


Strategic Knowledge Management in SMEs: Critical Factors for Sustainable Innovation




Gestión estratégica del conocimiento en pymes: Factores críticos para la innovación sostenible.

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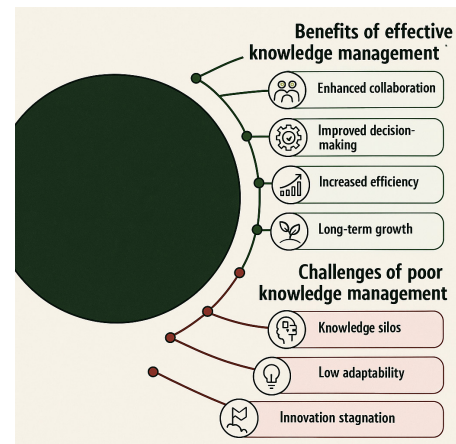
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HIGHLIGHTS

- A grounded theory-based model reveals how SMEs strategically manage knowledge to drive sustainable innovation across diverse territorial contexts.
- The study identifies strategic knowledge awareness as a central construct linking leadership, culture, practices, and regional conditions in SMEs.
- Findings offer a practical and adaptable framework for designing context-sensitive innovation strategies in emerging economies.


GRAPHICAL ABSTRACT



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Keywords:

knowledge management, SMEs, sustainable innovation, strategic leadership, grounded theory, organizational capabilities, territorial context

Palabras clave:

gestión del conocimiento, pymes, innovación sostenible, liderazgo estratégico, teoría fundamentada, capacidades organizacionales, contexto territorial

Strategic knowledge management (SKM) has become a critical enabler for driving sustainable innovation in small and medium-sized enterprises (SMEs), particularly in emerging economies where limited resources coexist with high-value tacit and contextual knowledge. This article presents the results of a qualitative study conducted with SME leaders across Colombia's five regions, using Grounded Theory as the methodological framework. Based on 50 semi-structured interviews, four key categories were identified: (1) recognition of knowledge as a strategic asset, (2) enabling leadership and learning culture, (3) coexistence of formal and informal knowledge management practices, and (4) territorial conditions influencing innovation capacity. From these, the central construct of strategic knowledge awareness emerged, which underpins a theoretical model explaining how SMEs build sustainable innovation capabilities. The resulting model, visualized through a Nvivo-style hierarchical structure, provides a relational framework for organizational decision-making and the design of place-based enterprise development strategies.

RESUMEN

La gestión estratégica del conocimiento (GEC) constituye un eje crítico para potenciar la innovación sostenible en pequeñas y medianas empresas (pymes), especialmente en contextos emergentes donde la disponibilidad de recursos es limitada pero el conocimiento tácito y contextual posee un alto valor organizacional. Este artículo presenta los resultados de una investigación cualitativa desarrollada con líderes de pymes en las cinco regiones de Colombia, utilizando como enfoque metodológico la Teoría Fundamentada. A partir del análisis de 50 entrevistas semiestructuradas, se identificaron cuatro categorías clave: (1) reconocimiento del conocimiento como activo estratégico, (2) liderazgo habilitador y cultura de aprendizaje, (3) coexistencia de prácticas formales e informales de gestión del conocimiento, y (4) condiciones territoriales que inciden en la capacidad innovadora. De estas categorías emergió el constructo central de conciencia estratégica del conocimiento, que articula un modelo teórico explicativo sobre cómo las pymes configuran sus capacidades para innovar de manera sostenible. El modelo, visualizado en estructura jerárquica tipo Nvivo, ofrece un marco relacional para la toma de decisiones organizativas y el diseño de estrategias territoriales de fortalecimiento empresarial.

1. Introduction

Contemporary economies are profoundly shaped by a structural paradox: while innovation is universally recognized as a sine qua non for business sustainability, organizations' ability to manage it strategically remains uneven, fragmented, and, in many cases, intuitive. In this scenario, small and medium-sized enterprises (SMEs)—which account for over 90% of the business fabric in Latin America—face the pressing challenge of developing dynamic capabilities that enable them not only to adapt to volatile environments, but also to generate sustainable value. In particular, strategic knowledge management (SKM) emerges as a critical lever to bridge this capability gap.

Unlike large corporations, SMEs operate under high structural vulnerability, with limited access to capital, technology, and qualified talent. Nevertheless, recent studies have shown that many of these organizations possess highly valuable

intangible assets—such as tacit knowledge, trust-based networks, and the ability to learn through action—which can be strategically harnessed to activate sustained and context-sensitive innovation processes ([Durst et al. 2023](#); [Cillo et al 2019](#)). In this sense, SKM should not be viewed merely as the deployment of technological systems, but rather as an organizational strategy anchored in enabling leadership, learning-oriented cultures, and territorial adaptation.

