

# Knowledge Management in the Tech Sector: A Rapid Review of Benefits, Challenges, and Metrics

Alice da Fonseca Monteiro<sup>1</sup>, Matheus Argôlo<sup>1</sup>, Carlos Eduardo Barbosa<sup>1,2</sup>, Lucas Nóbrega<sup>1</sup>, Luiz Felipe Martinez<sup>1</sup>, Yuri Lima<sup>1</sup>, and Jano de Souza<sup>1</sup>

<sup>1</sup>Systems and Computing Engineering Program of the Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering, Federal University of Rio de Janeiro, Brazil

<sup>2</sup>Naval Systems Analysis Center, Brazilian Navy, Rio de Janeiro, Brazil

[afm@cos.ufrj.br](mailto:afm@cos.ufrj.br)

[matheusargolo@cos.ufrj.br](mailto:matheusargolo@cos.ufrj.br)

[eduardo@cos.ufrj.br](mailto:eduardo@cos.ufrj.br)

[lucasnobrega@cos.ufrj.br](mailto:lucasnobrega@cos.ufrj.br)

[felipem@cos.ufrj.br](mailto:felipem@cos.ufrj.br)

[yuriodelima@cos.ufrj.br](mailto:yuriodelima@cos.ufrj.br)

[jano@cos.ufrj.br](mailto:jano@cos.ufrj.br)

**Abstract:** Knowledge Management (KM) plays a fundamental role in technology-based organizations by enabling them to effectively manage and utilize their knowledge resources in dynamic and fast-evolving environments. While KM has been extensively explored across various industries, its application within technology-driven sectors requires further examination due to the unique challenges these organizations face, such as rapid technological advancements, knowledge silos, information overload, and high employee turnover. Knowledge is a key driver of innovation, decision-making, and competitive advantage, so a deeper understanding of how KM operates in these contexts is essential. This study conducts a rapid literature review to investigate the benefits, challenges, and evaluation metrics associated with Knowledge Management in technology-based organizations. The findings reveal that well-implemented KM strategies enhance innovation capacity, operational efficiency, and more effective decision-making processes. However, despite its advantages, Knowledge Management implementation is often hindered by cultural barriers, reluctance to share knowledge, and difficulties aligning KM initiatives with overarching strategic goals. Overcoming these obstacles requires targeted investments in digital infrastructure, leadership support, and promoting a strong knowledge-sharing culture. We also identify a set of potential metrics for assessing KM effectiveness, including operational efficiency indicators, employee and customer satisfaction levels, patent data, knowledge stock, and structural capital. While these metrics build upon insights from the literature, further research is necessary to validate their applicability and reliability as measures of KM success in rapidly changing technology environments. Despite these challenges, Knowledge Management presents transformative potential for organizations seeking to leverage knowledge as a strategic asset, driving continuous innovation, improving organizational performance, and sustaining a competitive edge in an increasingly knowledge-intensive economy. By providing a structured understanding of KM's role, challenges, and possible success metrics, this study offers valuable insights for researchers and practitioners, guiding them in refining Knowledge Management strategies to enhance adaptability, collaboration, and long-term resilience in technology-driven industries.

**Keywords:** Technology-Based organizations, Innovation, Knowledge management, Knowledge metrics, Competitive advantage

---

## 1. Introduction

Knowledge Management (KM) practices are essential for organizations seeking to effectively manage and leverage their knowledge resources (Jauhari & Pratihari, 2010; McInerney & Koenig, 2011; McKeen et al., 2006). While KM has been extensively studied across various industries, the unique and rapidly changing landscape of technology-based organizations calls for a deeper investigation into how KM functions within these environments (Ahumada-Tello et al., 2022; Kocaoglu, 1999). In tech-driven sectors, where innovation and agility are key to sustaining competitiveness, understanding the specific impacts of KM is critical.

While prior research highlights KM's benefits and challenges, further focus is needed on its implementation and measurement in technology-based organizations. These organizations must manage rapid technological advancements, foster innovation, and ensure effective knowledge sharing (Earley, 2014; Samadi, 2011; Zighan, 2022), warranting a closer examination of KM's role.

This study conducts a rapid literature review to examine KM's benefits, challenges, and metrics in technology-based organizations. It explores KM's advantages, implementation challenges, and evaluation metrics, providing insights into its application in tech-driven environments. By clarifying these aspects, the study aims to help

researchers and practitioners refine KM practices, fostering sustainable growth and competitiveness in innovation-driven sectors.

