Strategic Alliances and Technological Innovation: Conditions and Mechanisms

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Abstract

This paper examines how strategic alliances enable firms to access new technologies and enhance innovation performance, and under which conditions such alliances succeed or fail. The study presents a structured conceptual synthesis of peer-reviewed literature on strategic alliances and technological innovation, integrating multiple theoretical perspectives and evidence from technology-intensive industries. It identifies key mechanisms – such as knowledge transfer, learning processes, and alliance governance – through which strategic alliances influence innovation outcomes. The analysis shows that strategic alliances can significantly enhance innovation outcomes when partners demonstrate strong technological complementarity, effective governance structures, and high absorptive capacity. Conversely, misaligned objectives, weak governance, and risks of knowledge leakage often undermine alliance performance. The study is conceptual and does not empirically test causal relationships. The findings provide guidance for managers designing technology-oriented alliances and for scholars developing more nuanced models of collaborative innovation. The paper contributes by synthesising fragmented literature into an integrated framework that highlights the conditions for success and failure in alliance-based innovation strategies.

Introduction

In the contemporary global economy, innovation and technological capabilities are central sources of firms' competitive advantage. Rapid technological advancements, digital transformation, and increasing product and service complexity raise the requirements for knowledge, capital, and research capacities, which individual firms find increasingly difficult to provide alone. Consequently, firms are turning to external sources of knowledge and technological partnerships, with strategic alliances representing one of the most important forms of organised collaboration for accessing new technologies (Soh & Roberts, 2005; Vonortas & Zirulia, 2015).

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Previous research indicates that strategic alliances can significantly enhance firms' innovation performance, particularly in technology-intensive industries where development costs are high and specialised competencies are required (Haeussler et al., 2012; Sampson, 2007). Collaboration enables the combination of heterogeneous knowledge, the exchange of technological solutions, and faster learning, which increases firms' ability to develop new products and technologies (Ferreira et al., 2020a, 2020b; Lin et al., 2012). Over the past decade, the importance of alliances has further increased due to digitalisation, which requires the integration of platforms, data resources, and software across different organisations (Bockelmann et al., 2024).

Nevertheless, empirical research findings are not uniform. While some studies identify a strong positive relationship between strategic alliances and innovativeness, others caution that collaboration itself does not guarantee superior technological outcomes and may even lead to the loss of key knowledge or increased dependence on partners (Li et al., 2016; Miles et al., 1999). These differences in findings indicate that the effects of alliances are not universal but depend on the conditions under which collaboration takes place, such as partners' technological complementarity, absorptive capacity, and the way the alliance is organised (Lin et al., 2012; Park & Seo, 2025; Sampson, 2007).

This highlights an important research gap: although strategic alliances have become a central mechanism for accessing technologies, it remains unclear why some partnerships lead to significant innovation breakthroughs, while others have no substantial effect. In particular, it is still uncertain whether innovation outcomes are primarily the result of the mere existence of an alliance or are more strongly determined by the quality of collaboration, the intensity of knowledge exchange, and the technological complementarity between partners. This issue is especially relevant in technology-intensive and digital environments, where innovation increasingly occurs within networks of firms rather than within individual organisations (Bockelmann et al., 2024; Ferreira et al., 2020a; Rezaei, 2024, 2025).

On this basis, the paper focuses on understanding the mechanisms through which strategic alliances influence access to new technologies and firms' innovation performance, as well as identifying the conditions under which such collaborations are effective or ineffective. To this end, the paper first synthesises the existing literature on technological alliances, then develops a conceptual framework linking partner complementarity and collaboration intensity to innovation outcomes and finally discusses the theoretical and practical implications for managing strategic partnerships in a rapidly changing technological environment.

This study addresses the identified research gap by posing the following research question: How do strategic alliances enable firms to access new technologies and enhance innovation performance, and which governance and knowledge-related risks most often undermine these outcomes?

To answer this research question, the paper integrates the conceptual foundations of strategic alliances with evidence from technology-intensive industries and an analysis of alliance-related risks. In particular, it examines the role of partner complementarity and collaboration intensity through the lens of knowledge transfer mechanisms and governance structures, while sectoral examples illustrate how these mechanisms function in practice.