A persistent theoretical and empirical gap, however, lies in understanding how SMEs in emerging economies, particularly those operating in production-heterogeneous regions such as Colombia, mobilize their organizational knowledge in support of innovation. Most existing research has addressed knowledge management through normative or functionalist models, with limited attention to the emergent, situated, and relational processes that characterize small firms. It is precisely at this juncture that the present research is positioned, seeking to answer the following question:

What are the critical factors that determine the success of strategic knowledge management in SMEs oriented toward sustainable innovation?

To address this, the study was designed as a qualitative, exploratory-explanatory investigation, grounded in Grounded Theory, which allows for theoretical constructs to emerge inductively from empirical evidence. Fifty semi-structured interviews were conducted with SME leaders located in Colombia's five major regions—Caribbean, Andean, Pacific, Orinoquía, and Amazonia—with the aim of identifying organizational patterns, territorial tensions, and leadership logics associated with knowledge management ([Wiig, K. M. 1997](#)).

The findings reveal the emergence of a core integrative category: strategic knowledge awareness—defined as SMEs' capacity to recognize, mobilize, and apply knowledge from a deliberate, context-driven, and transformation-oriented perspective. This central construct underpins a theoretical model that relates transformational leadership, organizational culture, formal and informal knowledge practices, and structural contextual conditions as key factors influencing sustainable innovation performance ([Yukl, G. 2013](#)). The resulting model, graphically represented as a hierarchical structure in Nvivo style, not only systematizes the internal and external dynamics operating in SMEs but also provides a practical analytical tool for public policy intervention, business decision-making, and the design of territorial innovation strategies.

This article is organized into six sections. Following this introduction, a critical review of the specialized literature is presented, followed by the methodological design and epistemological foundations. Then, empirical results are described and organized into theoretical categories, discussed in relation to previous research, and finally, conclusions and recommendations are offered for multiple audiences: researchers, policy makers, and business leaders committed to knowledge-driven sustainable development.

2. Literature Review

2.1. Organizational Culture and its Influence on Knowledge Management in SMEs

Organizational culture is a decisive factor in the effective implementation of knowledge management (KM) in small and medium-sized enterprises (SMEs). According to [Schein, E. H. \(2010\)](#), organizational culture comprises the shared values and norms that influence members' behavior within an organization. In the context of SMEs, a culture that fosters continuous learning, collaboration, and openness to change is essential for the development of effective KM practices.

[Alavi, M., & Leidner, D. E. \(2001\)](#) emphasize that organizational culture directly impacts employees' willingness to share and use knowledge. A culture that regards knowledge as a strategic asset facilitates its creation, transfer, and application. Conversely, cultures that fail to value knowledge may obstruct these processes, limiting the organization's ability to innovate and adapt to changing environments.

More recent studies, such as [Cillo et al. \(2019\)](#), have found that SMEs with cultures oriented toward learning and innovation are more likely to successfully implement KM practices. These cultures cultivate environments where employees feel safe sharing ideas and knowledge, which in turn fosters sustainable innovation.

[Carayannis et al. \(2018\)](#) further argue that an organizational culture promoting collaboration and knowledge exchange across hierarchical levels and departments is fundamental for innovation. In SMEs, where resources are limited, internal

collaboration becomes even more crucial for maximizing existing knowledge and generating new ideas.

Finally, studies such as [Donate, M. J., & Sánchez de Pablo, J. D. \(2015\)](#) suggest that organizational culture also shapes a company's ability to absorb and apply external knowledge. An open and flexible culture allows SMEs to integrate external knowledge more effectively, which is vital for sustainable innovation in dynamic business environments.

The following table systematizes the main theoretical sources used in this literature review. It includes information on the authors, the critical factors identified, the type of analytical contribution, and the associated thematic categories.