## 2. Methodology

This study used a Rapid Review to synthesize research on KM in technology-based organizations. This method accelerates systematic reviews by narrowing database searches and streamlining result synthesis. While efficient, it may limit review depth and quality assessment. Nonetheless, it provides timely evidence for decision-making in fast-evolving fields like technology.

The research focused on the following questions:

- RQ01: What benefits have technology-based organizations experienced from implementing internal KM practices?
- RQ02: What are the main challenges technology-based organizations face in implementing KM?
- RQ03: What metrics do technology-based organizations use to measure the success of KM initiatives?

### 2.1 Search Strategy

The rapid review systematically searched for Scopus, which was selected for its size and popularity. Table 1 presents the search string used to identify articles on KM in technology-based companies, limited to the past ten years for relevance. Included document types were articles, conference papers, and reviews, all in English, which may exclude relevant studies in other languages.

**Table 1: Search String for Scopus database**

Search String
TITLE(knowledge AND (tech OR technology-based OR Tech-based OR technology-driven)) AND PUBYEAR > 2014 AND PUBYEAR < 2025 AND (LIMIT-TO(DOCTYPE,"ar") OR LIMIT-TO(DOCTYPE,"cp") OR LIMIT-TO(DOCTYPE,"re")) AND (LIMIT-TO(LANGUAGE,"English"))

### 2.2 Screening and Selection Process

The search yielded 231 articles, which were screened by removing duplicates and reviewing titles and abstracts for relevance. After this filtering, 48 articles underwent a full-text review. Following independent evaluation, 19 articles were selected for the final analysis, as shown in Table 2. This study included research on KM practices in technology-based organizations, published in English between 2014 and 2025. Exclusion criteria removed studies that did not directly address KM in these organizations and literature reviews.

### 2.3 Data Extraction

A standardized data extraction form was developed to capture relevant information from each included study. The extracted data included:

- Study identification (year, author, title)
- Main benefits and outcomes from KM practices
- Implementation challenges
- Metrics used to measure KM success

A thematic analysis identified recurring themes on KM benefits, challenges, and success metrics in technology-based organizations, offering a holistic view of KM's impact on organizational outcomes in the tech sector.

**Table 2: Selected studies after applying inclusion and exclusion criteria**

Year	Title	Reference
2024	Relationship between open innovation and innovation performance within high-tech firms: The mediating role of knowledge management capability	(Wu & Nachiangmai, 2024)
2023	Knowledge management in high-tech products and customer satisfaction: The smartphone industry	(Varriale et al., 2023)
2023	Assessing social capital and knowledge sharing in the high-tech industry: a moderating role of hypercompetition	(Lin & Huang, 2023)
2023	Identifying and prioritizing the factors affecting the knowledge flow in high-tech industries	(Zahedi et al., 2023)

Year	Title	Reference
2022	The Effect of Knowledge Management on the Sustainability of Technology-Driven Businesses in Emerging Markets: The Mediating Role of Social Media	(Tajpour et al., 2022)
2022	Innovative work behavior in high-tech enterprises: Chain intermediary effect of psychological safety and knowledge sharing	(Xu & Suntrayuth, 2022)
2021	Fostering knowledge sharing in the innovation process: Information and communication technology-based versus face-to-face relationships	(Ceci et al., 2021)
2021	The Impacts of Knowledge Management Practices on Innovation Activities in High-And Low-Tech Firms	(Law et al., 2021)
2021	Relationship Between Conditions of Knowledge Management and Innovation Capability in New Technology-Based Firms	(Acosta-Prado et al., 2021)
2021	Knowledge-oriented leadership in high tech companies on B2B and B2C markets	(Soniewicki, 2021)
2021	Integration of Knowledge Management Systems and Product Data in a Single Information Space of a High-Tech Enterprise	(Porsev et al., 2021)
2020	Mediation impact of marketing intelligence in the relationship between technology based knowledge sharing and product innovation	(Al-Hashem, 2020)
2019	Showcasing knowledge: The promotion of knowledge management in a technology-based organization	(Krause et al., 2019)
2019	Knowledge integration methods, product innovation and high-tech new venture performance in China	(Guo et al., 2019)
2018	Knowledge management strategies, intellectual capital, and innovation performance: a comparison between high- and low-tech firms	(Buenechea-Elberdin et al., 2018)
2018	Knowledge Management Capability Impact on Enterprise Performance in Russian High-Tech Sector	(Gorlacheva et al., 2018)
2018	Operational knowledge management in a manufacturing enterprise in the high-tech sector - Case study	(Zimmer & Madeja, 2018)
2017	Knowledge Management and Collaboration strategies for technology-based firms in Baja California	(Ahumada-Tello et al., 2017)
2015	Managing knowledge creation in high-tech R&D projects: A multimethod study	(Chandrasekaran & Linderman, 2015)

### 3. Findings

The findings from this rapid literature review provide valuable insights into the benefits, challenges, and success metrics of KM practices in technology-based organizations.

