significantly reducing energy consumption and environmental impact. These examples illustrate that innovation covers a broad and dynamic spectrum, influencing both the technology and processes that underpin the competitiveness and long-term success of companies.

Linking this to the topic of innovation, it is important to point out that innovation and KM go hand in hand for the success of the organization, since human activity is a continuous interaction between knowledge and imagination, which is mediated by discovery and experimentation. Gonzalez and Martins (2017) argue that knowledge is an asset that the organization develops over time, through the organized action of its individuals, within a context that permeates the organization. Furthermore, according to Almeida et al. (2016, p.38), "[...] in innovative companies and businesses, there is a need to clarify, idealize, develop and implement products and processes, which can and should be carried out by teams of people". This means that learning, creating and innovating are complex attitudes that involve discovering and/or creating spaces and behaviors, products, services, methods, processes and business models.

3 Methodology

This research answers how knowledge management supports innovation within the context of a traditional industrial organization. For this purpose, it was conducted a case study, with bibliographic and documentary approaches. The case study involves an in-depth analysis of an aspect in its real context, being applied to the investigation of the relationship between knowledge management (KM) and Innovation in a metallurgical industry (Yin, 2001; Gil, 2008). The company analyzed in this study is a large-scale manufacturing firm located in the northwest region of the state of Rio Grande do Sul, Brazil. For confidentiality reasons, the company's name will not be disclosed; it will be referred to as “Company A” throughout this study, in accordance with its preference not to be identified. It operates in the production of equipment for intralogistics and agribusiness, serving both industrial and agricultural sectors on a national and international level. The study also considers the role of innovation hub from the same city of the industry, which was established through a collaborative initiative involving local industries, public authorities, and one university from the South of Brazil. The institute’s mission is to foster innovation at a regional level, indirectly supporting the development of knowledge and contributing to the retention and training of human capital in the local and regional context.

This study adopts a qualitative approach, and data collection was conducted through semi-structured interviews guided by a validated research protocol. The instrument was refined through expert review to ensure alignment with the study’s objective and the clarity of the questions. The interviews were designed to capture managerial perceptions regarding the relationship between knowledge management (KM) and Innovation within the organizational context. So, the research included individual and remote semi-structured interviews applied to the company's managers and the Innovation Hub. In addition, bibliographic and documentary data were found, with the interviews focused on responding to the study objectives.

Participants included ten top-level managers from Company A and the coordinator of the company’s innovation hub. These individuals were selected due to their strategic roles and direct involvement in processes that interact with innovation and knowledge management within the organization. Their positions provide a comprehensive view of how innovation initiatives are conceived, implemented, and integrated across different departments, making them key informants for understanding the dynamics between knowledge management and innovation.

The inclusion of these actors was based on their strategic positions and their direct involvement in knowledge-related and innovative-driven processes. Innovation hubs play a key role within the quadruple helix model by facilitating interactions between firms, research institutes, universities, and society at large. These entities foster knowledge flows across sectors, enabling the co-creation of innovation in collaborative and multidisciplinary environments (Etzkowitz & Leydesdorff, 2000).

Table 2 presents an overview of the interviews conducted with several professionals from the company and the HUB manager. This survey highlights not only the diversity of areas of activity of the interviewees, but also the vast experience accumulated over the years, which ranges from 1 to 35 years within the organization. These interviews provide a solid basis for analyzing the perceptions and contributions of each professional, especially regarding KM and innovation. The diversity of experience and length of service of the interviewees reflect different levels of tacit and explicit knowledge, which are fundamental to the work itself and to understanding how knowledge is managed and used to foster innovation within the company.

Table 2 - Frame of interviewees

Area	Identification	Date	Interview Duration	Time in the company
Management Coordinator of Projects	E1	02/16/2024	26:47 minutes	12 years
Health Coordinator, Safety and Environment	E2	12/02/2024	36:47 minutes	11 years
RDI Coordinator	E3	12/01/2024	01h:05 minutes	11 years
Engineering Manager	E4	02/16/2024	34:50 minutes	25 years
Manufacturing Manager	E5	03/11/2024	27:54 minutes	2 years
Manufacturing Director	E6	01/02/2024	25:47 minutes	35 years
Maintenance Manager	E7	05/17/2024	20:12 minutes	2 years
After-Sales Manager	E8	02/09/2024	31:24 minutes	20 years
Sales Manager	E9	02/19/2024	30:35 minutes	16 years
Commercial Director	E10	08/30/2024	48:06 minutes	8 years
HUB Manager	E11	01/29/2024	01h:03 minutes	1 year

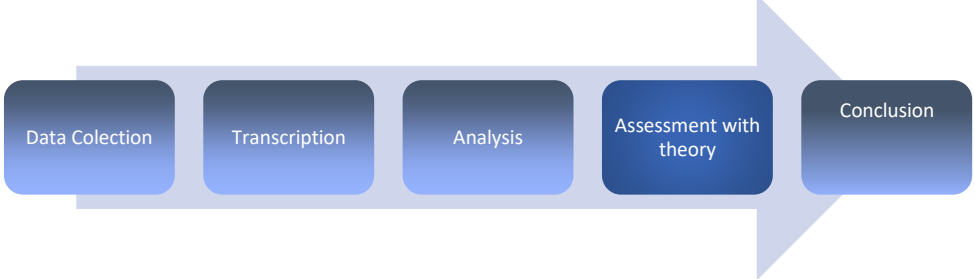
Source: research data.

