

Article

Organizational Ambidexterity and Open Innovation: A Case Analysis of Michelin

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Abstract

The tire industry, as a long-established and mature sector, is undergoing a profound transformation driven by electrification, smart manufacturing, and sustainability. In this context, efficiency-oriented strategies and incremental improvements can no longer ensure long-term competitiveness. Using Michelin as a case study, this paper examines how open innovation operates as an organizational mechanism for fostering ambidexterity by balancing exploitation with the development of exploration capabilities. The findings reveal that Michelin integrates external knowledge through inbound, outbound, and coupled open innovation, while employing structural and domain separation to absorb, recombine, and institutionalize exploratory initiatives within core operations. This dual approach enables the firm to preserve efficiency advantages while cultivating adaptive capacity under technological and regulatory uncertainty. The study extends theories of open innovation and organizational ambidexterity to a mature manufacturing context and highlights the organizational conditions under which openness supports, rather than undermines, strategic renewal. It also offers practical implications for incumbent firms pursuing strategic transformation under uncertain technological and policy environments.

Keywords: open innovation; organizational ambidexterity; Michelin; case study

1. Introduction

On 28 May 1889, the Michelin brothers, André and Edouard, founded Michelin & Co. The company expanded rapidly, first establishing a reputation in bicycle and automobile tires, then diversifying into the design and manufacture of tires for various types of vehicles, including trucks, Formula 1, and aviation (Bhasin, 2024). This long organizational history makes Michelin a theoretically informative case for examining how mature incumbents adapt under conditions of technological disruption. Although it has become a multinational company, it has remained rooted in its origins, maintaining its headquarters in the same location, while consistently emphasizing brand development and technological innovation as the core foundations of its competitive advantage. Today, Michelin is one of the world's leading tire manufacturers, producing over 200 million high-performance tires annually and possessing strong exploitation capabilities rooted in operational excellence and manufacturing expertise (Michelin, 2023).

Nevertheless, the tire industry is undergoing a profound transformation. The emergence of electric vehicles, autonomous driving, and smart manufacturing, coupled with growing pressures from carbon neutrality and the circular economy, has rendered traditional strategies centered on lean production and incremental improvements increas-



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ingly insufficient for addressing rising environmental complexity (Vanshika & Nishika, 2024). Under these conditions, incumbent manufacturers must not only preserve efficiency advantages but also develop robust exploration capabilities, thereby intensifying the organizational challenge of balancing exploitation and exploration (March, 1991; Lavie et al., 2010).

Against this backdrop, Michelin, along with Bridgestone and Goodyear, continues to dominate the global tire market while facing intensifying technological and competitive pressures (Bhasin, 2024; Vanshika & Nishika, 2024). For Michelin, the strategic challenge is no longer whether to invest in R&D but how to systematically integrate external knowledge and reorganize its innovation processes in order to sustain long-term competitiveness in a dynamic environment. Through complementary mechanisms of structural and domain separation, Michelin seeks to decouple exploratory initiatives from its efficiency-oriented core operations, thereby pursuing organizational ambidexterity.

Despite the growing body of research on open innovation and organizational ambidexterity, prior studies have largely examined these two streams in parallel, offering limited insight into the concrete organizational mechanisms through which open innovation enables firms—particularly mature, capital-intensive manufacturing incumbents—to achieve ambidexterity (Lavie et al., 2010; Levinthal & March, 1993). Existing research has primarily focused on high-technology firms, startups, or innovation performance outcomes, leaving unanswered how traditional manufacturing organizations integrate external knowledge into their organizational structures to simultaneously sustain exploitation and cultivate exploration capabilities. This gap is especially salient in industries characterized by strong path dependence, high capital intensity, and regulatory constraints, where the tension between efficiency and renewal poses distinctive organizational challenges (Levitt & March, 1988; Cecere et al., 2014; Lavie et al., 2010). As a result, we still lack process-level explanations of how open innovation is translated into durable ambidextrous capabilities in capital-intensive incumbents.

Accordingly, this study addresses the following research problem: How does open innovation function as an organizational mechanism through which incumbent manufacturing firms construct and sustain organizational ambidexterity? Using Michelin as an in-depth case, we examine how inbound, outbound, and coupled open innovation practices are systematically integrated with structural and domain separation mechanisms to reconcile the persistent tension between exploitation and exploration under conditions of technological disruption and environmental uncertainty.

This study offers three primary contributions. First, it advances ambidexterity theory by explicating how open innovation operates not merely as a knowledge-sourcing strategy but as a concrete organizational mechanism through which firms integrate exploration and exploitation within a unified structural architecture. Second, it extends the empirical boundary of open innovation and ambidexterity research to mature manufacturing contexts, demonstrating how capital-intensive incumbents can reconfigure organizational design to support strategic renewal. Third, it provides actionable managerial guidance on aligning open innovation initiatives with organizational structures to achieve long-term resilience and competitive advantage amid technological and regulatory turbulence.

Methodologically, this study adopts a qualitative single-case research design centered on Michelin. Drawing on extensive publicly available secondary data—including corporate reports, industry documents, and EU project databases—the analysis traces how open innovation practices are structurally embedded to enable organizational ambidexterity.

The remainder of this paper is structured as follows. Section 2 develops the theoretical framework integrating open innovation and organizational ambidexterity. Section 3 describes the research design, data sources, and analytical approach. Section 4 presents the

external analysis of the tire industry. Sections 5 and 6 analyze Michelin's capabilities for exploitation and open innovation practices in constructing organizational ambidexterity. Finally, Section 7 discusses the theoretical and managerial implications and concludes the study.

2. Theoretical Framework

To investigate how Michelin structurally integrates external knowledge and balances innovation activities, we build our theoretical foundation on two interrelated concepts: open innovation and organizational ambidexterity.