Table 1. Systematization of Theoretical Sources Used

Author(s) and Year	Critical Factors	Analytical Contribution	Thematic Categories
Schein, E. H. (2010)	Organizational values and shared norms	Emphasizes the influence of cultural foundations on behavior and learning dynamics	Organizational Culture
Alavi, M., & Leidner, D. E. (2001)	Strategic valuation of knowledge	Demonstrates how culture affects employees' willingness to share and use knowledge	Organizational Culture
Cillo et al. (2019)	Learning-oriented and innovative culture	Shows that learning-focused cultures foster effective KM and sustainable innovation	Organizational Culture
Carayannis et al. (2018)	Cross-hierarchical collaboration and knowledge flow	Argues that internal knowledge sharing is key to innovation, especially in resource-scarce SMEs	Organizational Collaboration
Donate & Sánchez de Pablo (2015)	Absorptive capacity and openness to external knowledge	Highlights how open cultures enhance the integration of external knowledge	Knowledge Absorption Capacity
Nonaka, I., & Takeuchi, H. (1995)	Knowledge creation through SECI model	Proposes the spiral model for knowledge conversion in organizational contexts	Knowledge Management Processes
Davenport, T. H., & Prusak, L. (1998)	Knowledge as a strategic asset	Conceptualizes knowledge management as a core organizational function for competitive advantage	Strategic Knowledge Management

Source: Own elaboration, 2025.

The table above summarizes the key contributions of various authors regarding organizational culture and its impact on knowledge management (KM) in SMEs. A favorable organizational culture—characterized by values of learning, collaboration, and openness—is fundamental to implementing effective KM practices. Additionally, the importance of structured processes for knowledge creation and management is highlighted, such as the SECI model proposed by [Nonaka, I., & Takeuchi, H. \(1995\)](#), and the strategic KM perspective introduced by [Davenport, T. H., & Prusak, L. \(1998\)](#).

Organizational culture plays a crucial role in strategic knowledge management within SMEs. A culture that promotes learning, collaboration, and openness to change facilitates the creation, transfer, and application of knowledge—elements that are essential for sustainable innovation. This section aligns with the central research question of the article, which seeks to explore how organizational culture influences SMEs' ability to strategically manage knowledge and foster sustainable innovation.

While the literature underscores the importance of a favorable organizational culture for KM, some SMEs may face significant challenges in transforming their existing culture. Factors such as resistance to change, lack of committed leadership, and limited resources may hinder the implementation of a knowledge-oriented culture.

Future research should explore effective strategies for transforming organizational culture in SMEs, taking into account their specific limitations. Furthermore, it is necessary to develop cultural diagnostic tools that allow SMEs to assess their readiness for KM practices and design appropriate interventions ([Zhang, M. J., & Jiang, Z. 2015](#)).

Although the literature emphasizes the relevance of an enabling organizational culture for KM, it is important to recognize that transforming the existing culture in SMEs can be a complex process. Resistance to change, limited leadership commitment, and resource constraints may obstruct these efforts. Therefore, it is essential to develop targeted strategies that address these challenges and support the transition toward a knowledge-oriented organizational culture.

To better understand the relationship between organizational culture and KM in SMEs, future studies could focus on the development of diagnostic instruments tailored to the specific characteristics of small firms. Additionally, it would be valuable to explore practical interventions and training programs that assist SMEs in cultivating a culture that encourages learning, collaboration, and sustainable innovation.

2.2. Strategic Leadership and its Influence on Knowledge Management in SMEs

Strategic leadership plays a critical role in the effective implementation of knowledge management (KM) in small and medium-sized enterprises (SMEs). Strategic leaders are responsible for setting a clear vision, fostering an organizational culture conducive to learning and innovation, and aligning resources and processes to facilitate the creation, transfer, and application of knowledge ([Donate & Pablo 2015](#)).

[Chaithanapat et al. \(2022\)](#) emphasize that knowledge-oriented leadership (KOL) significantly impacts innovation quality and organizational performance in SMEs. Their study shows that KOL positively influences customer knowledge management, which in turn enhances innovation outcomes and overall firm performance. These findings highlight the importance of SMEs adopting a strategic approach to KM to drive sustainable innovation.

[Aragón-Correa et al. \(2007\)](#) argue that transformational leadership, characterized by the ability to inspire employees toward shared goals, is essential for promoting organizational learning and innovation in SMEs. This leadership style creates an environment in which knowledge is freely shared and managed to improve processes and products, thus contributing to innovation sustainability.

Moreover, studies such as [Amar, A. D. \(2004\)](#) suggest that leaders who empower employees and encourage autonomy in decision-making foster greater engagement in KM activities. This active participation is fundamental for generating and applying new ideas, which in turn strengthens the organization's innovative capacity.

The systematic review by [Durst et al. \(2023\)](#) on KM in SMEs indicates that strategic leadership is a determining factor in the adoption and success of KM practices. Leaders who understand the importance of knowledge as a strategic resource and promote its effective management contribute significantly to the development of sustainable innovation capabilities in SMEs.