The interviews were recorded and transcribed to facilitate the process of data analysis and interpretation. Then, for the process of data analysis and interpretation, the content analysis technique was adopted (Gibbs, 2008; Bardin, 2016).

To this end, the content analysis process included the following steps: preparation of the collected data (the interviews); transformation of the collected and transcribed content into analysis units; classification of the units into analysis categories; analysis of the data itself; and interpretation (Schreier, 2012; Bardin, 2016). It is worth noting that, as recommended by Bardin (2016), the categories of analysis will be defined as a priori, that is, the categories of content analysis are closely related to the theoretical constructs addressed in the framework. The work was structured based on two categories: KM and innovation.

Aligned with the objective of analyzing how knowledge management fosters and/or promotes innovation in the context of metallurgical industry, the following section presents the findings that emerged from interviews and data collection. To this end, content analysis was used to interpret the interviews. This technique allows the researcher to examine the interview content by categorizing participants' statements and interpreting the underlying meanings of their discourse (Silva & Fossá, 2015). A content analysis was conducted based on priori categories that guided the organization of section 4, namely: (1) perceptions of knowledge management, (2) KM practices, strategies, and challenges, and (3) the relationship between KM and innovation. These categories were defined in advance, grounded in the theoretical framework adopted for this research. The interviews were transcribed, the content was broken down, and the data were systematically cataloged as presented in the next section. Figure 2 summarizes the main stages of the research protocol.

Figure 2 - Research Protocol



Source: Prepared by the authors.

So, to ensure methodological rigor and alignment with the study's objectives, a research protocol was developed and applied during data collection and analysis. This protocol guided the entire qualitative process—from the design of interview questions to the categorization of data—allowing for consistency, depth, and transparency in the interpretation of findings. The research protocol included the definition of a priori categories, interview conduction, transcription, content analysis, and interpretation of results. This step-by-step approach ensured coherence between the theoretical framework and the empirical investigation, supporting the analytical structure of the results.

4 Results

This section presents the main findings derived from the empirical research conducted in a metallurgical company. The data were obtained through semi-structured interviews with managers and professionals occupying strategic positions, selected for their involvement with knowledge processes and innovation initiatives. The analysis focused on identifying how KM is perceived, practiced, and challenged within the organization, based on the perspectives of the interviewees.

The results were organized into three analytical dimensions. These dimensions emerged through inductive analysis, supported by the theoretical framework previously discussed, and aim to reveal the depth and complexity of KM dynamics in a traditional industrial setting.

4.1 Perceptions of Knowledge Management: Understandings Within The Organization

The initial stage of the analysis explored how knowledge management is conceptually understood by the interviewees. The responses revealed a wide range of interpretations, reflecting different assumptions, roles, and operational experiences related to knowledge within the company. While some emphasize structural aspects, such as documentation and systematization, others highlight social dimensions, such as knowledge sharing, learning, and professional development.

Table 3 summarizes the statements collected, highlighting the variety of perspectives that coexist within the organization:

Table 3 - Knowledge Management Concept described by interviewees.

INTERVIEWEE	EVIDENCE
E1	"A method in which you **record, store, and organize** all situations in which you learned something, whether in the context of an internal process or in the context of production [...] You store this, and that is knowledge management."
E2	"Having a reading of all my responsibilities or skills necessary for the position I occupy and how to conduct this **transfer** of knowledge so that other people can also be directing this process."
E3	"These are all ways of keeping information within the company, so that we can use this information in all spheres, or in some more strategic positions so that the business can be maintained and perpetuated. And another is **to transmit** information to all sectors and to all the people involved who need it so that they can perform their role in the best possible way with the highest level of information possible."
E4	"To control, manage and administer the knowledge generated in the company, so that this knowledge is **maintained, not lost** and is encouraged so that people continue to evolve and **acquire** more knowledge."
E5	"Capture the part of that knowledge that people have, with CPFs, and be able to capitalize on that in a way that allows you to **share** and use that knowledge that was often generated internally within that company."