2.1. Open Innovation

Open innovation refers to innovation activities in which firms systematically acquire, exchange, and utilize resources from inside and outside the organization to achieve greater efficiency and value (H. W. Chesbrough, 2003). Unlike closed innovation, which relies solely on internal R&D resources, open innovation emphasizes breaking down organizational boundaries to respond to fast-changing market demands and achieve value co-creation through collaboration with research institutions, governments, suppliers, and even customers (H. Chesbrough et al., 2018; Gassmann & Enkel, 2004).

In terms of knowledge flow, open innovation is typically categorized into two forms: inbound (outside-in) and outbound (inside-out) (H. W. Chesbrough, 2003). Inbound open innovation enhances internal processes by acquiring external knowledge and technology, accelerating product development, and aligning strategies with policy and market dynamics, as illustrated by Intel Corporation (H. Chesbrough & Crowther, 2006; H. W. Chesbrough, 2003). In contrast, outbound open innovation involves transferring internal innovations outward through licensing or joint ventures, thereby generating value through knowledge spillovers and fostering cross-organizational innovation networks, as seen in the case of Lucent (H. Chesbrough & Crowther, 2006; H. W. Chesbrough, 2003).

In practice, firms such as Michelin have increasingly adopted coupled open innovation, which combines inbound and outbound activities to complement knowledge integration and innovation pathways (Gassmann & Enkel, 2004). In Michelin's case, these modes collectively form a strategic system that aligns external knowledge with internal transformation and supports both organizational agility and scalability.

While open innovation provides the channels for knowledge flows, ambidexterity explains how firms translate these inputs into balanced innovation outcomes.

2.2. Organizational Ambidexterity

Organizational ambidexterity emphasizes how firms balance the seemingly contradictory yet complementary activities of exploration and exploitation in uncertain and dynamic external environments (Lavie et al., 2010). Exploration involves identifying, searching, assimilating, and creating new knowledge to help firms venture into uncharted areas, whereas exploitation focuses on refining, executing, and redeveloping existing knowledge to improve operational efficiency and short-term performance (March, 1991). As a key manifestation of dynamic capabilities, ambidexterity enables flexible resource allocation, rapid responses to environmental changes, and the development of sustainable competitive advantage (Lavie et al., 2010).

Within the context of open innovation, firms break through the resource constraints of traditional organizational boundaries by collaborating, forming alliances, and embedding themselves in innovation networks with external organizations, thereby integrating exploration and exploitation behaviors more effectively (Gassmann & Enkel, 2004). This cross-organizational knowledge integration mechanism not only alleviates structural con-

flicts arising from internal resource contention but also supports the development of a sustainable innovation system.

Specifically, Stettner and Lavie (2014) suggested that firms achieve ambidexterity by synergizing external exploration capabilities (e.g., acquisitions or alliances) with internal exploitation practices (e.g., process optimization or knowledge transformation). Luger et al. (2018) further adopted a dynamic evolutionary perspective, emphasizing that firms should flexibly adjust the exploration–exploitation balance to enhance resilience and long-term performance.

To effectively address the tension between exploration and exploitation, Lavie et al. (2010) proposed four typical organizational coordination mechanisms. Contextual ambidexterity allows employees to flexibly switch between exploration and exploitation according to specific tasks by establishing a culture and management system that support the coexistence of innovation and efficiency; structural (organizational) separation allocates exploration and exploitation tasks to different organizational units, creating dedicated structures, resources, and processes for each (Tushman & O'Reilly, 1996); temporal separation emphasizes that exploration and exploitation occur at different stages of organizational development; and domain separation occurs when exploration and exploitation are pursued within the same organizational unit but in distinct domains—such as product lines, market segments, or technological fields. These mechanisms provide multiple pathways for enterprises to achieve strategic balance and lay a solid foundation for improving organizational innovation performance (Lavie et al., 2010).

Among the multiple forms of ambidexterity identified in the literature, this study focuses primarily on structural and domain ambidexterity. This focus is theoretically grounded in the nature of Michelin's organizational context. In capital-intensive and technologically complex manufacturing industries, exploration and exploitation often require fundamentally different resource configurations, performance metrics, and time horizons. Under such conditions, structural separation enables firms to protect exploratory initiatives from efficiency-driven pressures of core operations, while domain separation allows firms to pursue both activities within the same organization across distinct technological and market domains (Lavie et al., 2010). Together, these mechanisms provide the organizational flexibility necessary for sustaining innovation without undermining operational stability. Accordingly, structural and domain ambidexterity constitute the most appropriate analytical lens for examining how Michelin reconciles competing innovation demands.

In this study, we highlight Michelin as a representative case of ambidexterity practice, focusing on how it combines structural and domain separation to balance exploration and exploitation. The subsequent sections will analyze these mechanisms in detail.

2.3. Open Innovation as a Mechanism for Organizational Ambidexterity

While open innovation and organizational ambidexterity have often been treated as distinct research streams, their integration remains theoretically underdeveloped, particularly in traditional manufacturing contexts. We argue that open innovation functions as a central organizational mechanism through which firms construct and sustain ambidexterity by embedding exploratory activities within exploitation-oriented systems.

Specifically, inbound open innovation expands firms' exploratory capacity by enabling access to diverse external knowledge and emerging technologies, thereby mitigating internal path dependence (Levitt & March, 1988; Levinthal & March, 1993). Outbound open innovation transforms internally generated innovations into ecosystem-level exploitation through standard-setting, platform diffusion, and cross-industry applications. Coupled open innovation synchronizes these knowledge flows, allowing firms to pursue exploration

while reinforcing existing capabilities. Through these mechanisms, open innovation enables firms to dynamically manage the tension between exploration and exploitation.