Finally, recent studies have explored the relationship between sustainable leadership and frugal innovation in SMEs. For instance, [Wang et al. \(2023\)](#) examine how sustainable leadership styles influence frugal innovation in Chinese SMEs, underscoring the importance of leadership that balances economic, social, and environmental dimensions to achieve sustainable innovation outcomes.

The following table systematizes the main theoretical sources used in this literature review on strategic leadership and its influence on knowledge management in SMEs. The table includes information on the authors, the critical factors identified, the type of analytical contribution, and the related thematic categories.

Table 2. Systematization of Theoretical Sources on Strategic Leadership and Knowledge Management in SMEs

Author(s) and Year	Critical Factors	Analytical Contribution	Thematic Categories
Donate & Pablo (2015)	Knowledge-oriented leadership	Examines how strategic leadership fosters KM practices and drives innovation in SMEs	Strategic Leadership
Chaithanapat et al. (2022)	Customer knowledge and innovation performance	Demonstrates the impact of KOL on customer KM and its effect on innovation quality	Knowledge-Oriented Leadership
Aragón-Correa (2007)	Transformational leadership and organizational learning	Argues that transformational leadership enhances learning and innovation in SMEs	Transformational Leadership
Amar, A. D. (2004)	Employee empowerment and decision-making autonomy	Highlights how participative leadership increases engagement in KM and innovation	Participative Leadership
Durst (2023)	Strategic leadership for KM adoption	Indicates that strategic leadership is key in implementing effective KM practices in SMEs	KM Implementation
Wang et al. (2023)	Sustainable leadership and frugal innovation	Explores how sustainability-oriented leadership promotes frugal innovation in SMEs	Sustainable Leadership
Brunswicker & Vanhaverbeke (2015)	Leadership in open innovation	Investigates how leadership shapes open innovation strategies in resource-constrained SMEs	Open Innovation Leadership

Source: Own elaboration, 2025.

The table above summarizes the key contributions of various authors regarding strategic leadership and its impact on knowledge management (KM) in SMEs. It is evident that different leadership styles—such as knowledge-oriented, transformational, participative, and sustainable leadership—significantly influence both the implementation of KM practices and the innovation capabilities of SMEs. These leadership approaches foster an organizational culture conducive to learning, collaboration, and innovation—elements that are essential for sustainability in today’s business environment.

Strategic leadership in SMEs is fundamental to the effective implementation of KM and the advancement of sustainable innovation. Leaders who adopt knowledge-oriented approaches, empower their employees, and promote a culture of learning and innovation contribute significantly to building sustainable innovation capabilities. This section aligns with the central research question of the article, exploring how strategic leadership influences KM and sustainable innovation in SMEs.

Although the literature highlights the relevance of strategic leadership in KM and innovation, it is important to recognize that implementing effective leadership styles can face several challenges. Factors such as resistance to change, resource constraints, and the lack of leadership development programs may limit leaders’ ability to promote a culture of KM and innovation.

Future research could focus on the development of leadership training programs tailored to the specific needs of SMEs. Furthermore, it would be valuable to explore how different leadership styles influence KM and sustainable innovation across diverse cultural and sectoral contexts, in order to identify the most effective practices in each case.

While the literature emphasizes the significance of strategic leadership in fostering KM and innovation in SMEs, the practical implementation of such leadership styles may be hindered by real-world challenges. Resistance to change, lack of resources, and insufficient leadership training are all obstacles that must be addressed. Therefore, it is essential

to develop specific strategies that confront these barriers and support the adoption of leadership models that drive KM and sustainable innovation.

To better understand the relationship between strategic leadership, KM, and sustainable innovation in SMEs, future studies should examine the evolution and adaptation of leadership development programs designed for small businesses. Additionally, cross-contextual analyses of how leadership styles function across sectors and regions can help pinpoint the most effective approaches for scaling KM-driven innovation sustainably.

3. Methodology

This study follows a **qualitative, exploratory–interpretative design**, aimed at understanding the critical factors that influence strategic knowledge management (SKM) for sustainable innovation in Colombian SMEs. The methodological approach was based on **Grounded Theory** ([Strauss, A., & Corbin, J. 1998](#)), due to its inductive nature and its capacity to generate emerging substantive theory from empirical data.

The research was conducted in the **five main geographical regions of Colombia** (Caribbean, Pacific, Andean, Orinoquía, and Amazonia), with the objective of identifying common patterns and territorial differences in the perception and implementation of knowledge management practices in SMEs.

3.1. Research Design and Methodological Approach

A qualitative approach was chosen, as it enables the interpretation of complex phenomena from the perspective of social actors. Grounded Theory was selected as the methodological strategy because it facilitates the construction of emergent theory based directly on the lived experiences of SME leaders, without imposing predefined conceptual frameworks.