E6	"**Passing on** or maintaining knowledge in the company, that is, what is really important. How to ensure that people who have knowledge do not leave the company, or that, if they do, the knowledge remains available."
E7	"A system of education and development, where I enable, **train,** monitor and measure this development over time. Knowledge is added to people's routines as professionals, from the beginning, trained, qualified and qualified."
E8	"It allows knowledge to be leveled among all employees in the company, whether in the department or outside it. Knowledge must be **explicit and documented** for the development of new projects and the evolution of employees."
E9	"The way you handle information. It wouldn't just be about being knowledgeable but understanding where all the knowledge points are in the company and **knowing how to use them."**
E10	"A tool that helps with the management and visibility of the career path, helping to **identify** where each individual can fit based on their skills"

Source: research data.

The analysis of the interviewees' responses reveals that the concept of KM within the company is still in a process of construction and lacks a unified understanding. While some respondents associate KM with technical and procedural aspects - such as storing information, recording processes, and systematizing documentation (E1, E3, E4) - others present a more human-centered view, emphasizing the transfer of tacit knowledge, the development of competencies, and the socialization of experience across the organization (E2, E6, E7).

One group adopts a preservationist logic, prioritizing mechanisms to retain and maintain knowledge in the face of employee turnover, particularly by transforming individual knowledge into accessible organizational assets (E5, E6). Another set of responses suggests an orientation toward learning and continuous development, seeing KM as a process that supports professional growth and internal capacity building (E7, E8, E10).

Furthermore, a more strategic view emerges in some statements, in which KM is not limited to operational efficiency but is seen as a tool for organizational sustainability and innovation (E3, E9). This diversity of perspectives suggests that the company operates with fragmented conceptions of KM, oscillating between instrumental, cultural, and developmental approaches. Such plurality may hinder the formulation of integrated KM strategies and reinforce the need for a shared understanding across different organizational levels.

An analysis of KM from both theoretical and empirical perspectives reveals differing approaches and priorities among managers. From a theoretical standpoint, KM is understood as a dynamic process involving the creation, sharing, storage, and application of knowledge (Nonaka & Takeuchi, 1995). The literature emphasizes that for KM to generate organizational value, it must be supported by an enabling environment and the strategic use of emerging technologies (Hislop et al., 2018; Loon, 2020; Andreeva & Kianto, 2011). Empirically, the interview data reflects how these theoretical principles manifest unevenly in practice—while some managers recognize and attempt to structure KM processes accordingly, others operate with more fragmented or informal approaches, highlighting a gap between theoretical models and organizational realities.

Three main themes emerged from the interviews: centralization, preservation, and sharing of knowledge. Many managers highlighted the importance of centralizing and organizing knowledge, ensuring its preservation, especially in the event of employee departures, and promoting its transfer to new employees and areas. In addition, emphasis was placed on the ongoing training of employees for the development of new projects.

A comparative analysis with the literature confirms the convergence of concepts, such as knowledge preservation, with Nonaka and Takeuchi's theories on the conversion of tacit knowledge into explicit knowledge. It also reinforces the relevance of organizational culture in ensuring the success of KM initiatives (Hislop et al., 2018). Based on these insights, it is strongly recommended that the company adopt a fully integrated knowledge management

system—one that deliberately addresses both tacit and explicit dimensions of knowledge. This system should be supported by ongoing training programs and robust learning platforms, ensuring that knowledge is not only retained and shared but actively cultivated as a strategic asset across all organizational levels.

4.2 Km Practices, Strategies, and Organizational Challenges

The interviews reveal the diversity of perspectives on the application of KM in the company, highlighting the centralization, preservation and transfer of knowledge as essential elements. While some interviewees emphasize the importance of recording and organizing knowledge (E1, E4), others focus on the transfer and maintenance of knowledge, especially tacit knowledge, which is seen as a strategic resource for innovation (E2, E6, E9). Organizational culture also emerges as a determining factor for the robustness of KM practices, being more effective in companies that encourage knowledge sharing and documentation.

Challenges include the concentration of knowledge among few employees and the lack of structured processes to ensure continuity of knowledge. To mitigate these problems, the company has implemented planned routines in areas such as engineering and uses a competent matrix to allocate projects efficiently and improve the use of human resources. This approach not only standardizes operations but also allows knowledge to be used in a consistent and sustainable way, regardless of personnel changes.

KM is deeply linked to innovation and value delivery, as noted by interviewee E3. The company uses its accumulated expertise to maintain high quality standards in products and services, even with employee turnover. Preserving knowledge, both tacit and explicit, is essential for the continued success and innovation of the organization, ensuring that the legacy left by employees is used for continuous development and to respond quickly to market challenges. Table 4 shows the different perceptions of the challenges that the company presents regarding the main challenges and barriers to KM.