In mature manufacturing industries characterized by high capital intensity, technological lock-in, and regulatory constraints, this integration becomes particularly critical (Lavie et al., 2010; Cecere et al., 2014). Without appropriate organizational design, external knowledge inflows may generate internal conflict and inefficiency. Accordingly, structural and domain separation operate as complementary governance mechanisms that anchor open innovation processes within the organizational core while preserving the autonomy required for exploration. Through this alignment, open innovation is transformed from a set of dispersed innovation practices into a coherent organizational mechanism for sustaining ambidexterity over time.

3. Methods

Case study research has been widely recognized as a critical method for the construction and advancement of management theories (Eisenhardt, 1989; Yin, 2009). By examining specific phenomena in real-world contexts, case studies provide rich insights and are particularly suitable for addressing “how” and “why” questions. They are especially valuable for understanding why companies undertake strategic transformations and how they implement them successfully (Yin, 2009). Accordingly, this study employs a case study approach to explore how Michelin utilizes open innovation mechanisms to balance exploration and exploitation, thereby enhancing its competitive advantage in the high-end tire segment.

This research strategy is particularly appropriate given the study’s focus on understanding how open innovation operates as an organizational mechanism for ambidexterity. The phenomenon under investigation involves complex interactions among organizational structure, innovation processes, and strategic behavior that are deeply embedded in the firm’s historical and institutional context. A qualitative single-case design enables in-depth process tracing and contextualized interpretation that would be difficult to capture through large-sample quantitative approaches (Yin, 2009; Eisenhardt, 1989). Accordingly, the case study approach provides a suitable methodological foundation for addressing the study’s “how” and “why” research questions.

Michelin was selected as the case for this study due to its experience in leveraging organizational transformation to respond to both internal and external challenges. In particular, the company has significantly improved production efficiency and optimized organizational culture by introducing innovative production systems. These initiatives enabled Michelin to advance organizational transformation and strengthen its long-term competitiveness (Uyan, 2023). In addition, Michelin represents a mature, capital-intensive manufacturing incumbent that has pursued strategic renewal under conditions of technological disruption and sustainability pressure, making it a theoretically informative setting for examining how firms integrate external knowledge while maintaining strong exploitation capabilities. This transformation context provides a rich basis for examining how open innovation mechanisms support the balance between exploitation and exploration.

Case studies typically fall into two categories: single-case and multiple-case designs. Multiple case studies allow for wide comparisons across different settings (Yin, 2009). In contrast, single-case studies offer unique value in situations where a single organization provides particularly rich, theory-informing insights (Herriott & Firestone, 1983). In this case, understanding the context deeply and tracing nuanced processes is more important than the number of units analyzed (Eisenhardt, 1989; Baxter & Jack, 2008).

Consistent with Baxter and Jack (2008), the analysis centers exclusively on Michelin as a single organization. This focused approach enables an in-depth, context-sensitive examination and facilitates the identification of unique patterns and practices that may not

be observable through broader comparative methods. In summary, this study adopts a single-case design to capture Michelin's unique innovation dynamics and generate new theoretical and practical insights rooted in the case context.

In line with best practices in qualitative case research (Yin, 2009; Baxter & Jack, 2008), data were collected from a variety of publicly available secondary sources. These sources include Michelin's Universal Registration Documents (2022–2025), sustainability reports, and EU-funded project databases such as BlackCycle. More specifically, the empirical material consists exclusively of publicly available secondary data, including (1) Michelin's Universal Registration Documents (2022–2025) and related corporate disclosures, (2) sustainability and innovation-related reports, (3) official corporate publications and press releases, and (4) documentation from EU-funded collaborative projects (e.g., BlackCycle) as well as global co-innovation platforms initiated by Michelin (e.g., Movin'On). These sources were used to trace Michelin's evolving open innovation practices and organizational design choices in the context of its recent strategic transformation.

Using evidence from multiple data types improves the reliability and validity of the findings. However, given the potential bias inherent in firm-authored materials, evidence was iteratively compared across different document types—such as corporate reports and externally produced project documentation—to strengthen the credibility of interpretations and reduce the risk of single-source bias. Firm-authored materials were treated primarily as descriptive sources, while externally produced and jointly governed documentation (e.g., EU project reports and independent industry publications) served as validation sources. When discrepancies arose, priority was given to evidence that was externally corroborated and supported by multiple independent references.

To enhance analytical rigor and reliability, we used a multi-level triangulation approach combining source triangulation, investigator triangulation, and interpretive validation (Yin, 2009; Gioia et al., 2013). First, key empirical claims were carefully verified across multiple independent sources, such as corporate reports, EU project documentation, external industry publications, and media materials. Second, to increase interpretive reliability, all authors independently reviewed and coded the primary documents during the initial analysis phase. The coding schemes and initial interpretations were then compared, and discrepancies were discussed until consensus was achieved, reducing individual bias and strengthening the robustness of analytical judgments. Third, when contradictory or ambiguous evidence was found, we revisited the original documents and considered alternative interpretations before finalizing analytical conclusions. Specifically, when inconsistencies arose, claims were provisionally suspended until they could be confirmed through at least two independent sources and discussed among the authors.

Following these validation procedures, data were analyzed using a concept-guided qualitative analysis. Guided by the core theoretical constructs of open innovation and organizational ambidexterity, the authors systematically reviewed the documents to identify and organize evidence related to inbound, outbound, and coupled open innovation, as well as to exploration, exploitation, structural separation, and domain separation.

Inbound open innovation was traced through evidence of partnerships, joint laboratories, and strategic investments (e.g., the Michelin Innovation Lab and NewBiz, Fac-toLab/SimatLab/ChemistLab, and collaborations in hydrogen mobility and recycling). Outbound open innovation was traced through evidence of technology diffusion and standard-setting efforts (e.g., WISAMO, AirProne, and RFID-based lifecycle management systems). Coupled open innovation was traced through collaborative ecosystem programs and platforms (e.g., BlackCycle and Movin'On).