#### 3.1 RQ01: What Benefits Have Technology-Based Organizations Experienced From Implementing Internal KM Practices?

One of the most cited benefits of KM is enhanced innovation performance. Wu & Nachiangmai (2024) highlight that KM, particularly when integrated with open innovation, improves knowledge capture, storage, and sharing, fostering innovation. Al-Hashem (2020) and Ceci et al. emphasize KM's role in product innovation through knowledge sharing and marketing intelligence. Law et al. (2021) note its importance in managing market uncertainties and technological complexities. Acosta-Prado et al. (2021) further highlight KM's role in balancing knowledge exploration and exploitation, strengthening innovation in dynamic environments. Additionally, Buenechea-Elberdin et al. (2018) and Tajpour et al. (2022) stress KM's contribution to sustaining innovation by enhancing intellectual capital and knowledge transfer.

KM also plays a critical role in new product development. Law et al. (2021) and Wu & Nachiangmai (2024) state that integrating diverse knowledge sources through KM fosters creativity and supports product innovation. Guo et al. (2019) highlight the importance of coordinated knowledge integration in high-tech industries, ensuring the successful development and launch of innovative products. Beyond development, KM enhances product performance by improving technical knowledge management. Varriale et al. (2023) show how knowledge about key product modules, such as processors and touchscreens, optimizes product design, improving functionality and customer satisfaction. Law et al. (2021) and Guo et al. (2019) further confirm KM's role in managing technological complexities, enhancing both innovation and product quality.

At the organizational level, KM strengthens overall performance by optimizing resource management and fostering innovation. Gorlacheva et al. (2018) identify KM as a mediator between innovation and business outcomes, while Xu & Suntrayuth (2022) link it to improved employee collaboration and knowledge-sharing environments. Ahumada-Trello et al. (2017) emphasize KM's role in leveraging intangible assets like intellectual property, enhancing long-term sustainability. Tajpour et al. (2022) further suggest that KM supports business survival by fostering continuous learning and knowledge transfer. Additionally, KM enhances intellectual capital by improving structural and relational assets. Buenechea-Elberdin et al. (2018) highlight how codification and personalization strategies reinforce internal knowledge systems and external networks, ensuring continuous competitiveness.

Competitive advantage is another significant benefit of KM. Varriale et al. (2023) note that accumulating knowledge on critical product components in industries like smartphones strengthens market positioning. Ahumada-Trello et al. (2017) emphasize KM's role in managing intellectual property and technology transfer, which is crucial for maintaining a competitive edge. Tajpour et al. (2022) and Soniewicki (2021) highlight knowledge creation and leadership as key drivers of long-term competitiveness, especially in fast-paced, technology-driven industries. Furthermore, KM significantly enhances R&D performance by fostering knowledge creation within teams. Chandrasekaran & Linderman (2015) show that KM improves psychological safety in project teams, encouraging collaboration and leading to innovative solutions in high-tech R&D.

Finally, KM contributes to operational efficiency, employee satisfaction, and intellectual capital. Porsev et al. (2021) highlight its role in reducing downtime through better knowledge access, improving staff satisfaction with information support, and optimizing internal communication. These elements collectively create a more efficient, innovative, and competitive organization.

### **3.2 RQ02: What are the Main Challenges Technology-Based Organizations Face in Implementing KM?**

Cultural challenges and collaboration are central to effective KM. Chandrasekaran & Linderman (2015) note that team diversity can hinder psychological safety, which is essential for intuitive knowledge creation. Wu & Nachiangmai (2024) emphasize the need for investments in fostering a knowledge-sharing culture. Lin and Huang (2023) highlight that hyper-competition in high-tech firms disrupts social dynamics crucial for KM. Zahedi et al. (2023) stress the role of supportive cultures in overcoming barriers to knowledge flow. Cultural obstacles, such as high power distance (Xu & Suntrayuth, 2022) and lack of trust (Zimmer & Madeja, 2018), further complicate KM implementation. Tajpour et al. (2022) argue that poor communication between managers and employees limits knowledge transfer sustainability in technology-based organizations.