Methodologically, the paper uses a structured conceptual synthesis of peer-reviewed research on strategic alliances and technological innovation. The review design combines a targeted database search with backward and forward citation tracking to identify core contributions, which are then coded and synthesised into an integrative framework highlighting mechanisms (knowledge transfer, learning, governance) and boundary conditions (complementarity, absorptive capacity, appropriation risks). The paper contributes to the international literature by consolidating fragmented findings into a coherent conditions-and-mechanisms perspective that clarifies why alliances enhance innovation in some contexts but fail in others, and by translating these insights into actionable governance implications for technology-oriented partnerships.

The remainder of the paper is structured as follows. Section 2 explains the methodology, outlining the Consensus-assisted literature analysis and the synthesis procedure. Section 3 reviews the conceptual foundations of strategic alliances, including their key characteristics and organisational forms. Section 4 examines the role of strategic alliances as a channel for accessing technology and driving innovation, with particular focus on knowledge and technology transfer mechanisms. Section 5 presents illustrative evidence from selected technology-intensive industries. Section 6 discusses the main risks and challenges associated with technology-oriented strategic alliances. Section 7 considers the findings in relation to existing literature, and Section 8

concludes by summarising the main insights and outlining directions for future research.

Research Methodology

This study uses a structured conceptual synthesis based on a Consensus-assisted literature analysis. Its purpose is to consolidate peer-reviewed research on strategic alliances and technological innovation, integrating dispersed findings into an explanatory framework of mechanisms and boundary conditions. The guiding research question is: How do strategic alliances enable firms to access new technologies and enhance innovation performance, and under what conditions do these alliances succeed or fail?

The literature corpus was sourced using Consensus (Consensus.app), an AI-powered academic search and synthesis tool that retrieves and summarises research papers. Searches were conducted using combinations of keywords and question prompts aligned with the research question (e.g. strategic alliances, technology alliances, R&D alliances, innovation performance, knowledge transfer, alliance governance, absorptive capacity, opportunism/knowledge leakage). The search was limited to peer-reviewed academic outputs and refined iteratively by inspecting returned results and adjusting terms to capture both core alliance literature and newer work on digital and platform-based collaboration. The resulting set of candidate papers was exported for screening and synthesis.

The "data" in this conceptual study comprise scholarly sources identified through the Consensus-assisted search process. Papers were retained if they: (i) examined strategic alliances as an inter-firm governance form (excluding M&A as the primary mechanism), (ii) explicitly linked alliance participation, design, or governance to technology access, knowledge transfer, or innovation outcomes, and (iii) were published in reputable peer-reviewed outlets. Papers were excluded if they focused solely on non-technological collaboration outcomes or lacked a clear connection to innovation performance. To mitigate potential tool and publication biases, the screening was complemented by backward and forward citation tracking of field-defining sources and by targeted searches for seminal works frequently cited across the retrieved studies.

The final corpus was analysed using a structured coding procedure. Each source was coded for: (a) mechanisms (e.g. knowledge transfer, learning processes, partner-based innovation activities, governance arrangements), (b) boundary conditions (e.g. partner complementarity, technological distance, absorptive capacity, power asymmetries, institutional context), and (c) innovation outcomes (e.g. exploratory or exploitative innovation, new product development, technological performance). Findings were then synthesised across studies to develop an integrative framework that distinguishes the conditions under which alliances enhance innovation performance from those under which collaboration introduces risks or leads to performance deterioration. The resulting synthesis is presented in the paper's integrative table of success and failure conditions.

As a conceptual synthesis, the study does not estimate causal effects and relies on the availability and comparability of published evidence. In addition, Consensus-assisted retrieval may under-represent certain outlets or research traditions. These limitations are addressed by triangulating Consensus results with citation tracking and by emphasising boundary conditions and heterogeneity rather than assuming universal alliance effects.

Strategic Alliances: Conceptual Foundations

Building on the methodology described in Section 2, this section provides the conceptual baseline needed to answer the research question. It defines strategic alliances and synthesises their key characteristics, then outlines the dominant organisational forms discussed in the literature. By clarifying how alliances differ in structure and governance, the section also anticipates the mechanisms and boundary conditions that later explain when alliances facilitate technology access and innovation and when they do not.

Definition and Key Characteristics of Strategic Alliances

Strategic alliances are voluntary forms of cooperation, based on contractual or informal arrangements, between two or more independent firms, whose purpose is to achieve shared strategic objectives while preserving the legal and organisational independence of the partners (Gulati, 1998). Unlike mergers or acquisitions, strategic alliances do not involve a transfer of ownership but are based on collaboration that enables access to resources, knowledge, and technologies without full organisational integration. This characteristic makes them particularly attractive in environments marked by rapid technological change, high development costs, and high levels of uncertainty (Soh & Roberts, 2005; Vonortas & Zirulia,

2015).