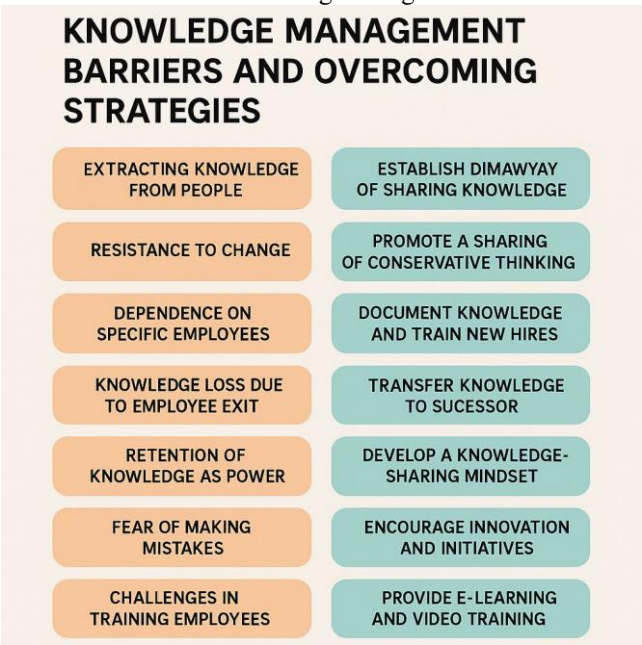
Table 4 - Responses regarding the main challenges and barriers to KM

INTERVIEWED	PERCEPTION
E1	Difficulty in extracting knowledge from people and recording what is in the process; establishing an effective method of knowledge management.
E2	Need to be up to date and open to change; people's resistance to change; conservative management model that makes it difficult to implement new practices.
E3	Dependence on specific knowledge of certain employees; lack of documentation and procedures; difficulty in training new employees.
E4	Loss of knowledge when trained employees leave the company; difficulty in retaining and transferring all knowledge to new employees.
E5	Mentality of retaining knowledge as an individual power; need to change the mindset to share knowledge and develop other people in the company.
E6	Overcoming the fear of making mistakes and investing in new initiatives; facing cultural barriers that hinder innovation.
E7	Challenges in training new employees; need for appropriate tools for knowledge management, such as e-learning and video training.
E8	Excessive focus on acquiring software rather than improving processes; need to work with people and processes first before automating; importance of adequate planning before technology implementation.
E9	Challenges are more related to paradigms than to physical or technological obstacles; cultural resistance and the need to adapt to new knowledge management tools.
E10	Difficulty in engaging people in taking the project to the end in a robust and complete way, also in the product.

Source: research data.

The data presented in Table 5 reveal a complex landscape of barriers that affect the effectiveness and institutionalization of KM in the company. These challenges can be grouped into three interrelated categories: cultural, structural, and technological.

Figure 3 – Knowledge Management Barriers and Overcoming Strategies



Source: Prepared by the authors.

From a cultural standpoint, several interviewees point to resistance to change, the perception of knowledge as individual power, and fear of making mistakes as key obstacles (E2, E5, E6, E9). These factors reflect a mindset that is still oriented toward knowledge retention rather than sharing, which undermines collaborative learning and inhibits the emergence of innovation. As highlighted by Asrar-ul-Haq and Anwar (2016), such cultural barriers are among the most persistent and difficult to overcome in KM implementation processes.

Structurally, dependence on key individuals and the absence of standardized procedures hinder knowledge continuity, especially in cases of turnover (E3, E4). The lack of formal documentation amplifies this vulnerability, restricting the organization's capacity to leverage experiential knowledge and share it effectively across teams.

Technologically, while some respondents highlight the value of digital tools for KM, others warn against overreliance on software without first aligning people and processes (E7, E8). This reflects the need for a balanced approach, where technology supports—rather than replaces—strategic planning and human-centered knowledge flows.

Overall, interviewees indicate that KM challenges stem less from technical limitations and more from the need to transform organizational paradigms. Addressing these barriers requires not only tools and processes but also cultural and leadership changes that promote collective learning, openness, and continuous development.

In line with Nonaka and Takeuchi's (2008) framework, five conditions are essential: intention, autonomy, fluctuation and creative chaos, redundancy, and variety. While the intention to capture and record knowledge exists, it faces cultural barriers such as resistance to change and knowledge hoarding. Moreover, employee autonomy to share and retain knowledge is restricted by dependence on specific individuals and the absence of formal processes.

The main challenges identified include knowledge loss when employees leave the company, resistance to change, and lack of formal documentation. These factors hinder

effective knowledge transfer and sharing, leading to knowledge concentration in the hands of a few people. Over-reliance on technological tools without adequate focus on processes and organizational culture is also cited as a barrier to effective KM implementation. Cultural barriers, such as conservatism, limit innovation and knowledge sharing, are significant obstacles.