Aligning KM with organizational strategies and technology is another key challenge. Acosta-Prado et al. (2021) stress the importance of integrating KM with strategic goals and ICT tools to drive innovation. Buenechea-Elberdin et al. (2018) emphasize the complexity of maintaining KM strategies suited to a company's technological level. Tajpour et al. (2022) advocate for integrating KM with digital tools like social media, warning that failure to modernize KM strategies can hinder business sustainability.

Organizational flexibility and investment are also crucial. Wu & Nachiangmai (2024) highlight the need for significant investments in KM infrastructure, training, and technology, while Zahedi et al. (2023) emphasize flexible structures to facilitate knowledge flow. Acosta-Prado et al. (2021) agree, noting that adaptability is vital for KM in rapidly evolving environments. Tajpour et al. (2022) add that rigid KM practices limit modernization and hinder competitiveness in tech-driven industries.

Balancing knowledge exploration and exploitation is another challenge. Acosta-Prado et al. (2021) stress the need for agility in adopting new knowledge while maintaining existing competencies. Krause et al. (2019) discuss the transition from knowledge sharing to creation, while Buenechea-Elberdin et al. (2018) highlight the challenge of adapting KM strategies in fast-paced industries. Tajpour et al. (2022) argue that continuously applying and transferring knowledge is essential for business performance and sustainability.

A lack of formal KM awareness and structured KM practices further impedes effectiveness. Krause et al. (2019) note the absence of internal marketing and communication tools to promote KM, while Zimmer & Madeja (2018) highlight inefficiencies caused by informal knowledge-sharing mechanisms. Tajpour et al. (2022) emphasize the need for structured KM environments to facilitate seamless knowledge exchange.

Finally, managing knowledge retention is a key challenge. Varriale et al. (2023) argue that organizations must balance retaining general versus specialized knowledge across product modules. They suggest that maintaining

in-depth knowledge while leveraging external expertise helps enhance customer satisfaction while controlling costs and complexity.

### 3.3 RQ03: What Metrics do Technology-Based Organizations use to Measure the Success of KM Initiatives?

While explicit KM metrics are not consistently identified, the literature suggests potential indicators of KM success. Porsev et al. (2021) highlight operational efficiency, where reduced downtime due to better problem-solving knowledge and employee satisfaction with information support reflect KM effectiveness. Varriale et al. (2023) link KM to customer satisfaction scores and patent filings, suggesting that improved product knowledge and innovation can measure KM’s impact. Buenechea-Elberdint et al. (2018) and Kianto et al. (2014) emphasize structural capital, where knowledge codification and storage signal KM success. Finally, Soniewicki (2021) associates knowledge-oriented leadership with competitiveness, implying that enhanced organizational performance may result from effective KM.

## 4. Discussion

The review findings highlight KM practices’ significant benefits for technology-based organizations, particularly in enhancing innovation performance. Studies indicate that KM, when integrated with open innovation and ICT tools, fosters knowledge sharing, converts tacit to explicit knowledge, and improves product and overall innovation outcomes (Al-Hashem, 2020; Buenechea-Elberdin et al., 2018; Ceci et al., 2021; Wu & Nachiangmai, 2024). This aligns with broader literature asserting KM’s positive impact on innovation (Gloet & Terziovski, 2004; Hung et al., 2010).

Additionally, KM enhances new product development by integrating diverse knowledge sources, aiding in technological complexity management and market adaptation, leading to higher product performance (Guo et al., 2019; Law et al., 2021; Pitt & MacVaugh, 2008). It also optimizes operations and leverages intellectual capital, strengthening innovation capacity and competitive advantage (Ahumada-Tello et al., 2017; Gorlacheva et al., 2018; Tajpour et al., 2022). Furthermore, KM-driven structural and relational capital accumulation ensures long-term competitiveness and improved business performance (Buenechea-Elberdin et al., 2018; Mer et al., 2023; Varriale et al., 2023). Table 3 summarizes these KM benefits.