In the context of innovation and technological development, strategic alliances allow firms to combine complementary competencies, share research capacities, and reduce individual exposure to risks associated with developing new technologies (Haeussler et al., 2012; Sampson, 2007). Collaboration thus serves as a mechanism for accelerating learning and creating synergies between partners that exceed the capabilities of individual organisations.

A key characteristic of strategic alliances is their long-term orientation, as most such partnerships are not intended as short-term transactions, but as more durable forms of cooperation aimed at the joint development of technologies, products, or markets (Inkpen & Beamish, 1997). Long-term orientation is especially important in research and development alliances, where the results of collaboration often become apparent only after an extended period.

Another fundamental characteristic is mutual trust, which enables the effective exchange of sensitive knowledge and reduces the need for excessively detailed control and contractual constraints. As technological alliances often involve the exchange of tacit knowledge, patents, and research procedures, trust is a key prerequisite for successful technology transfer (Lin et al., 2012; Rezaei, 2024).

A key aspect of strategic alliances is the sharing of resources and risks. Partners share financial resources, human capital, technological infrastructure, and research capacities, reducing the burden on individual firms and enabling the implementation of projects that would be too costly or risky to undertake independently (Ferreira et al., 2020a; Sampson, 2007). This characteristic is particularly evident in high-technology and biotechnology industries, where uncertainty is exceptionally high (Esmaelnezhad et al., 2023).

Finally, strategic alliances are characterised by a relatively high degree of flexibility. Compared to hierarchical forms of organisation, they allow faster adaptation to change in technology, demand, or the regulatory environment, as partners retain strategic autonomy and can adjust the scope and form of collaboration in line with evolving circumstances (Bockelmann et al., 2024; Inkpen & Beamish, 1997).

Taken together, these characteristics explain why strategic alliances have become one of the central organisational forms for innovation and technological development in the contemporary economy. Two concepts recur throughout the analysis: alliance governance, referring to the formal and informal arrangements that structure collaboration, and absorptive capacity, defined as firms' ability to recognise, assimilate, and apply external knowledge. These concepts help explain why similar alliance forms may lead to different innovation outcomes.

Typologies and Forms of Strategic Alliances

Strategic alliances can take various organisational forms, which differ in their degree of integration, distribution of control, and intensity of collaboration between partners. The choice of an appropriate alliance form is closely linked to firms' objectives, the nature of the technology, and the level of environmental uncertainty (Gulati, 1998). The literature most commonly distinguishes four basic forms: joint ventures, licensing and distribution partnerships, research and development (R&D) partnerships, and non-equity alliances.

A joint venture is an alliance in which partners establish a new legal entity to implement a specific business or technological project. This form enables a high degree of integration, as partners combine capital, knowledge, and management, and share both the risks and outcomes of collaboration. Joint ventures are particularly suitable when projects require large initial investments or when firms enter new markets characterised by high levels of institutional or technological uncertainty (Gulati, 1998).

Licensing and distribution partnerships are based on contractual arrangements that enable the transfer of technologies, intellectual property rights, or access to distribution channels without the need for a joint organisation. Licensing agreements enable firms to utilise external technologies or brands, while distribution partnerships broaden the market reach of products or services through partners' existing networks. This form of alliance is characterised by a relatively low degree of organisational integration and a high level of flexibility (Sime et al., 2023).

Research and development partnerships focus on the joint development of new technologies, products, or processes. In these alliances, partners share scientific and technical knowledge as well as research infrastructure, enabling faster technological progress and reducing individual exposure to the risks of failure. R&D

partnerships are particularly common in high-technology industries, where innovation results from cumulative and collaborative learning (Ferrigno et al., 2021).

Non-equity strategic alliances are based on contractual cooperation without ownership ties between partners and include forms such as licensing, development, or market agreements. These alliances allow firms to collaborate and exchange resources or knowledge while maintaining a high degree of strategic autonomy and greater flexibility in dynamic environments (Holmberg & Cummings, 2009; Lin et al., 2025).