This approach involved an iterative process of data collection, coding, and analysis through constant comparison cycles, which enabled the identification of categories, subcategories, and the relationships among them.

3.2. Study Components

Component 1: Fieldwork with SME leaders: An in-depth fieldwork phase was carried out with SME leaders operating in strategic sectors (technology, agribusiness, services, and light manufacturing), selected through theoretical sampling ([Glaser, B. G., & Strauss, A. L. 1967](#)). The study included a total of 50 semi-structured interviews, distributed as follows:

- Caribbean Region: 10 interviews (Barranquilla, Cartagena, Santa Marta)
- Andean Region: 15 interviews (Bogotá, Medellín, Bucaramanga)
- Pacific Region: 10 interviews (Cali, Buenaventura, Pasto)
- Orinoquía Region: 7 interviews (Villavicencio, Yopal)
- Amazon Region: 8 interviews (Leticia, Florencia)

The interviews were conducted between May and September 2024, targeting executives and managers of SMEs that had implemented knowledge management practices or innovation processes within the past three years.

The interview questions focused on five key areas:

1. Perception of knowledge as an organizational asset
2. Formal and informal knowledge management practices
3. Leadership styles and decision-making processes
4. Relationship between knowledge and innovation processes
5. Territorial and cultural conditions influencing knowledge management

Component 2: Coding and Theory Construction: Data analysis followed the phases proposed by Strauss and Corbin (1998):

- Open Coding: Identification of emerging concepts from relevant interview fragments. A preliminary bank of 142 codes was developed.
- Axial Coding: Grouping of codes into categories and subcategories, establishing causal and contextual relationships.
- Selective Coding: Integration of central categories into an explanatory model that links the critical factors of strategic knowledge management with sustainable innovation in SMEs.

The software ATLAS.ti 23 was used to organize coding and build co-occurrence matrices among categories. To ensure methodological rigor, the study applied quality criteria such as credibility, transferability, and confirmability, through analytical triangulation among researchers and participant validation of findings.

This methodology allowed for a deep and contextualized understanding of the factors that shape strategic knowledge management in Colombian SMEs. Through the direct voices of business leaders, the study identified practices, barriers, and enablers that influence the ability of these firms to innovate sustainably. The methodological design directly addresses the study's central research question: What are the critical factors that determine the success of strategic knowledge management in SMEs oriented toward sustainable innovation?

4. Results

4.1. Emerging Categories of Strategic Knowledge Management in Colombian SMEs

Based on the analysis of 50 semi-structured interviews with SME business leaders from the five regions of Colombia, four central categories were identified in relation to strategic knowledge management (SKM) and its connection to sustainable innovation. These categories emerged from open and axial coding processes and reflect common patterns across regions and sectors.

Category 1: Recognition of Knowledge as a Strategic Asset

One of the most salient findings was the growing awareness among SME leaders that knowledge constitutes a fundamental strategic asset for competitiveness. Expressions such as *“what sets us apart is the knowledge of our people”* or *“we know that what we know is valuable”* were recurrent throughout the interviews.

This category is composed of the following subcategories:

- Valuation of team's tacit knowledge
- Recognition of customer knowledge
- Relationship between knowledge and strategic decision-making

Most leaders acknowledged that knowledge is not confined to documents or manuals, but resides in experience, intuition, and daily interactions with clients. This perspective was particularly evident in companies located in the Caribbean and Orinoquía regions, where local and contextual knowledge is crucial to operations.

Category 2: Enabling Leadership and Learning Culture: Leadership emerged as a central catalyst for effective knowledge management. Leaders who cultivated a culture of learning, encouraged collaboration, and promoted experimentation reported better innovation outcomes.

Subcategories include:

- Embracing failure as a learning opportunity
- Participative and horizontal leadership style
- Intergenerational mentorship

In regions such as the Andean and Pacific, several leaders reported implementing weekly spaces for sharing lessons learned, mistakes, and solutions, known as *“improvement circles”* or *“experience labs.”*

Category 3: Formal and Informal Knowledge Management Practices: A coexistence between informal practices (e.g., on-the-job learning, oral transmission, “learning by doing”) and formal practices (e.g., digital platforms, onboarding protocols, document management systems) was clearly identified.

Subcategories include:

- Learning by observation and repetition
- Internal onboarding and training protocols
- Use of collaborative digital tools (Trello, Notion, Google Workspace)

Technology-focused SMEs in the Andean and Caribbean regions showed greater knowledge systematization. However, even traditional-sector firms demonstrated clear efforts to preserve and share organizational knowledge.