**Table 3: Benefits from KM practices**

<b>Benefit</b>	<b>Authors</b>
<b>Enhanced innovation performance</b> KM improves innovation by enabling better knowledge capture, storage, and sharing, particularly in high-tech organizations.	(Acosta-Prado et al., 2021; Al-Hashem, 2020; Buenechea-Elberdin et al., 2018; Ceci et al., 2021; Law et al., 2021; Tajpour et al., 2022; Wu & Nachiangmai, 2024)
<b>Improved new product development</b> KM integrates diverse knowledge sources and enhances technological complexity management, driving product innovation.	(Guo et al., 2019; Law et al., 2021; Wu & Nachiangmai, 2024)
<b>Increased product performance</b> KM optimizes knowledge of key components, improving product design, performance, and customer satisfaction.	(Guo et al., 2019; Law et al., 2021; Varriale et al., 2023)
<b>Improved organizational performance</b> KM boosts performance by improving efficiency and fostering collaboration and innovation through knowledge sharing.	(Ahumada-Tello et al., 2017; Gorlacheva et al., 2018; Tajpour et al., 2022; Xu & Suntrayuth, 2022)
<b>Strengthened intellectual capital</b> KM strengthens structural and relational capital, enhancing innovation and competitiveness.	(Buenechea-Elberdin et al., 2018)
<b>Competitive advantage</b> Effective KM ensures long-term competitiveness by fostering knowledge creation, innovation, and agility in dynamic markets.	(Ahumada-Tello et al., 2017; Soniewicki, 2021; Tajpour et al., 2022; Varriale et al., 2023)
<b>Improved R&amp;D performance</b> KM fosters knowledge creation in project teams, enhancing collaboration and driving innovation in high-tech R&D.	(Chandrasekaran & Linderman, 2015)
<b>Improved operational efficiency and employee satisfaction</b> KM minimizes downtime and enhances staff satisfaction by improving knowledge access and communication.	(Porsev et al., 2021)

The reviewed studies highlight that implementing KM in technology-based organizations faces several challenges, with cultural barriers and fostering collaboration being central issues. High power distance, lack of trust, and poor communication inhibit effective knowledge sharing, making it challenging to build the collaborative culture necessary for KM success (Chandrasekaran & Linderman, 2015; Xu & Suntrayuth, 2022; Zimmer & Madeja, 2018). Indeed, organizational culture is widely recognized in the literature as a significant obstacle to leveraging intellectual assets and implementing effective KM practices (Khakpour et al., 2009; Long & Fahey, 2000).

Additionally, the reviewed studies suggested that aligning KM practices with organizational strategies and integrating them with existing processes and ICT tools is complex, particularly in fast-evolving high-tech environments (Acosta-Prado et al., 2021; Buenechea-Elberdin et al., 2018). This perception is echoed by Smith et al. (2010), who argue that most organizations do not effectively align their KM initiatives with their overall business strategy. Similarly, organizational inflexibility and the need for significant investments in KM infrastructure, such as specialized training and technology, were also identified as barriers to KM effectiveness in the reviewed studies (Wu & Nachiangmai, 2024; Zahedi et al., 2023).

Furthermore, another finding in the reviewed studies is that organizations struggle to balance knowledge exploration with exploitation, requiring constant adaptation of KM strategies to manage both new and existing knowledge (Acosta-Prado et al., 2021; Krause et al., 2019), which is a widely acknowledged view in the literature (Lavie et al., 2011; Stadler et al., 2013). Finally, lack of formal KM systems and awareness were also identified in the reviewed studies as factors that can lead to inefficiencies and hinder the transition from knowledge sharing to knowledge creation (Krause et al., 2019; Tajpour et al., 2022), which is also supported in the existing literature (Memon et al., 2020), and in this regard, Varriale et al. (2023) point out that determining the appropriate knowledge retention level is a challenge. Table 4 presents the challenges to effective KM implementation.

**Table 4: Challenges to effective KM implementation**

Challenge	Authors
<b>Cultural challenges and fostering collaboration</b> Investing in a knowledge-sharing culture with psychological safety is crucial for fostering intuitive knowledge creation.	(Chandrasekaran & Linderman, 2015; Lin & Huang, 2023; Tajpour et al., 2022; Wu & Nachiangmai, 2024; Xu & Suntrayuth, 2022; Zahedi et al., 2023; Zimmer & Madeja, 2018)
<b>Aligning KM with organizational strategies and technology</b> Aligning KM with strategic goals and ICT integration is vital for innovation, while outdated strategies hinder sustainability and performance.	(Acosta-Prado et al., 2021; Buenechea-Elberdin et al., 2018; Tajpour et al., 2022)
<b>Organizational flexibility and investment needs</b> Effective KM demands investment in infrastructure, training, technology, and adaptable structures to handle evolving knowledge environments.	(Acosta-Prado et al., 2021; Tajpour et al., 2022; Wu & Nachiangmai, 2024; Zahedi et al., 2023)
<b>Balancing knowledge exploration and exploitation</b> Balancing knowledge exploration and competency maintenance is crucial for competitive advantage.	(Acosta-Prado et al., 2021; Buenechea-Elberdin et al., 2018; Krause et al., 2019; Tajpour et al., 2022)
<b>Lack of formal KM awareness and intentional KM practices</b> Without formal KM systems and communication tools, organizations face challenges in transitioning from knowledge sharing to creation, leading to inefficiencies.	(Krause et al., 2019; Tajpour et al., 2022; Zimmer & Madeja, 2018)
<b>Determining appropriate knowledge retention</b> Organizations must manage knowledge effectively without incurring unnecessary costs or complexity.	(Varriale et al., 2023)