The different forms of strategic alliances reflect the diversity of objectives and contexts in which firms collaborate. A key challenge for management is selecting the alliance form that best matches the level of uncertainty, the need for control, and the nature of the knowledge firms seek to acquire or share. While these alliance forms differ structurally, their innovation outcomes ultimately depend less on form alone and more on how collaboration is governed and enacted in practice.

Strategic Alliances as a Channel for Technology Access and Innovation

Building on these conceptual foundations, this section examines how strategic alliances function in practice as channels for accessing technology and driving innovation. It first outlines the main knowledge and technology transfer mechanisms emphasised in the literature, then discusses how partner complementarities and firms' absorptive capacity influence the effectiveness of these mechanisms. Finally, it highlights the governance arrangements that balance openness for learning with safeguards against appropriation, preparing the ground for the industry evidence and risk discussion in the following sections.

Innovation and Technological Development in Competitive Environments

In today's rapidly changing economic and technological environment, innovation and technological development are essential prerequisites for a firm's long-term competitiveness. Globalisation, digitalisation, and shorter product life cycles increase the pressure on firms to continually improve their products, services, and processes. Firms that do not invest in innovation or fail to keep pace with technological change risk losing market share, experiencing declining productivity, and gradually eroding their competitive position.

Technological innovation enables firms to differentiate themselves in the market, as new or improved solutions allow them to offer greater value to customers than their competitors. At the same time, innovation improves internal efficiency, as new technologies facilitate process automation, better data management, and more rational production. Thus, innovation serves not only as a source of growth but also as a mechanism for firms to adapt to changing environmental conditions.

Empirical research confirms that technological innovation is a key determinant of firm performance. Huang (2023) finds that firms that systematically invest in developing new technologies achieve higher productivity, faster growth, and a stronger competitive position in global markets. Technological innovation enables firms to develop unique products and services, improve quality, and reduce costs, thereby enhancing their long-term survival.

An important aspect of innovation is its role in firms' strategic adaptability. In environments where technologies and customer needs change rapidly, firms lacking sufficient innovation capabilities struggle to respond promptly to new opportunities or threats. Innovation, therefore, involves not only the creation of new products but also reflects a firm's ability to learn, adapt, and transform its business models.

In this context, innovation and technological development become central sources of sustainable competitive advantage. However, the complexity of modern technologies and the high costs of research and development mean that firms increasingly struggle to develop all necessary solutions independently. This raises the question of how firms can access external technologies without losing strategic control, a challenge that strategic alliances seek to address.

Knowledge and Technology Transfer through Strategic Alliances

Strategic alliances are among the most important mechanisms for transferring knowledge and technology between firms, as they enable a bidirectional and dynamic flow of information, experience, and technological solutions. This is not simply a one-way transfer of technology from one partner to another, but a process of mutual learning in which partners develop shared understanding, exchange practices, and jointly create new knowledge. Grant & Baden-Fuller (2004) emphasise that strategic alliances are a key organisational framework for learning, as they provide

firms with access to specialised knowledge that would be difficult or very costly to develop independently. In this paper, these processes are treated as mechanisms of knowledge transfer, while their effectiveness depends on contextual conditions such as complementarity, governance quality, and absorptive capacity.

Knowledge transfer within alliances includes both explicit knowledge, which is codified and relatively easy to transfer, and tacit knowledge, which is based on experience, routines, and employees' expertise. It is tacit knowledge that represents the greatest added value of strategic alliances, as it cannot be easily purchased or licensed, but is primarily transferred through direct collaboration, joint work, and interaction between partners (Inkpen & Tsang, 2005). In this way, alliances create conditions for deeper and more durable competence transfer that goes beyond formal contractual arrangements.

One of the key aspects of strategic alliances as a knowledge transfer mechanism is the formation of learning networks, in which firms exchange not only technologies but also research practices, development methodologies, and innovation cultures. These networks facilitate the emergence of new ideas and solutions that surpass the capabilities of individual firms, resulting from the combination of diverse knowledge bases (Guo et al., 2023). Furthermore, alliances foster cumulative learning: as firms accumulate collaboration experience and broaden or deepen their alliance portfolios, they strengthen absorptive capacity and become more effective at acquiring, assimilating and applying external knowledge to both exploratory and exploitative innovation outcomes (Bolívar-Ramos & Leyva-de la Hiz, 2025; Shukla et al., 2024; Zahoor et al., 2024).