Category 4: Territorial Barriers and Contextual Opportunities: Geographic and cultural context plays a decisive role. In Amazonia and Orinoquía, leaders highlighted difficulties in accessing specialized training and connectivity. At the same time, they emphasized the presence of trust-based community networks, which support knowledge sharing and learning.

Subcategories include:

- Limited access to digital infrastructure
- Shortage of trained personnel in KM
- Relational capital as a learning enabler

This regional contrast underscores that knowledge management cannot be understood as a homogeneous process in Colombia, but rather must be tailored to local ecosystems.

The findings of this section reveal that strategic knowledge management in Colombian SMEs is built upon direct experience, enabling leadership, and a persistent learning culture. Despite structural and technological barriers, business leaders increasingly recognize knowledge as a key source of innovation. These categories are closely aligned with the central research question by demonstrating that the success of SKM depends on cultural, organizational, and contextual factors.

4.2. Relationships Between Categories: Emergent Model of Strategic Knowledge Management for Sustainable Innovation in SMEs

Following the open coding process, axial coding was conducted to identify causal, contextual, strategic, and outcome-based relationships between the categories identified in section 4.1. Subsequently, through selective coding, these relationships were integrated into an emergent theoretical model, represented in a logical framework.

This model posits that sustainable innovation in SMEs is directly influenced by the articulation of four key dimensions:

1. Recognition of knowledge as a strategic asset
2. Enabling leadership
3. Knowledge management practices (both formal and informal)
4. Territorial context

Core of the Model: Strategic Knowledge Awareness

From the constant comparison of categories and subcategories, a central integrative category emerged: strategic knowledge awareness. This construct represents the point at which the organization not only acknowledges the value of knowledge but consciously operationalizes it as a driver of innovation.

Companies that have reached this level exhibit the following common patterns:

- Intentional and pedagogical leadership
- Formal processes for knowledge capture
- Internal systems for shared learning
- Adaptation to environmental conditions

Relationships Between Categories

Table 3. Key Relationships Between Emerging Categories According to Axial Coding,

Relationship Between Categories	Type of Relationship	Description
Organizational culture ↔ Enabling leadership	Causal	Transformational leadership fosters collaborative learning cultures.
Enabling leadership → Knowledge management practices	Strategic	Leaders legitimize and promote formal and informal KM activities.
Organizational culture → Strategic knowledge awareness	Conditional	Learning-oriented cultures reinforce the perception of knowledge as strategic.
KM practices ↔ Strategic knowledge awareness	Feedback loop	Knowledge systematization strengthens strategic awareness and vice versa.
Territorial context → Access to resources	Conditional	Regional ecosystems condition the availability of technology and talent.

Source: Own elaboration, 2025.

Visual Representation of the Emergent Model (Structured Description)

The model can be represented as a concentric structure:

1. Core: Strategic knowledge awareness
2. First ring (internal factors): enabling leadership, learning culture, knowledge management practices
3. Second ring (contextual factors): territorial environment, technological barriers, community-based relationships
4. Outcome: sustainable innovation capabilities (technological, organizational, and social)

The dynamic interaction among these levels constitutes the driving force of sustainable innovation in Colombian SMEs.

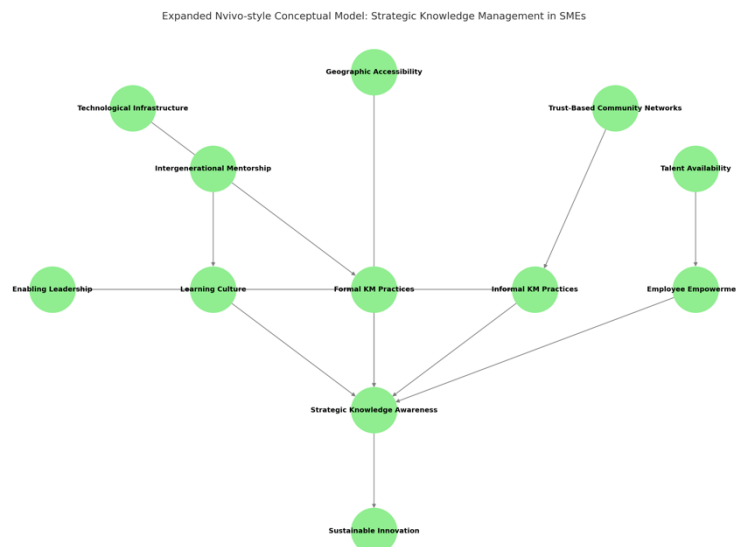
Validation and Theoretical Saturation: During the selective coding phase, cross-validation was conducted with key participants, who confirmed the model’s relevance and accuracy. No new categories emerged during the final coding cycles, allowing for sufficient theoretical saturation, which reinforced the model’s internal validity.