To examine organizational ambidexterity, evidence was further organized around the ways Michelin structurally separates exploratory initiatives from core operations (e.g., dedicated innovation labs) and allocates emerging businesses to distinct technological and market domains (e.g., hydrogen mobility and recycling technologies), thereby linking open innovation practices to separation mechanisms.

To improve transparency, Table 1 outlines the analytical dimensions, indicative indicators, core data sources, and related analytical purposes used in this study. The combination of multiple sources and analytic procedures enhances the credibility and applicability of the study's findings.

Table 1. Analytical Framework and Data Sources.

Analytical Dimension	Key Indicators (Examples)	Core Data Sources	Primary Period
Inbound OI	partnerships; joint laboratories; strategic investments; internal platforms (MIL, NewBiz)	URD (2022–2025); corporate publications; sustainability/innovation reports	2022–2025
Outbound OI	technology diffusion to other industries; standard-setting; service platforms (e.g., RFID standards, Watèa)	URD; corporate publications	2022–2025
Coupled OI	EU project databases/docs (e.g., BlackCycle) and public materials from Movin'On; sustainability reports	EU project databases/docs; sustainability reports	2022–2025
Structural Separation	dedicated innovation labs/units; distinct governance and evaluation criteria	URD; organizational disclosures	2022–2025
Domain Separation	allocation of emerging businesses into distinct technological/market domains (e.g., hydrogen, recycling)	URD; corporate strategy disclosures	2022–2025
Exploitation Capabilities	efficiency systems; quality control; global production network; patents/R&D infrastructure	URD; annual/sustainability reports	2022–2025

4. External Analysis—Tire Industry

In recent years, the global tire industry has undergone a significant structural transformation driven by rapid technological advances, intensified sustainability imperatives, and increasingly diverse customer demands. Rather than serving as descriptive background, these environmental forces fundamentally reshape the conditions under which firms must organize innovation activities (Lavie et al., 2010).

Collectively, they generate a persistent ambidexterity tension. Scale-based manufacturing, cost efficiency, and quality reliability continue to reward exploitation, while electrification, digitalization, and sustainability imperatives require exploration across unfamiliar technological domains. Because much of the relevant knowledge resides outside firm boundaries, resolving this tension depends on organizational mechanisms that connect exploration with exploitation, including external knowledge absorption, cross-domain recombination, boundary-spanning transfer, and the institutionalization of exploratory outcomes. In this context, open innovation functions as the primary mechanism through which firms mobilize external knowledge and sustain organizational ambidexterity. The following subsections examine how technological evolution, institutional pressure, and competitive structure activate these mechanisms and make open innovation structurally necessary.

4.1. Technological Evolution

Technological evolution in the tire industry is characterized by the coexistence of established manufacturing logics and emerging performance requirements associated with electrification, digitalization, and sustainability. Electric vehicles impose new demands related to durability, energy efficiency, and wear resistance (Persistence Market Research, 2023), while autonomous vehicles demand intelligent monitoring and data feedback capabilities to improve safety and real-time responsiveness (Pomoni, 2022). Furthermore, environmental imperatives accelerate the development of recyclable materials and circular production processes (Dhamija, 2024). Collectively, these developments expand the technological problem space beyond the boundaries of firms' existing R&D trajectories.

This expansion generates a structural ambidexterity tension. Exploitation-oriented routines, including scale efficiency, process optimization, and quality reliability, remain critical for maintaining competitiveness in a mature and cost-sensitive market. However, reliance on these routines alone increases the risk of technological lock-in, because emerging digital and material technologies require exploratory search across unfamiliar domains that cannot be addressed through incremental refinement of established knowledge bases (Levinthal & March, 1993). Crucially, much of the knowledge needed to address these emerging technological demands is distributed across specialized external actors, including technology firms, research institutions, and ecosystem partners. Under these conditions, ambidexterity typically requires organizational mechanisms that enable the absorption of external knowledge and its recombination with existing manufacturing capabilities. Inbound open innovation thus functions as a mechanism carrier, allowing firms to access, integrate, and experiment with external technological knowledge while preserving exploitation-based efficiency in core operations. Through these mechanisms, technological evolution makes open innovation structurally necessary for sustaining organizational ambidexterity rather than a discretionary strategic choice.

4.2. Institutional Pressure

Institutional pressures in the tire industry intensify ambidexterity demands by simultaneously reinforcing compliance-oriented exploitation and sustainability-driven exploration. On the one hand, regulatory regimes related to carbon emissions, fuel efficiency, and recyclable materials require firms to standardize processes and ensure reliable compliance (Dhamija, 2024), thereby strengthening exploitation-oriented routines. On the other hand, evolving sustainability standards and customer expectations introduce uncertainty regarding materials, technologies, and performance criteria, increasing the need for exploratory search beyond established routines (Dhamija, 2024).

This dual pressure generates a structural tension. While regulatory compliance rewards operational discipline and process reliability, sustainability-oriented innovation requires experimentation with novel technologies and coordination across multiple actors. Because many sustainability solutions depend on shared standards, complementary capabilities, and joint experimentation, these demands cannot be addressed through isolated internal innovation alone.

Under these conditions, organizational ambidexterity depends on mechanisms that enable collaborative experimentation and the institutionalization of exploratory outcomes. Coupled open innovation can function as a mechanism carrier by facilitating joint development with external partners, while outbound open innovation supports the diffusion and legitimation of sustainability solutions beyond firm boundaries. Through these mechanisms, institutional pressure renders open innovation structurally necessary for reconciling compliance-driven exploitation with sustainability-oriented exploration.