For knowledge and technology transfer to be effectively achieved, alliance partners must establish an appropriate governance architecture that enables coordination, maintains formal and informal communication routines, and supports the monitoring and evaluation of collaborative outcomes. Such governance is often operationalised through contractual provisions and joint coordinating bodies (e.g., joint committees) that structure knowledge exchange, while learning can become institutionalised through shared operating principles and routines across the collaborating organisations. In increasingly digital collaboration settings, cross-firm teams can also leverage digital platforms as boundary-spanning infrastructures for systematic information sharing and joint learning (Ben Arfi et al., 2023; Clauss & Ritala, 2023; Ribeiro et al., 2024; Samant & Kim, 2023). Such structures ensure that knowledge is not only transferred between partners but also permanently integrated into organisational routines, thereby contributing to firms' long-term innovation capability.

Industry Evidence: Technological Alliances across Sectors

This section demonstrates how strategic alliances drive technological innovation across selected technology-intensive sectors. It reviews alliance patterns in the pharmaceutical, automotive, and information technology industries, using these contexts to highlight how knowledge-transfer mechanisms and governance arrangements differ by industry. The examples are intended to make the conceptual arguments more concrete and to reveal sector-specific boundary conditions that help explain divergent alliance outcomes, preparing the ground for the risk-focused synthesis in the next section.

Pharmaceutical Industry

The pharmaceutical industry is one of the sectors where strategic alliances are essential due to exceptionally high costs, lengthy development cycles, and significant technological uncertainty. Developing new medicines requires a combination of biotechnological expertise, clinical infrastructure, and regulatory competencies, which individual firms rarely possess in full. Strategic alliances between large pharmaceutical companies and biotechnology firms, therefore, enable the effective combination of complementary resources and risk sharing (George et al., 2016).

The innovative impact of these alliances is mainly seen in the accelerated development of new therapies and a higher likelihood of commercialising research results. The partnership between BioNTech and Pfizer in developing an mRNA vaccine against COVID-19 demonstrated how combining scientific capabilities with global manufacturing and distribution capacities can significantly shorten the time from laboratory to market (Dolgin, 2021). Such collaborations confirm that technological alliances not only reduce risks but also enhance the efficiency of innovation processes.

This case illustrates how high partner complementarity and clearly defined governance arrangements can accelerate innovation while mitigating development risks.

Automotive Industry

In the automotive industry, strategic alliances have become an increasingly important response to structural transformation driven by electrification and software-intensive innovation. As Carrillo et al. (2024) argue, the technological uncertainty and complexity of new powertrains, batteries, and digital architectures often exceed the capabilities of individual manufacturers, prompting firms to form alliances and joint ventures to access complementary expertise and share R&D costs and technological risk.

A recent example of this trend towards software-intensive, platform-based collaboration is NVIDIA's partnerships with established car manufacturers such as Volvo, Mercedes-Benz, and Kia, as well as emerging robotaxi developers. By providing AI and simulation platforms such as Omniverse, NVIDIA enables automakers to integrate advanced autonomous driving and digital vehicle architectures without developing these complex software capabilities in-house, thereby reinforcing the role of strategic alliances as a key enabler of innovation under conditions of technological complexity and uncertainty (Gong, 2024).

Partnerships such as the collaboration between Toyota and Panasonic in developing battery technologies (Toyota, 2020), and the alliance between Ford and Volkswagen in electric and autonomous vehicles (Ford, 2019), enable accelerated learning and faster commercialisation of innovations. The innovative impact is also evident in the increasing standardisation and interoperability of key technologies, as well as in a more coordinated alignment with regulatory and technical requirements (Zhang et al., 2023; Zhang et al., 2024), which together reduce uncertainty and support a more stable transition towards sustainable mobility (Memon & Rossi, 2025; Simão et al., 2025).

Here, alliance outcomes depend strongly on the intensity of collaboration and partners' ability to integrate complex software and hardware knowledge.

Information Technology Industry

In the information technology sector, innovation is increasingly unfolding within digital platform ecosystems, where firms rely on interorganizational partnerships to combine complementary resources and capabilities. Such ecosystems require coordination mechanisms—often based on boundary resources such as APIs, data interfaces and shared standards—to enable interoperability and joint value creation across multiple actors. Recent evidence also shows that ecosystem partnerships are central to the development and commercialisation of AI-enabled solutions, while standard-oriented alliance networks can strengthen digital innovation by reducing coordination frictions and uncertainty (Costabile et al., 2022; Kohtamäki et al., 2025; Wang et al., 2024).