The emergent model built from the interview data reveals that sustainable innovation in SMEs is not exclusively the result of technological adoption or access to resources, but rather the outcome of a conscious knowledge management process, driven by leaders who value learning and tailor their strategies to territorial conditions. This model responds directly to the central research question by identifying the critical components and their interrelationships in strategic knowledge management for sustainable innovation.

4.3. Graphical Representations: Nvivo-Style Conceptual Model

Based on the axial and selective coding carried out during the qualitative analysis phase, a graphical representation of the emergent system of strategic knowledge management in SMEs was developed, using a visual approach inspired by the conceptual mapping structures in Nvivo software.

This model visually captures the dynamic interactions among the key factors influencing sustainable innovation in small and medium-sized enterprises, highlighting both the internal organizational elements and the external contextual conditions that shape knowledge management practices.



Nvivo-style Conceptual Model: Strategic Knowledge Management in SMEs

Fuente: elaboración propia, 2025

The presented figure shows a hierarchical structure of relationships between nodes, organized into three main levels:

- Top level: Territorial context, which functions as a conditioning environment. It includes factors such as access to technological infrastructure, availability of skilled talent, community relationships, and trust-based networks.
- Middle level (internal enablers):
 - Enabling leadership: A leadership style that fosters learning, collaboration, and shared decision-making.
 - Learning culture: Organizational values that promote knowledge sharing and continuous improvement.
 - Knowledge management practices: Formal and informal processes for capturing, storing, transferring, and applying knowledge.
- Central node: Strategic knowledge awareness, which represents the moment when an SME recognizes knowledge as a valuable asset and deliberately manages it as part of its organizational strategy.
- Bottom level: Sustainable innovation, understood as the firm's capacity to generate products, services, or processes that respond in a balanced way to economic, social, and environmental challenges.

Main Relationships of the Model

- Enabling leadership directly influences organizational culture and the adoption of KM practices.
- Learning culture and KM practices reinforce strategic knowledge awareness.
- The territorial context impacts KM practices, but also affects strategic knowledge awareness by shaping the availability of resources and opportunities.
- Once consolidated, strategic knowledge awareness becomes the engine that drives sustainable innovation.

The graphical representation of the emergent conceptual model demonstrates that strategic knowledge management in SMEs does not result solely from internal decisions, but from a complex interaction between leadership, organizational culture, KM practices, and the territorial context. This empirically derived model, based on the analysis of business leaders from Colombia's five regions, offers a practical and adaptable guide for organizations seeking to innovate sustainably.

5. Discussion

This study, conducted with SME business leaders across Colombia's five regions and developed through a qualitative approach grounded in Grounded Theory techniques, enabled the identification of a robust set of critical factors shaping strategic knowledge management (SKM) and its connection to sustainable innovation. The discussion of findings is organized into three dimensions: interpretation of results, dialogue with the literature, and analysis of the proposed emergent model.

Interpretation of Findings Through the Methodological Lens

The richness of the Grounded Theory approach allowed for the capture of situated knowledge and the meanings that SME leaders assign to their KM practices. Unlike quantitative studies centered on predefined indicators, this methodology provided a contextual and dynamic perspective, revealing that awareness of knowledge's strategic value does not always originate from explicit frameworks, but often emerges through practice, trial-and-error, and the accumulation of experiential learning.

In this sense, the emergent category of strategic knowledge awareness represents a key finding: SMEs that have managed to link their everyday learning practices with organizational decision-making demonstrate greater maturity in achieving sustainable innovation. This process, far from being linear, is shaped by transformational leadership, open organizational cultures, and territorial contexts that act as enablers or constraints.

Comparison with the Literature Reviewed: The results are consistent with the arguments of authors such as [Donate, M. J., & Sánchez de Pablo, J. D. 2015](#)), who claim that knowledge-oriented leadership is a key enabler of KM in SMEs. In this study, leaders who encouraged autonomy, collective learning, and horizontal structures were more effective in mobilizing knowledge—even in contexts of high uncertainty or limited resources.