To overcome these challenges, it is essential to create an environment that values KM, balancing the use of technologies, processes and a culture that encourages innovation and knowledge sharing. Integrating approaches, such as Chesbrough (2003) open innovation, can promote internal and external collaboration, helping to mitigate resistance to change. In this way, the company can develop a more robust KM strategy, aligned with innovation and capable of increasing its competitiveness and sustainability in a dynamic global market.

The interviewees' answers about knowledge management highlight important aspects, including improved communication, process optimization, and the development of new products or improvements to existing ones. Interviewee three emphasizes that the company has an innovative culture, confirming the importance of KM for the continuity of innovations, especially incremental ones, which are based on existing knowledge. He mentions that the company uses documentation practices to replicate projects and implement improvements, minimizing errors and increasing efficiency. This integration of the knowledge of more experienced employees with advances in systems and technologies creates an environment conducive to innovation. Nonaka and Takeuchi (1997) reinforce this view, stating that KM is essential for organizational competitiveness, as it shapes the interaction between people, technologies, and techniques, enabling the creation and dissemination of knowledge that is incorporated into the company's services and products.

The company implemented the Konviva platform and created "schools" for key processes such as welding, machining and painting, with the aim of improving employee training, reducing rework and increasing productivity. This platform, the result of research into the best training management options, was launched at the company's Corporate University, which allows automatic assessments and monitoring of learning paths in an integrated manner.

The Corporate University and the Konviva platform promote the dissemination of knowledge at various levels of the organization, from administrative to operational areas. Interviewee E5 emphasizes that knowledge management should focus on capturing and sharing internally generated knowledge, ensuring that it is not restricted to specific individuals. This approach is seen as essential to ensuring that knowledge becomes a company asset.

Knowledge management and organizational learning are essential to fostering continuous innovation within the company. Interviewees highlighted the importance of tools such as the competency matrix to monitor skills and tasks, although some mentioned challenges in integrating and sharing knowledge, especially across multiple projects. Organizational learning is recognized as a crucial element for the development of competencies, and research indicates that companies that apply effective knowledge management tend to be more innovative and perform better in the market, as argued by authors such as Boyett (2003) and Darroch (2005).

An analysis of the company's innovative investment percentage since 2018 reveals a pattern of fluctuations that indicates a strategic commitment to growth and competitiveness. In 2018, the company allocated 5.7% of its revenue to innovation, demonstrating an initial awareness of its importance. After a drop to 3.3% in 2019, investment jumped to 9.9% in 2020, driven by the need to quickly adapt to the changes caused by the pandemic. In the following years, the percentages stabilized at 4.8% and 4.4%, reflecting a period of consolidation of innovations. In 2023, investment rose to 6.4%, signaling a strategic effort to review the product line and focus on market opportunities.

Interviewers highlighted several tools and technologies used to facilitate knowledge management and promote innovation. The most cited include TOTVS ERP, the FLUIG platform, Salesforce CRM, production control systems (MES), assisted design software (CAD and SolidWorks) and product data management systems (PDM). These tools are essential at different stages of the knowledge cycle, allowing the organization not only to capture and store information, but also to advance improvements and expand its operations in the various areas.

The evolution of KM, as planned by Watanable and Senoo (2008), goes through several phases, from basic data storage to more strategic and sophisticated knowledge management. The company under study is currently between the initial and intermediate stages, still working on basic documentation in some areas (such as procedures and manuals), but continuing to invest in systems and tools for knowledge dissemination. Despite this progress, challenges still exist, such as dependence on structures and some knowledge on people.

The findings reveal that KM in the company is perceived and practiced in a fragmented manner, shaped by a combination of cultural, structural, and technological factors. While some employees recognize the potential of digitalization and automation to streamline knowledge processes and accelerate decision-making, others still rely heavily on traditional tools and practices. This divergence indicates the coexistence of multiple KM logics, which can hinder integration and strategic alignment.

Notably, the implementation of initiatives such as the Ideas Program and the creation of the Dojo room, developed in partnership with the Lean Institute, represent promising steps toward institutionalizing a learning-oriented culture. The Dojo room, in particular, reflects the organization's effort to provide a structured environment for knowledge sharing and disciplined experimentation, in line with Dobni's (2008) perspective on the need for organizational infrastructures that foster innovation. Such actions not only reinforce the company's commitment to continuous improvement but also signal a gradual shift toward a more mature and systemic approach to KM, capable of supporting incremental innovation and enhancing organizational adaptability.

4.3 The Relationship Between Knowledge Management and Innovation

The empirical findings demonstrate that the relationship between knowledge management (KM) and innovation within Company A is both latent and emerging. While the company does not yet have a consolidated or formal KM policy explicitly aligned with innovation, the interviews reveal several informal practices that suggest a growing awareness of the strategic value of knowledge. In this context, innovation tends to emerge from localized initiatives, often driven by individual expertise or specific departments, rather than from an integrated organizational strategy.