4.3. Competitive Structure of the Tire Industry

Porter's Five Forces model is employed as a focused analytical lens to examine how competitive pressures in the tire industry translate into innovation constraints and ambidexterity tensions faced by incumbents such as Michelin. Rather than providing a comprehensive industry overview, the framework is used selectively to identify structural forces that reinforce exploitation-oriented efficiency while simultaneously limiting differentiation through established technological trajectories. These competitive conditions and their implications are summarized in Table 2. As shown in Figures 1 and 2, major players such as Michelin, Bridgestone, and Goodyear exhibit closely aligned sales between 2022 and 2023 (Forlander, 2024), with only marginal year-to-year variation. Figure 2 further shows that their market shares remain closely clustered (Michelin, 2024b, 2025a), while the combined share of mis-sized and other players continues to expand. This convergence reflects a mature and saturated competitive environment, reinforcing Michelin's reliance on exploitation-oriented strategies, including cost efficiency, standardized production, and global manufacturing reliability, while constraining growth based solely on internally driven incremental improvements.

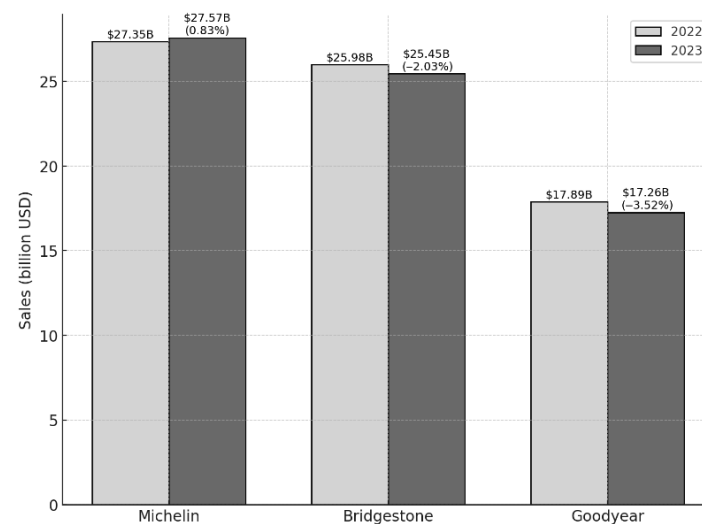


Figure 1. Sales of Major Tire Manufacturers, 2022–2023.

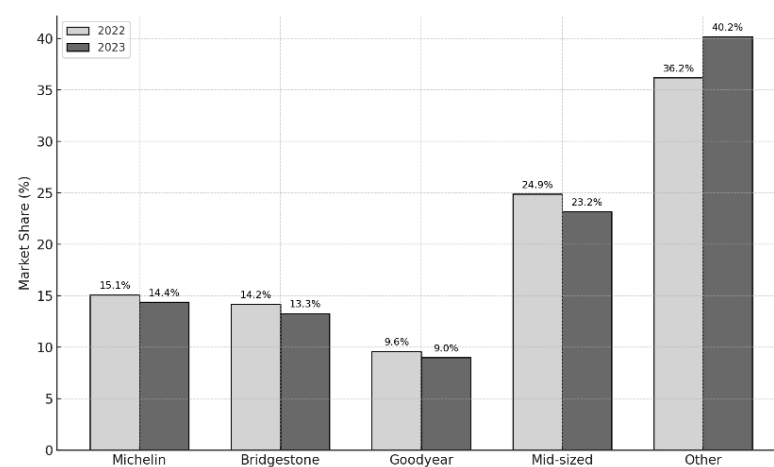


Figure 2. Market Share of Major Tire Manufacturers, 2022–2023.

Table 2. External Analysis—The tire industry.

External Factor	Industry Impact	Ambidexterity Tension	Why Open Innovation Is Necessary
Technological Change	New performance demands beyond existing R&D capacity	Existing exploitation ensures efficiency and reliability, but limits the firm's ability to respond to emerging digital and intelligent technologies	Inbound open innovation enables the absorption and recombination of external technological knowledge beyond existing R&D trajectories, supporting exploration while preserving exploitation-based efficiency
Institutional Pressure	Stricter sustainability regulations	Efficiency-driven processes conflict with long-term investment in environmentally sustainable materials and processes	Coupled open innovation supports collaborative experimentation and the institutionalization of sustainability solutions, while outbound open innovation facilitates their diffusion and scaling across organizational boundaries
Market Pressure	Rising customer expectations for differentiated products	Standardization and scale-based exploitation improve cost efficiency but reduce flexibility and customization	Outbound open innovation enables the transfer and commercialization of differentiated value propositions through external market channels, reconciling scale-based exploitation with customization demands
Competitive Pressure	Intense rivalry and supply risks	Scale-based advantages stabilize short-term performance but increase vulnerability to price competition and input volatility	Inbound open innovation provides access to complementary knowledge, while coupled open innovation enables cross-boundary coordination and recombination to address rivalry, volatility, and boundary erosion

Supplier and buyer bargaining power further intensifies these constraints. Approximately 60% of raw material costs are concentrated among a limited set of suppliers and switching to alternatives that meet stringent quality and sustainability standards remains costly (PortersFiveForce.com, 2025). Input price volatility, including rubber price fluctuations of up to 24.7% in 2023, increases pressure on procurement efficiency and process optimization (PortersFiveForce.com, 2025; Precedence Research, 2025). On the demand side, although Michelin's brand value reached \$8.8 billion in 2025, supporting strong customer loyalty (Michelin, 2025c), buyers increasingly expect differentiated performance and sustainability outcomes. This combination limits the effectiveness of standardized offerings and exposes diminishing returns from internal incremental innovation alone.