The innovative impact of these alliances is evident in the creation of platforms and open innovation models that accelerate the diffusion of new technologies and increase their market value (Chesbrough, 2020). Furthermore, strategic partnerships in the digital platform domain enable firms to develop and scale platform- and cloud-based business models by mobilising complementary actors and coordinating ecosystem roles; competitiveness therefore increasingly depends on firms' capability to align business-model innovation with broader ecosystem dynamics and shared standards (Burström et al., 2021; Khanagha et al., 2022). In this context, alliances serve not merely as a means of accessing technology but as a key mechanism shaping contemporary digital competitiveness.

In such ecosystems, governance extends beyond bilateral coordination to platform-level rules that shape innovation incentives.

Risks and Challenges of Technology-Oriented Strategic Alliances

Technology-oriented strategic alliances enable firms to access knowledge, resources, and innovation capabilities that individual firms may struggle to develop on their own. Despite these advantages, such alliances also involve significant risks that can reduce or even negate the expected benefits. A key challenge is that collaboration is based on partial openness between organisations that simultaneously remain potential competitors. Based on the preceding analysis, an integrative framework is proposed that synthesises the main conditions of success and failure in technology-oriented strategic alliances. Table 1 summarises the main conditions under which strategic alliances enhance or undermine firms' innovation performance.

Table 1
Conditions of Success and Failure in Technology-Oriented Strategic Alliances

Dimension	Conditions of Success	Conditions of Failure
Strategic Fit	Clear alignment of alliance objectives with firms' long-term innovation strategies; complementary technological resources	Vague or conflicting strategic objectives; overlap without complementarity
Partner Complementarity	Partners possess distinct but compatible technological capabilities and market knowledge	High redundancy of knowledge or asymmetric dependence
Governance Structure	Clearly defined governance mechanisms, decision rights, and dispute resolution procedures	Ambiguous control structures; weak contractual safeguards
Knowledge Management	Balanced mechanisms for knowledge sharing and protection; strong absorptive capacity	Uncontrolled knowledge leakage; opportunistic learning
Relational Factors	High levels of trust, transparency, and prior collaboration experience	Cultural incompatibility; lack of mutual trust
Dynamic Capabilities	Ability to adapt alliance structure as technologies and markets evolve	Structural rigidity; inability to respond to technological change

Source: Authors' own synthesis

Table 1 highlights that alliance failure rarely results from a single factor. Instead, unsuccessful outcomes typically emerge from misalignment across strategic objectives, governance arrangements, and knowledge management practices, even when technological complementarity exists.

One of the main challenges in managing technology- and innovation-oriented alliances is aligning partners' objectives and expectations. Differences in goals and agendas can create instability and heighten the risk of conflict, particularly in technological alliances. Moreover, partner-based opportunism is associated with performance inefficiencies, as it increases coordination and safeguarding costs and undermines collaborative effort (Ben Jemaa-Boubaya et al., 2020; Musarra et al., 2021). Research shows that alliances are more successful when partners have developed organisational capabilities for learning from previous collaborations, as this enables better relationship management, higher levels of trust, and more effective dispute resolution (Heimeriks et al., 2009).

A particularly significant risk in technological alliances is the unintended transfer of core knowledge. Because innovation collaborations require close interaction between research and development teams, there is a danger that a partner may gain access to sensitive information or core technologies and use them beyond the agreed framework (Park & Ungson, 2001). This risk is especially high when power asymmetries exist between partners, as larger and more established firms often possess greater bargaining and organisational capabilities and may appropriate key knowledge from weaker partners (Inkpen & Tsang, 2005).

In addition to knowledge and power, interorganisational culture also plays an important role. Differences in decision-making styles, communication patterns, and organisational values can lead to misunderstandings, reduced coordination, and slow project implementation (Bouncken et al., 2018). These problems are particularly pronounced in international alliances, where organisational differences are compounded by differences in national cultures, legal systems, and business practices. Although trust is a key binding force in successful collaboration, it develops gradually and is highly vulnerable to breaches of agreements or perceived unfair behaviour (De Mattos et al., 2025).

An important but often overlooked challenge concerns the contractual and governance balance between flexibility and control. Technological environments are dynamic, and alliances must therefore be sufficiently flexible to allow changes in objectives, projects, and technological directions. At the same time, excessive rigidity or over-formalisation can inhibit innovation by constraining experimentation and rapid adaptation. Conversely, overly loose contracts increase the risk of opportunistic behaviour and the loss of control over

strategic resources.