Although no formal metrics were proposed, the reviewed studies suggest potential measures for assessing KM effectiveness in key areas. Porsev et al. (2021) highlight operational efficiency, particularly downtime reduction due to knowledge gaps, implying it is a relevant metric, while employee satisfaction with information support could serve as an indirect measure through surveys. Varriale et al. (2023) link customer satisfaction to product knowledge, suggesting that surveys or reviews could assess KM's success in knowledge communication. They also mention patent data and knowledge stock as indicators of a company's technological knowledge base, implying that patent filings, mainly linked to product modules, could reflect KM-driven innovation. Buenechea-Elberdin et al. (2018) and Kianto et al. (2014) emphasize structural capital, proposing that the extent of knowledge codification and storage signals KM effectiveness. Together, these indicators offer a multi-

dimensional evaluation of KM’s impact on operational efficiency, innovation, and strategic knowledge management. Table 5 presents the potential metrics for measuring KM effectiveness.

**Table 5: Potential metrics for measuring KM effectiveness based on insights from reviewed studies**

Potential Metrics	Authors
<b>Operational efficiency</b> Downtime reduction and employee satisfaction with information support indicate KM effectiveness in minimizing inefficiencies and enhancing operational efficiency.	(Porsev et al., 2021)
<b>Customer satisfaction</b> Customer satisfaction scores from reviews or surveys can measure KM's effectiveness in enhancing product-related knowledge.	(Varriale et al., 2023)
<b>Patent data and knowledge stock</b> Patent filings, especially those tied to product modules, can serve as a metric for KM's impact on innovation and knowledge accumulation.	(Varriale et al., 2023)
<b>Structural capital</b> KM effectiveness can be measured by codified knowledge volume, usage rate, update frequency, coverage, and employee satisfaction with KM systems.	(Buenechea-Elberdin et al., 2018)

## 5. Conclusion

Knowledge Management in technology-driven firms must be understood as a dynamic, integrative capability that turns dispersed expertise into actionable innovation. Our rapid review confirms that KM enhances innovation performance—especially when combined with open innovation practices—and supports new product development by integrating diverse knowledge sources (Wu & Nachiangmai, 2024; Law et al., 2021; Guo et al., 2019) . At the same time, cultural barriers such as lack of psychological safety and misalignment with strategic objectives continue to impede KM’s full potential (Chandrasekaran & Linderman, 2015; Acosta-Prado et al., 2021) . Our interpretation highlights that tackling these challenges is not merely a matter of technology deployment but of deliberately shaping organizational norms and governance structures to sustain knowledge flows.

To translate these insights into practice, organizations should establish recurring, cross-functional knowledge-sharing workshops and “KM hackathons” that encourage open dialogue and peer learning, thereby reducing silos and building trust (Chandrasekaran & Linderman, 2015) . Embedding KM in formal governance—by creating a senior-led steering committee with clear accountability for KM outcomes—ensures that initiatives are aligned with corporate strategy and receive the necessary resources (Acosta-Prado et al., 2021) . Deploying integrated digital platforms, such as AI-driven intranet agents that index research reports, patents, and meeting records, accelerates knowledge discovery and reuse, reducing search times and operational friction (Porsev et al., 2021) . Piloting Communities of Practice around emerging domains like edge computing or DevOps further balances exploration and exploitation, enabling teams to capture evolving best practices in fast-changing contexts (Buenechea-Elberdin et al., 2018; Acosta-Prado et al., 2021) .

Building on these interventions, we introduce the concept of a “KM Digital Twin”—a real-time model of an organization’s knowledge assets and flows. By continuously mapping expertise networks, identifying bottlenecks in collaboration graphs, and simulating the effects of proposed interventions (e.g., targeted training or platform upgrades), a KM Digital Twin elevates KM from retrospective reporting to predictive orchestration. This living model can recommend mentor-mentee matches based on complementary skill sets and forecast the impact of governance changes on knowledge sharing, empowering leaders with scenario-driven decision support.