Finally, the threat of substitutes and new entrants extends beyond traditional tire technologies. The expansion of shared mobility and public transportation, along with the entry of electric vehicle manufacturers and technology firms into smart mobility ecosystems, erodes established industry boundaries (Little, 2024; MMR, 2025). These developments challenge firm-centric and closed innovation approaches and increase dependence on external knowledge integration and ecosystem coordination.

While Porter's Five Forces framework is effective in clarifying these structural sources of competitive pressure, its industry-bound and static logic limits its ability to capture ecosystem-level dynamics and cross-boundary knowledge flows (Grundy, 2006). Accordingly, the framework is employed here as a complementary tool. Taken together, the competitive forces identified above translate into distinct innovation pressures, as summarized in Table 2, generating a structural tension in which exploitation-oriented efficiency remains necessary but insufficient. Under these conditions, open innovation emerges as a

mechanism for accessing external knowledge and coordinating complementary capabilities, thereby motivating firms such as Michelin to rely more on open innovation in addressing organizational ambidexterity.

5. Exploitation as Michelin's Core Strength

Michelin has long stood out due to its strong exploitation capabilities in areas such as operational efficiency, large-scale production, strict quality control, and a worldwide supply and distribution network. These capabilities reflect Michelin's accumulated routines, assets, and process efficiencies that have historically underpinned its competitive advantages, consistent with the concept of exploitation as the refinement and extension of existing knowledge (March, 1991).

First, Michelin's highly standardized and automated manufacturing system enables industry-leading performance in safety, durability, and sustainability (Michelin, 2022, 2023). Rigorous quality management and continuous improvement mechanisms enable the company to achieve exceptional consistency and reliability at scale, securing a stable market position. From a theoretical perspective, these efficiency-oriented routines exemplify exploitation, which enhances short-term performance and operational reliability by deepening existing knowledge and practices (March, 1991).

Secondly, Michelin's proprietary R&D capabilities and vertically integrated supply chain further reinforce its exploitation strength. With nine R&D centers worldwide and over 12,000 patents (Michelin, 2025b), the company has built robust technological barriers and cost efficiencies. Meanwhile, this accumulation of specialized assets and routines also reflects a path-dependent technological trajectory, in which past investments and success patterns increasingly shape future strategic choices. While such path dependence strengthens reliability and efficiency, it may also constrain deviation from established technological paradigms (Lavie & Rosenkopf, 2006; Levinthal & March, 1993; Levitt & March, 1988).

Finally, Michelin demonstrates superior exploitation capabilities in its global expansion and brand management. Its worldwide network of production facilities, distribution channels, and customer service enables rapid deployment of mature technologies and products across regions (Michelin, 2022). This global network and reputation provide stable cash flow and robust market support. These resources provide organizational slack and financial stability, which are important preconditions for sustained investment in long-term and high-risk innovation initiatives (Cyert & March, 1963).

However, relying solely on internally accumulated exploitation capabilities is no longer sufficient to fully address the profound transformations in the current industrial context. As highlighted in the external analysis above, the tire industry is undergoing rapid technological evolution, facing mounting regulatory pressures, and experiencing a reshaping of the competitive landscape. These forces reflect heightened environmental turbulence, which progressively erodes the effectiveness of incremental, efficiency-oriented innovation (Lavie et al., 2010).

Under such turbulent conditions, deeply embedded routines and path-dependent capabilities simultaneously enable and constrain exploration (Cecere et al., 2014; Lavie et al., 2010). On the one hand, Michelin's scale, financial stability, and accumulated technological expertise provide the absorptive capacity and resource base necessary to engage in exploratory activities beyond organizational boundaries (Cohen & Levinthal, 1990). On the other hand, strong internal routines and established technological paradigms risk reinforcing cognitive and organizational lock-in, thereby narrowing the scope of internal search.

Given this context, closed innovation and internal improvements alone are insufficient to resolve the exploration-exploitation tension. Michelin must leverage its exploitation strengths as organizational mechanisms that support the absorption, recombination, and embedding of externally generated knowledge. This strategic challenge underpins the firm's turn toward open innovation as a dynamic capability that enables sensing external technological shifts, seizing opportunities through collaboration, and reconfiguring existing assets to address emerging domains (Bogers et al., 2019).

Importantly, Michelin's transition from exploitation to exploration is not an abrupt shift but a capability-driven process. From a dynamic capability perspective, Michelin's exploitation strengths provide micro-foundations for sensing, seizing, and reconfiguring in response to environmental turbulence (Teece, 2007). Specifically, Michelin's deep industry knowledge and standardized evaluation routines support the sensing of externally developed technologies, financial discipline and process controls enable the selective seizing of collaborative innovation opportunities, and its integration capabilities facilitate the reconfiguration and institutionalization of external knowledge within existing operations.

In this way, exploitation does not merely precede exploration but actively shapes how exploration is organized and governed through specific organizational mechanisms. By leveraging its established exploitation strengths through dynamic capabilities, Michelin mitigates the constraining effects of path dependence while enabling strategic renewal. Open innovation thus emerges not as a substitute for exploitation, but as a mechanism through which exploitation-based routines are mobilized to absorb, recombine, and institutionalize external knowledge. This logic underpins the firm's turn toward open innovation as a mechanism for realizing organizational ambidexterity. The following section examines how Michelin operationalizes ambidexterity through different modes of open innovation.

6. Open Innovation and Ambidexterity

This section examines how Michelin operationalizes organizational ambidexterity through specific open innovation mechanisms rather than through isolated collaborative initiatives. Building on the firm's exploitation foundations and the external pressures identified earlier, we show how inbound, outbound, and coupled open innovation function as distinct mechanism carriers that enable the absorption, recombination, transfer, and institutionalization of knowledge across exploratory and exploitative domains.