Overall, technology-oriented strategic alliances create significant opportunities for innovation, but their outcomes are strongly conditioned by firms' ability to manage knowledge, power relations, cultural differences, and institutional mechanisms of collaboration. The success of such alliances is therefore not an automatic consequence of cooperation, but rather the result of sophisticated management of complex interorganizational relationships.

Discussion

The purpose of this article is to explain how and under what conditions strategic alliances enable firms to access new technologies and enhance their innovation performance. The analysis of theoretical literature, highly technology-intensive sectors, and key risks reveals that strategic alliances represent an important, yet not self-evident, mechanism for achieving technological competitiveness.

At a general level, the literature confirms that alliances enable firms to access external knowledge resources, research capabilities, and complementary technologies, which is crucial in environments where innovation development is increasingly capital- and organisation-intensive (Grant & Baden-Fuller, 2004; Gulati, 1998). Empirical examples from the pharmaceutical, automotive, and information technology industries further confirm that firms without partnership networks struggle to keep pace with rapid technological change, particularly in areas such as biotechnology, vehicle electrification, or artificial intelligence. In this sense, strategic alliances function as a key channel for technological absorption and the joint creation of innovations (Aggarwal, 2020).

However, the analysis also clearly shows that the effects of alliances are not unambiguous. While some authors view alliances as an almost automatic source of innovation advantage (Gulati, 1998), others emphasise that the benefits are strongly conditioned by the organisational and strategic capabilities of the partners (Doz & Hamel, 1998). The Sony–Ericsson case, which achieved limited synergies despite extensive technological collaboration, illustrates that the mere formation of an alliance does not guarantee success. Key factors include goal alignment, knowledge complementarity, and the ability to engage in joint learning.

Similar divergences are also evident regarding risks. Although alliances often reduce financial and technological uncertainty by sharing costs and resources (Gulati, 1998), they can simultaneously create new forms of dependence and exposure. The dispute between Toshiba and Western Digital demonstrates that conflicts over intellectual property and control of technology can cause more harm than benefit (Inkpen & Beamish, 1997). This confirms that alliances are not only a mechanism of cooperation, but also a potential arena for strategic conflict.

From a managerial perspective, the findings suggest that alliance design should begin by diagnosing partner complementarity and absorptive capacity before selecting governance mechanisms that strike a balance between learning and appropriation.

An important tension in the literature also arises regarding the balance between openness and knowledge protection. While the open innovation paradigm emphasises the benefits of free knowledge flows (Chesbrough, 2003), research in strategic management warns that excessive openness reduces incentives for investment in research and increases the risk of imitation (Audretsch & Belitski, 2023; Grant & Baden-Fuller, 2004; Ritala & Stefan, 2021). The Apple–IBM example illustrates that firms in practice often opt for selective knowledge sharing, which enables collaboration without jeopardising key competitive advantages. This confirms that alliance success depends on a fine balance between cooperation and the protection of strategic resources.

The discussion also reveals important gaps in the existing literature. The influence of the institutional environment, regulation, and national innovation systems on alliance performance remains insufficiently explored (Hagedoorn, 2002). Similarly, the issue of power asymmetries between large and small partners, which is particularly pronounced in the pharmaceutical industry (Ferrigno et al., 2021), also remains underexplored. Moreover, most studies do not address the long-term effects of alliances on organisational learning and firms' strategic transformation (Ben Jemaa-Boubaya et al., 2020; Musarra et al., 2021).

Based on this discussion, it is possible to directly answer the research question. Strategic alliances enable firms to access new technologies and enhance their innovation performance, primarily when high levels of knowledge complementarity exist, effective learning mechanisms are in place, and power and governance relationships are

balanced. When these conditions are absent, alliances may become a source of conflict, knowledge loss, and strategic vulnerability. They therefore cannot be regarded as a universal solution for technological competitiveness, but rather as a complex organisational instrument whose effects are strongly context-dependent.

Conclusion

This article examined the role of strategic alliances as a mechanism for accessing new technologies and strengthening firms' innovation performance. Based on an extensive review of the literature and an analysis of different industrial environments, it can be concluded that strategic alliances represent one of the key organisational responses to the increasing complexity of technological development and global competition by enabling firms not only to improve innovation performance, but also to gain access to external technologies and specialised knowledge that would be difficult to develop internally.