From a theoretical standpoint, KM is described as a dynamic and cyclical process of creating, sharing, storing, and applying knowledge (Nonaka & Takeuchi, 1995). In organizations aiming for innovation, this cycle must be embedded into routines and supported by leadership and culture (Hislop et al., 2018). However, in the case studied, knowledge conversion—especially from tacit to explicit knowledge—is still underdeveloped, limiting the company's ability to reuse critical learning to drive innovation.

The literature reinforces that the successful interplay between KM and innovation requires more than systems and repositories—it demands a favorable organizational environment, leadership engagement, and absorptive capacity (Andreeva & Kianto, 2011; Inkinen, 2016). The findings suggest that although the company has taken steps to digitize processes and develop technical training platforms, these actions are not yet strategically connected to innovation goals. As Islam et al. (2021) point out, knowledge sharing

directly influences innovative performance and long-term sustainability, but this sharing must be intentional and supported by organizational mechanisms.

Moreover, the involvement of the innovation hub, though still peripheral, offers a promising channel for external knowledge flows. The Triple Helix model (Etzkowitz & Leydesdorff, 2000) reinforces the potential of such partnerships between academia, industry, and public institutions in accelerating innovation through knowledge exchange. In this light, strengthening the role of the hub and aligning it more closely with internal KM practices could enhance both the company's learning processes and its innovative output.

In summary, the relationship between KM and innovation in Company A reflects an early-stage integration, where practices are evolving but not yet fully institutionalized. The analysis supports the recommendation for implementing a strategic KM framework—one that aligns knowledge flows with innovation objectives, fosters cross-functional collaboration, and builds capacity for continuous learning and adaptation.

5 Contributions

This study offers significant contributions to both academic research and organizational practice by deepening the understanding of how knowledge management (KM) promotes and sustains innovation in industrial environments, particularly in the manufacturing sector.

Grounded in foundational KM frameworks (Nonaka & Takeuchi, 1995, 1997, 2008; Loon, 2020; Davenport, 2006; Dalkir, 2005, 2013; Hislop et al., 2018), the findings reinforce the critical role of KM processes—namely knowledge creation, sharing, retention, and application—as enablers of continuous improvement and innovation. The study illustrates how the conversion of tacit into explicit knowledge, and vice versa, constitutes a key dynamic for sustaining competitiveness and fostering incremental innovation. Furthermore, it contributes to the theoretical discourse by highlighting how KM, when systematized and aligned with organizational routines, becomes a core organizational capability that supports not only operational efficiency but also strategic adaptability in traditional industries.

From a practical perspective, the research identifies concrete managerial actions that reflect the organization's evolving KM maturity. These include the implementation of structured knowledge-sharing mechanisms, the Ideas Program, and the Dojo room in partnership with the Lean Institute—all of which demonstrate a growing commitment to integrating KM with innovation management. Interviewers highlighted gains in communication, process efficiency, and product evolution, confirming that innovation is not solely the result of breakthrough ideas but often stems from incremental improvements grounded in accumulated organizational knowledge.

Another insight from the interviews is that KM enables project replication, reduces operational errors, and promotes organizational learning. In an industrial setting where innovation tends to be incremental, the combination of experienced professionals' tacit knowledge with documented practices and technological tools proves essential for generating new solutions while preserving organizational memory.

Additional KM-derived practices include the adoption of e-learning platforms (e.g., Konviva), the development of a corporate university, and the creation of structured training schools. These initiatives align with strategic objectives and enhance human capital development, reinforcing the link between knowledge, innovation, and value creation. Moreover, KM practices have shown to support decision-making in areas such as human resources, research and development (R&D), and executive leadership, fostering a closer alignment between organizational culture and innovation-driven performance.

In conclusion, this study reinforces KM as a dynamic capability capable of shaping the interaction between people, processes, and technology. It contributes to literature by demonstrating how knowledge, when properly managed, becomes a fundamental driver of incremental innovation and organizational resilience in the industrial sector.

6 Final Considerations

Although the relevance of KM and innovation is widely recognized, Brazilian industry still faces persistent challenges, including the absence of a consolidated organizational culture oriented toward knowledge and innovation, as well as limited investment in R&D and in the industrial sector. Overcoming these barriers demands more consistent public policies, stronger collaboration among companies, universities, and research centers, and greater appreciation of qualified professionals.

This study sought to analyze how KM can foster innovation in the industrial environment, focusing on the metallurgical sector. The objective was to examine, understand, and identify strategies and technologies that support innovation and KM, under the premise that knowledge is a fundamental element for enabling organizational innovation. The theoretical framework combined key concepts from KM and innovation literature, and to gain in-depth insights, a qualitative exploratory case study approach was employed.