As illustrated in Figure 3, Michelin's open innovation system is embedded within an organizational architecture characterized by structural and domain separation. These separation mechanisms do not merely shield exploratory activities from efficiency-oriented routines; they actively structure knowledge flows between external partners and the organizational core. For instance, in 2024 alone, the company initiated more than 170 new partnerships and launched eight joint laboratories (Michelin, 2024b). This evolution reflects a deliberate effort to institutionalize open innovation as a strategic capability rather than a series of ad hoc initiatives. By channeling exploratory inputs through dedicated units and separated domains, Michelin enables selective internalization, cross-domain recombination, and subsequent scaling of new knowledge without destabilizing its exploitation base.

Drawing on the ambidexterity literature (Lavie et al., 2010), we conceptualize Michelin's open innovation practices as operating through a mode-mechanism-capability logic. This logic indicates that different modes of open innovation activate distinct organizational mechanisms, including absorptive capacity building, knowledge externalization, and bidirectional co-creation (Cohen & Levinthal, 1990). Specifically, inbound builds absorptive capacity and exploratory routines, outbound converts exploratory outcomes into ecosystem-level exploitation through standards and platforms, and coupled synchronizes bidirectional flows to enable systemic innovation. Structural and domain separation serve

as institutional foundations that bind each mode to the organizational core, minimizing resource conflicts while preserving exploratory autonomy.

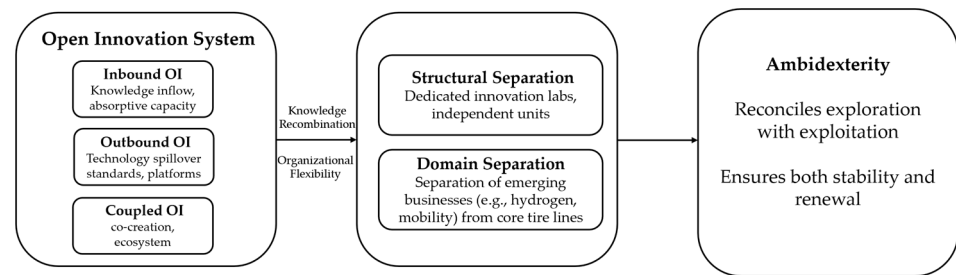


Figure 3. Conceptual Model of Organizational Ambidexterity at Michelin.

Building on this logic, we further draw on [Adner's \(2017\)](#) distinction between ecosystem-as-affiliation (participant-centered) and ecosystem-as-structure (activity/value proposition-centered), which helps clarify why the three modes differ in the type of interdependence they create and therefore in how they enable ambidexterity.

6.1. Inbound Open Innovation for Exploration

Inbound open innovation functions as Michelin's primary organizational mechanism for expanding exploratory search beyond established technological trajectories. Rather than merely increasing the volume of external interactions, inbound open innovation structures how external knowledge is identified, absorbed, recombined, and embedded into the firm's existing technological and operational domains ([H. W. Chesbrough, 2003](#)). From an organizational learning perspective, inbound open innovation builds absorptive capacity by enabling firms to recognize, assimilate, and apply external knowledge ([Cohen & Levinthal, 1990](#)). At the ecosystem level ([Adner, 2017](#)), Michelin's inbound open innovation reflects an ecosystem-as-affiliation logic, in which value creation centers on Michelin as the focal participant that accesses and internalizes knowledge from a broad network of external actors, rather than on the alignment of interdependent activities among partners.

In practice, inbound open innovation at Michelin operates through a sequential mechanism of knowledge absorption and recombination. External knowledge inputs related to high-tech materials, hydrogen energy, and green mobility are first accessed through boundary-spanning interfaces, then selectively internalized and recombined with Michelin's existing scientific and engineering expertise ([Michelin, 2025a](#)). Crucially, this sequencing allows exploratory knowledge to accumulate without directly disrupting exploitation-oriented production routines, thereby decoupling exploratory learning from short-term efficiency pressures.

This absorption and recombination mechanism is supported by convergent evidence from multiple sources, including corporate disclosures, EU-funded project documentation, and independent industry publications. The alignment of these sources indicates that external knowledge was not treated as isolated inputs but was progressively embedded into organizational learning processes.

Michelin implements these absorption and recombination mechanisms through three complementary organizational devices, each of which performs a distinct role in transforming external knowledge into internal exploratory capability. First, internal platforms. Programs such as the Michelin Innovation Lab (MIL) and the "NewBiz" initiative function as controlled entry points for external and internal ideas originating from employees, customers, and partners, ensuring a continuous inflow of novel concepts for validation and integration ([Michelin, 2024a](#)). By providing protected spaces for experimentation and early-stage evaluation, these platforms operate as front-end filters, screening and selectively

assimilating novel concepts before any potential integration into broader R&D activities, thereby supporting the development of absorptive capacity (Cassiman & Valentini, 2016; Cohen & Levinthal, 1990).

Second, external partnerships. Michelin has built cooperative networks with universities, research institutes, startups, and industrial consortia that serve as recurring learning interfaces, rather than one-off research projects (Michelin, 2025f). As shown in Figure 4, its collaborations include joint laboratories, such as FactoLab, SimatLab, and ChemistLab, established with the University of Clermont-Ferrand, the ICCF, and the University of Lyon. These labs focus on areas ranging from human–machine collaboration and materials science to hydrogen modeling and next-generation sustainable elastomers (Michelin, 2025g). The repeated nature of these interactions supports iterative learning and cumulative knowledge transfer, enabling exploratory insights to be gradually embedded into Michelin’s R&D routines.