Accurate measurement remains critical. We advocate combining traditional metrics—operational efficiency gains (Porsev et al., 2021), customer satisfaction scores (Varriale et al., 2023), patent filings and knowledge-stock assessments (Varriale et al., 2023)—with novel, twin-derived indicators such as collaboration density and intervention ROI estimates. Structural capital metrics, like codified knowledge volume and system usage rates, provide further insight into KM system health (Buenechea-Elberdin et al., 2018) . Such a multi-dimensional measurement system ensures both quantitative rigor and real-time adaptability.

In sum, while cultural resistance, strategic misalignment, and metric selection pose real hurdles, the combined application of structured cultural programs, formal governance, advanced digital platforms, and the KM Digital Twin concept offers a comprehensive roadmap. By embracing these solutions, technology-based organizations can move beyond overcoming implementation challenges to fully leverage KM as a strategic asset—driving

continuous innovation, operational excellence, and sustained competitive advantage in an increasingly knowledge-intensive economy.

**Ethics Declaration:** Ethical clearance was not required for the development of this research.

**AI Declaration:** AI tools such as Grammarly and ChatGPT were used solely for language revision. The authors' analysis and interpretations are their own.

## References

- Acosta-Prado, J. C., Navarrete, J. F. F., & Tafur-Mendoza, A. A. (2021). Relationship Between Conditions of Knowledge Management and Innovation Capability in New Technology-Based Firms. *International Journal of Innovation Management*, 25(1).
- Ahumada-Tello, E., Evans, R. D., & Puga, M. C. (2017). *Knowledge Management and Collaboration strategies for technology-based firms in Baja California*. 442–447. Scopus.
- Ahumada-Tello, E., Ramos, K., Martínez-Gutiérrez, R., & Ravina-Ripoll, R. (2022). Knowledge Complexity and Collective Intelligence Development in Technology Based-Firms. *2022 IEEE Technology and Engineering Management Conference*, 242–246.
- Al-Hashem, A. O. (2020). Mediation impact of marketing intelligence in he relationship between technology based knowledge sharing and product innovation. *TEM Journal*, 9(2), 688–693.
- Buenechea-Elberdin, M., Sáenz, J., & Kianto, A. (2018). Knowledge management strategies, intellectual capital, and innovation performance: A comparison between high- and low-tech firms. *Journal of Knowledge Management*, 22(8), 1757–1781.
- Ceci, F., Lazoi, M., Lezzi, M., & Mohammad, H. (2021). Fostering knowledge sharing in the innovation process: Information and communication technology-based versus face-to-face relationships. *Knowledge and Process Management*, 28(3), 302–316.
- Chandrasekaran, A., & Linderman, K. (2015). Managing knowledge creation in high-tech R&D projects: A multimethod study. *Decision Sciences*, 46(2), 267–300.
- Earley, S. (2014). The Digital Transformation: Staying Competitive. *IT Professional*, 16, 58–60.
- Gloet, M., & Terziovski, M. (2004). Exploring the relationship between knowledge management practices and innovation performance. *Journal of Manufacturing Technology Management*, 15, 402–409.
- Gorlacheva, E. N., Gudkov, A. G., Omelchenko, I. N., Drogovoz, P. A., & Koznov, D. V. (2018). *Knowledge Management Capability Impact on Enterprise Performance in Russian High-Tech Sector*. 2018 IEEE International Conference on Engineering, Technology and Innovation. Scopus.
- Guo, R., Cai, L., & Fei, Y. (2019). Knowledge integration methods, product innovation and high-tech new venture performance in China. *Technology Analysis and Strategic Management*, 31(3), 306–318.
- Hung, R., Lien, B. Y.-H., Fang, S.-C., & McLean, G. N. (2010). Knowledge as a facilitator for enhancing innovation performance through total quality management. *Total Quality Management & Business Excellence*, 21, 425–438.
- Jauhari, A., & Pratihar, A. S. (2010). Knowledge Management: For New Times With New Technologies. *Prabandhan: Indian Journal of Management*, 3, 3–11.
- Khakpour, A., Ghahremani, Y., & Pardakhtchi, D. D. M. H. (2009). *The Relationship Between Organizational Culture and Knowledge Management (Cultural Barriers and Challenges of Knowledge Sharing)*.
- Kianto, A., Ritala, P., Spender, J. C., & Vanhala, M. (2014). The interaction of intellectual capital assets and knowledge management practices in organizational value creation. *Journal of Intellectual Capital*, 15, 362–375.
- Kocaoglu, D. F. (1999). Technology and innovation management. *Portland International Conference on Management of Engineering and Technology*.
- Krause, M. G., Cunha, C. J. C. D. A., Lapolli, É. M., & Dandolini, G. A. (2019). Showcasing knowledge: The promotion of knowledge management in a technology-based organization. *Knowledge and Process Management*, 26(4), 299–307.
- Lavie, D., Kang, J., & Rosenkopf, L. (2011). Balance Within and Across Domains: The Performance Implications of Exploration and Exploitation in Alliances. *Organ. Sci.*, 22, 1517–1538.
- Law, K. M. Y., Lau, A. K. W., & Ip, A. W. H. (2021). The Impacts of Knowledge Management Practices on Innovation Activities in High- And Low-Tech Firms. *Journal of Global Information Management*, 29(6).
- Lin, C.-P., & Huang, T.-Y. (2023). Assessing social capital and knowledge sharing in the high-tech industry: A moderating role of hypercompetition. *Management Decision*, 61(1), 120–143. Scopus.
- Long, D. W. de, & Fahey, L. (2000). Diagnosing cultural barriers to knowledge management. *Academy of Management Perspectives*, 14, 113–127.
- McInerney, C. R., & Koenig, M. E. D. (2011). Knowledge Management (KM) Processes in Organizations: Theoretical Foundations and Practice. *Synthesis Lectures on Information Concepts, Retrieval, and Services*, 3, 96.
- McKeen, J. D., Zack, M. H., & Singh, S. (2006). Knowledge Management and Organizational Performance: An Exploratory Survey. *39th Annual Hawaii International Conference on System Sciences*, 7, 152b–152b.
- Memon, S. B., Qureshi, J. A., & Jokhio, I. A. (2020). The role of organizational culture in knowledge sharing and transfer in Pakistani banks: A qualitative study. *Global Business and Organizational Excellence*, 39, 45–54.
- Mer, A., Saini, A. K., Lakhera, G., & Gutang, A. (2023). Knowledge Management and Its Role in Organizational Effectiveness and Decision Making: A Descriptive Study. *Journal of Informatics Education and Research*.