The findings demonstrate that KM plays a crucial role in promoting innovation in the company studied, which recognizes the importance of managing its knowledge efficiently and views innovation as a continuous and collaborative process. The main barriers identified are linked to organizational culture and resistance to change. To address these challenges, the company invests in initiatives aimed at fostering an innovative culture and in continuous training for employees and leadership.

The analysis revealed that the company has implemented several innovation-driven initiatives, including a suggestion program, partnerships with universities and technology institutes, acquisition of an e-learning platform, construction of a “Dojo” room, and expansion of the research, development, and innovation area. Additional programs such as the “Ideas” initiative and GPTW assessments—which measure innovation culture—have generated tangible results, including process improvements, product development, enhanced team skills, and retention of critical knowledge.

These outcomes reinforce that the effective integration of KM and innovation is essential for competitiveness and long-term growth, and the company studied is aware of this, as evidenced by its robust growth plans. Nevertheless, this research has limitations, notably the single-case focus on a metallurgical company and the small sample. Future studies should broaden the scope of data collection, include comparative analyses across time periods, and explore contributions from the innovation hub once it reaches a more mature stage of operation. Furthermore, deeper investigations into the relationship between organizational culture and structure, particularly from the people’s perspective, would be valuable.

Finally, this study confirmed that the processes of knowledge creation and the entire knowledge spiral can be effectively transformed into innovation. Organizations that understand and leverage this dynamic can turn it into a sustainable competitive advantage, delivering products and services that generate value for both the market and society. In sum, KM facilitates the creation, dissemination, and application of knowledge, while innovation converts this knowledge into solutions that drive economic development and competitive positioning.

6 References

Almeida, A., Basgal, D. M. O., & Rodriguez, M. V. R. (2016). *Inovação e gestão do conhecimento*. FGV.

Alqhtani, F. M. (2025). Knowledge management for research innovation in universities for sustainable development: A qualitative approach. *Sustainability, 17*(6), 2481.
Alshammari, S., & Yusof, R. (2024). Elevating performance: A systematic review of transformational leadership and knowledge management in the Saudi oil & gas sector. *Global Business & Management Research, 16*.
Andreeva, T., & Kianto, A. (2011). Knowledge processes, knowledge-intensity and innovation: A moderated mediation analysis. *Journal of Knowledge Management, 15*(6), 1016–1034. https://doi.org/10.1108/13673271111179343
Asrar-ul-Haq, M., & Anwar, S. (2016). A systematic review of knowledge management and knowledge sharing: Trends, issues, and challenges. *Cogent Business & Management, 3*(1), 1127744. https://doi.org/10.1080/23311975.2015.1127744
Bardin, L. (2016). *Análise de conteúdo*. Edições 70.
Bashir, M., & Farooq, R. (2018). The synergetic effect of knowledge management and business model innovation on firm competence: A systematic review. *International Journal of Innovation Science, 11*(3), 362–387. https://doi.org/10.1108/IJIS-10-2018-0103
Boyett, J. T., & Boyett, J. H. (2003). *O guia dos gurus: Marketing: as melhores ideias dos melhores marketeiros*. Campus.
BRF aplica gestão do conhecimento no desenvolvimento de novos produtos. (2024, fevereiro 8). *Channel 360º*. https://www.channel360.com.br/brf-gestao-do-conhecimento-desenvolvimento-de-novos-produtos/
Chaithanapat, P., & Rakthin, S. (2021). Customer knowledge management in SMEs: Review and research agenda. *Knowledge and Process Management, 28*(1), 71–89.
Chesbrough, H. (2003). *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business Press.
Confederação Nacional da Indústria. (2022, setembro). *Indústria brasileira perde mais uma posição no ranking mundial* (Ano 6, n. 1). Portal da Indústria.
Cui, J. (2025). The explore of knowledge management dynamic capabilities, AI-driven knowledge sharing, knowledge-based organizational support, and organizational learning on job performance: Evidence from Chinese technological companies. *ArXiv*.
Dalkir, K. (2005). *Knowledge management in theory and practice*. Elsevier.
Dalkir, K. (2013). *Knowledge management in theory and practice* (2nd ed.). Routledge.
Darroch, J. (2005). Knowledge management, innovation and firm performance. *Journal of Knowledge Management, 9*(3), 101–115. https://doi.org/10.1108/13673270510602809
Davenport, T. H. (2006). *Pense fora do quadrado: descubra e invista em seus talentos para maximizar resultados da sua empresa*. Elsevier.
Davenport, T., & Prusak, L. (1998). *Working knowledge: How organizations manage what they know*. Harvard Business Review Press.
Dobni, C. B. (2008). Measuring innovation culture in organizations: The development of a generalized innovation culture construct using exploratory factor analysis. *European Journal of Innovation Management, 11*(4), 539–559. https://doi.org/10.1108/14601060810911156
Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From national systems and "Mode 2" to a Triple Helix of university–industry–government relations. *Research Policy, 29*(2), 109–123.
Gibbs, G. (2008). *Análise de dados qualitativos*. Artmed.
Gil, A. C. (2008). *Como elaborar projetos de pesquisa* (4ª ed.). Atlas.
Gonzalez, R. V. D., & Martins, M. F. (2017). O processo de gestão do conhecimento: Uma pesquisa teórico-conceitual. *Gestão e Produção, 24*(2), abril/junho. https://www.scielo.br/j/gp/a/cbfhzLCBfB6gnzrqPtyby8S/?lang=pt
Hislop, D., Bosua, R., & Helms, R. (2018). *Knowledge management in organizations: A critical introduction* (4th ed.). Oxford University Press.