Likewise, the literature on organizational culture ([Schein, E. H. 2010](#); [Cillo 2019](#)) is confirmed: SMEs that share values around learning, trust, and experimentation tend to foster environments more conducive to developing innovation capabilities. The coexistence of formal and informal KM practices also reinforces and extends the work of [Alavi, M., & Leidner, D. E. \(2001\)](#), demonstrating that in SMEs these two logics not only coexist but do so functionally and adaptively.

Furthermore, the inclusion of territorial context as an emergent category supports the arguments of [Carayannis et al. \(2018\)](#), who stress the importance of considering regional ecosystems to understand organizational innovation. Regional differences—such as those observed between Amazonia and the Andean region—highlight that SKM cannot be homogenized or replicated without local adaptation.

Theoretical Value and Practical Use of the Emergent Model: The proposed model, developed inductively from the data and visualized using a Nvivo-style structure, integrates individual, organizational, and contextual dimensions into a logical architecture of causal and strategic relationships. At its core, strategic knowledge awareness articulates theory and practice, the explicit and the tacit, the internal and the external. This conception goes beyond traditional KM models that treat knowledge as an isolated system, proposing instead a systemic and adaptive vision, aligned with the challenges of sustainable innovation.

From a practical standpoint, the model offers SMEs a roadmap to intervene across four critical fronts: leadership, organizational culture, KM practices, and contextual adaptation. It also serves as a foundation for designing organizational strengthening strategies centered on knowledge and tailored to regional and sectoral realities.

The findings of this study—contextualized through Grounded Theory methodology and contrasted with high-impact international literature—lead to the conclusion that strategic knowledge management in Colombian SMEs is a relational, gradual, and territorialized process, whose success depends on the coherent articulation of leadership vision, organizational culture, daily practices, and contextual conditions.

This study contributes both to the theoretical development of the field and to practical organizational application, offering an emergent model that may support future research, innovation-oriented public policy, and SME capacity-building programs.

Finally, the findings support the hypothesis that effective SKM in SMEs requires a supportive cultural environment, leadership aligned with innovation strategy, and accessible digital tools. The empirical evidence aligns with the knowledge spiral proposed by Nonaka & Takeuchi (1995), in which the conversion between tacit and explicit knowledge is facilitated by strong organizational support structures.

Conclusions

This qualitative study, grounded in data collection and analysis from the perspective of SME business leaders in Colombia, led to the construction of a robust explanatory model of the **critical factors** that influence **strategic knowledge management (SKM)** and its relationship to **sustainable innovation**.

From the Methodological Design

- Grounded Theory proved to be a suitable approach for capturing the contextual complexity of the phenomenon, allowing for the inductive identification of categories and relationships that would not have been evident from predefined theoretical frameworks.
- The territorial diversity of the fieldwork (across five regions of Colombia) enriched the understanding of how local context influences the way SMEs perceive, value, and manage knowledge.
- Theoretical sampling and in-depth fieldwork with 50 business leaders facilitated category saturation and internal

validation of the proposed model, ensuring both interpretative rigor and conceptual depth.

From the Results

- Strategic knowledge awareness emerged as a key integrative category: it represents the turning point at which SMEs begin to view knowledge not just as an operational resource, but as a strategic asset that can be intentionally managed to drive innovation.
- Enabling leadership—particularly in its transformational and pedagogical forms—was identified as an essential trigger for building organizational cultures that support continuous learning and knowledge exchange.
- The coexistence of formal and informal knowledge management practices was not contradictory but complementary. SMEs that intentionally integrate both demonstrate higher levels of adaptability and innovation.
- Territorial conditions—such as access to technological infrastructure, available human capital, and the presence of trust-based community networks—act either as barriers or enablers of SKM, depending on the degree of local appropriation.
- The emergent model, represented graphically, demonstrates that sustainable innovation in SMEs is the outcome of a relational network involving leadership, organizational culture, KM practices, and context. This implies a necessary shift away from linear or one-dimensional views of KM.

Contributions

- This study contributes to the literature by offering a substantive theory built from the real-world experiences of Colombian SME leaders, and provides a practical tool for the design of organizational strategies, public policies, and training programs.
- Finally, the research shows that for SMEs to transition toward sustainable innovation, it is not enough to adopt technologies or external methods; it is essential to cultivate organizational awareness of the value of knowledge, grounded in leadership, tailored to local contexts, and sustained by living learning processes.

Credit authorship contribution statement

The author was responsible for the conceptualization of the study, the qualitative methodological design based on Grounded Theory, data collection and analysis, and interpretation of the results. The author also developed the emergent theoretical model, generated the graphical visualizations, drafted the original manuscript, conducted the critical content review, and completed the final editing of the article. All phases of the research and writing process were carried out solely by the author.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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