In direct response to the research question, strategic alliances allow firms to access new technologies and enhance innovation performance mainly when partner complementarities are strong, absorptive capacity is sufficient to internalise external knowledge, and governance mechanisms balance learning with protection against appropriation and opportunism. When these conditions are weak– particularly with misaligned objectives, poor governance design, or increased risk of knowledge leakage – alliances are more likely to underperform and may even erode technological advantage.

The results of the theoretical analysis support two key implications. First, the effectiveness of technology transfer in strategic alliances largely depends on partner complementarity. Collaboration between firms with different but complementary knowledge bases, resources, and technological capabilities enables faster knowledge transfer, reduced development costs, and greater effectiveness in innovation processes. Strategic alliances therefore function as accelerators of technological progress, as they allow firms to access specialised competencies that are difficult to develop independently.

Second, the analysis confirms that the level of innovativeness is more closely related to the intensity of collaboration than to the mere formal existence of an alliance. Firms that establish deep and operational collaboration—through the sharing of research capabilities, joint product development, and continuous knowledge exchange—achieve a higher number of innovations, shorter development cycles, and greater value added. In contrast, purely formal or superficial partnerships without genuine joint work rarely generate significant innovation outcomes.

The main contribution of this article lies in the synthesis of three dimensions: strategic alliance theory, empirical insights from key technology-intensive industries, and the analysis of risks associated with collaboration. In doing so, the article demonstrates that strategic alliances are not merely an organisational form, but a dynamic learning mechanism that can substantially shape firms' long-term competitiveness.

Nevertheless, the study has important limitations. The analysis is based exclusively on existing literature and conceptual synthesis and therefore does not allow for direct empirical testing of the findings. Future research should incorporate quantitative analyses of larger samples of firms, as well as in-depth case studies from individual industries, to more precisely assess how partner complementarity, collaboration intensity, and the institutional environment influence actual innovation outcomes.

In addition, it would be valuable to investigate the long-term effects of strategic alliances, particularly their impact on organisational learning, business model transformation, and sustainable competitiveness. Special attention should also be devoted to contemporary trends such as digital transformation, artificial intelligence, and the green transition, as these processes are fundamentally reshaping the logic of inter-firm collaboration.

In conclusion, strategic alliances remain one of the most important mechanisms for knowledge creation and transfer in the contemporary economy. Their success, however, is not self-evident: it rests on partner complementarity, the depth of collaboration, and the ability to balance cooperation with the protection of strategic resources. It is precisely within this balance that their greatest potential for long-term innovativeness and competitive advantage lies.

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Strateška zavezništva in tehnološke inovacije: pogoji in mehanizmi

Izvleček

Ta članek preučuje, kako strateška zavezništva podjetjem omogočajo dostop do novih tehnologij in izboljšujejo inovacijsko uspešnost ter pod kakšnimi pogoji so taka zavezništva uspešna ali neuspešna. Študija predstavlja strukturirano konceptualno sintezo strokovno pregledane literature o strateških zavezništvih in tehnoloških inovacijah, pri čemer združuje več teoretičnih perspektiv in dokazov iz tehnološko intenzivnih panog. Opredeljuje ključne mehanizme – kot so prenos znanja, učni procesi in upravljanje zavezništev –, prek katerih strateška zavezništva vplivajo na rezultate inovacij. Analiza kaže, da lahko strateška zavezništva znatno izboljšajo rezultate inovacij, kadar partnerji izkazujejo močno tehnološko komplementarnost, učinkovite strukture upravljanja in visoko absorpcijsko zmogljivost. Nasprotno pa neusklajeni cilji, šibko upravljanje in tveganja izgube znanja pogosto oslabijo uspešnost zavezništva. Študija je konceptualna in ne preverja vzročnih povezav empirično. Ugotovitve nudijo smernice za menedžerje, ki oblikujejo tehnološko usmerjene zavezništva, in za znanstvenike, ki razvijajo bolj natančne modele sodelovalnih inovacij. Članek prispeva s sintezo razdrobljene literature v celovit okvir, ki poudarja pogoje za uspeh in neuspeh v inovacijskih strategijah, temelječih na zavezništvih.

Ključne besede: strateška zavezništva, tehnološke inovacije, prenos znanja, sodelovanje med podjetji, upravljanje; uspešnost inovacij