Hsiao, Y. C., Chen, C., & Chang, S. C. (2011). Knowledge management capacity and organizational performance: The social interaction view. *International Journal of Manpower, 32*(5/6), 645–660. https://doi.org/10.1108/01437721111158242
IBGE. (2020). *Pesquisa de inovação – Pintec*. IBGE.
Inkinen, H. (2016). Review of empirical research on knowledge management practices and firm performance. *Journal of Knowledge Management, 20*(2), 230–257. https://doi.org/10.1108/JKM-09-2015-0336
Islam, M. Z., Jantan, A. H., & Yusoff, R. M. (2021). Linking knowledge sharing to innovation capability: The mediating role of knowledge application. *Journal of Innovation & Knowledge, 6*(1), 89–97.
Lin, H. (2007). A stage model of knowledge management: An empirical investigation of process and effectiveness. *Journal of Information Science, 33*(6), 643–659. https://doi.org/10.1177/01655515060763
Loon, M. (2020). The role of knowledge management in creating value in higher education institutions: A service perspective. *Journal of Business Research, 123*, 196–203. https://doi.org/10.1016/j.jbusres.2017.11.022
Macedo, V., Thurler, L., Dias, E. F., & Cavalcanti, M. (2021). A transformação digital nas organizações: Reflexões sobre as competências de um gestor do conhecimento. *Perspectivas em Gestão & Conhecimento, 11*(esp.), 115–130. https://doi.org/10.22478/ufpb.2236-417X.2021v11nEspecial.57565
Nisembaum, H. (2000). *A competência essencial*. Editora Gente.
Nonaka, I., & Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press.
Nonaka, I., & Takeuchi, H. (1997). *Criação de conhecimento na empresa*. Campus.
Nonaka, I., & Takeuchi, H. (2008). Teoria da criação do conhecimento organizacional. In H. Takeuchi & I. Nonaka (Orgs.), *Gestão do conhecimento* (pp. 59–81). Bookman.
OECD. (2018). *Oslo manual 2018: Guidelines for collecting, reporting and using data on innovation* (4th ed.). OECD Publishing. https://www.oecd.org/publications/oslo-manual-2018-9789264304604-en.htm
Ribeiro, E. M., & Izquierdo, O. C. (2017). *Gestão do conhecimento e governança no setor público*. UFBA.
Salvador, S. L., Biegelmeyer, U. H., Fernandes, A. M., Fidélis, A. C. F., Pozzo, D. N., Camargo, M. E., & Moreira, L. F. (2024). Cultura organizacional: O motor da inovação no setor metalmecânico. *P2P e Inovação, 10*(2).
Schreier, M. (2012). *Qualitative content analysis in practice*. SAGE Publications.
Schumpeter, J. (1934). *The theory of economic development*. Harvard University Press.
Silva, A. H., & Fossá, M. I. T. (2015). Análise de conteúdo: Exemplo de aplicação da técnica para análise de dados qualitativos. *Qualit@s: Revista Eletrônica, 17*(1), 14. https://www.fepiam.am.gov.br/wp-content/uploads/2020/06/2113-7552-1-PB.pdf
WIPO. (2022). *Índice global de inovação 2022: Resumo executivo* (15ª ed.). Organização Mundial da Propriedade Intelectual (WIPO). https://www.wipo.int/edocs/pubdocs/pt/wipo-pub-2000-2022-exec-pt-global-innovation-index-2022-15th-edition.pdf
Yeboah, A. (2023). Innovation process model: An integration of innovation costs, benefits and core competence. *Cogent Business & Management, 10*(1). https://doi.org/10.1080/23311975.2023.2176445
Yin, R. K. (2001). *Estudo de caso: Planejamento e métodos* (2ª ed.). Bookman