- Pitt, M., & MacVaugh, J. (2008). Knowledge management for new product development. *J. Knowl. Manag.*, 12, 101–116.
- Porsev, K. I., Ivanova, V. A., Abramov, P. I., & Aniskina, N. N. (2021). *Integration of Knowledge Management Systems and Product Data in a Single Information Space of a High-Tech Enterprise*. 42–45.
- Samadi, S. (2011). Fostering creativity and innovation for organizations in a turbulent environment for longterm survival. *2011 IEEE International Summer Conference of Asia Pacific Business Innovation and Technology Management*, 71–74.
- Smith, H. A., McKeen, J. D., & Singh, S. (2010). *Developing and Aligning a KM Strategy*.
- Soniewicki, M. (2021). *Knowledge-oriented leadership in high tech companies on B2B and B2C markets*. 716–724.
- Stadler, C., Rajwani, T. S., & Karaba, F. (2013). Solutions to the Exploration/Exploitation Dilemma: Networks as a New Level of Analysis. *POL: Other International Strategy & Policy*.
- Tajpour, M., Hosseini, E., Mohammadi, M., & Bahman-Zangi, B. (2022). The Effect of Knowledge Management on the Sustainability of Technology-Driven Businesses in Emerging Markets: The Mediating Role of Social Media. *Sustainability*, 14(14).
- Varriale, V., Cammarano, A., Michelino, F., & Caputo, M. (2023). Knowledge management in high-tech products and customer satisfaction: The smartphone industry. *Journal of Open Innovation: Technology, Market, and Complexity*, 9(1).
- Wu, J., & Nachiangmai, S. (2024). Relationship between open innovation and innovation performance within high-tech firms: The mediating role of knowledge management capability. *Journal of Infrastructure, Policy and Development*, 8(5).
- Xu, Z., & Suntrayuth, S. (2022). Innovative work behavior in high-tech enterprises: Chain intermediary effect of psychological safety and knowledge sharing. *Frontiers in Psychology*, 13.
- Zahedi, M. R., Naghdi Khanachah, S., & Papoli, S. (2023). Identifying and prioritizing the factors affecting the knowledge flow in high-tech industries. *Journal of Science and Technology Policy Management*.
- Zighan, S. (2022). Disruptive Technology from an Organizational Management Perspective. *2022 International Conference on Business Analytics for Technology and Security (ICBATS)*, 1–5.
- Zimmer, J., & Madeja, M. (2018). *Operational knowledge management in a manufacturing enterprise in the high-tech sector—Case study*. 2456–2469.