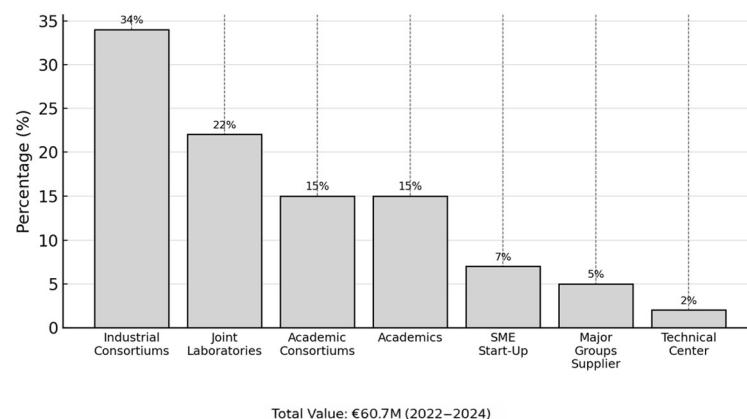


Figure 4. Michelin’s Network Partnership.

Finally, strategic investments. Its acquisitions in hydrogen technologies (e.g., Symbio), 3D printing (AddUp), and recycling (Carbios, Enviro) further strengthen Michelin’s ability to internalize breakthrough innovations and integrate them into its broader technological landscape (Michelin, 2024a). Compared with arm’s length collaborations, equity-based investments enable closer coordination between external development activities and internal engineering processes, accelerating the conversion of exploratory inputs into exploitable organizational assets. Overall, inbound open innovation at Michelin operates as a mechanism-driven process in which external knowledge flows are systematically accessed, internalized, recombined, and embedded through structured organizational interfaces. By channeling exploratory learning through internal platforms, recurring partnerships, and strategic investments, Michelin expands technological search into new domains such as green mobility and sustainable materials while preserving the stability of its exploitation core. In this way, inbound open innovation directly contributes to organizational ambidexterity by resolving the exploration-exploitation tension at the level of organizational processes rather than isolated initiatives.

6.2. Outbound Open Innovation for Exploration

Outbound open innovation functions as Michelin’s primary organizational mechanism for externalizing and scaling internally generated exploratory outcomes beyond firm boundaries (H. W. Chesbrough, 2003). Rather than merely transferring technologies outward, outbound open innovation structures how exploratory knowledge is diffused, standardized, and institutionalized so that it can be exploited by a broader set of external actors. At the ecosystem level, Michelin’s outbound open innovation reflects an ecosystem-as-affiliation logic (Adner, 2017), in which value creation emerges through the diffusion

and adoption of technologies and standards across a broad set of loosely coupled actors. Rather than orchestrating tightly aligned interdependencies, Michelin participates as an active contributor to industry-wide technology diffusion and standard-setting processes.

On the one hand, Michelin leverages its long-standing expertise in flexible composites to create spillover effects across industries. Originally developed to enhance tire performance through lightweight design, durability, and energy efficiency, this capability has found applications in shipping, healthcare, and industrial manufacturing. Representative outcomes include the Uptis puncture-resistant tire, the WISAMO wind-propulsion system, and the AirProne inflatable cushions, which illustrate how internally developed exploratory technologies are externalized and recombined with existing production systems and market channels outside Michelin's core tire business (Michelin, 2025b). Through these diffusion mechanisms, exploratory knowledge is scaled via established manufacturing routines and distribution infrastructures, enabling exploitation beyond the firm's original technology domain.

On the other hand, outbound open innovation at Michelin also operates through institutionalization mechanisms that translate exploratory outcomes into shared industry standards. By promoting digital tire standards such as the integration of RFID-based lifecycle management, Michelin has translated internal innovations into widely adopted practices among OEMs and distributors (Michelin, 2024b). This process not only advances tire recycling and sustainable upgrading but also consolidates Michelin's role in setting technological norms. In doing so, Michelin demonstrates how exploratory achievements can be institutionalized as industry-wide exploitation, thereby strengthening collective innovation capacity.

This institutionalization process is supported by convergent evidence from corporate disclosures, industry technology reports, and sustainability and recycling documentation, which together indicate that Michelin's digital innovations were embedded in stable, industry-wide routines rather than remaining firm-specific practices.

Finally, Michelin's exploratory investments in hydrogen energy further illustrate outbound open innovation as a scaling mechanism. Through Symbio, a joint venture with Faurecia, the company has modularized hydrogen fuel cell systems (StackPack®) and opened them to external manufacturers, accelerating the industrialization of hydrogen mobility (Michelin, 2025e). Complementing this initiative, the "Watèa by Michelin" service platform functions as an outbound interface through which exploratory solutions such as smart tire monitoring and mobility data analytics are diffused into fleet operations and service ecosystems (Michelin, 2025e). Rather than exercising direct control, these outbound initiatives position Michelin as an active participant that facilitates the dissemination and application of exploratory technologies through modular architectures and service platforms.

In sum, Michelin's outbound open innovation enables the externalization and scaling of exploratory outcomes through technology diffusion, standard-setting participation, and platform-based dissemination. By connecting internal exploration with broader industry application, outbound open innovation primarily contributes to organizational ambidexterity by strengthening exploitation while maintaining alignment with ongoing exploratory activities.

6.3. Coupled Open Innovation for Exploration

Coupled open innovation functions as Michelin's primary mechanism for enabling systemic exploration through the coordination and alignment of interdependent activities across organizational boundaries (Gassmann & Enkel, 2004). Compared with one-way knowledge inflow or outflow, the coupled model highlights co-creation, mutual learning,

and embeddedness in innovation ecosystems. Consistent with [Adner's \(2017\)](#) ecosystem-as-structure perspective, the central challenge in this mode is not participation per se, but the alignment of interdependent activities required to realize a shared value proposition ([Adner, 2017](#)).

For Michelin, coupled open innovation connects internal exploration capabilities with external implementation by structuring how heterogeneous partners coordinate exploration-related activities, rather than by simply exchanging or transferring knowledge. Through this mechanism, exploratory initiatives remain anchored to the firm's exploitation-oriented core while enabling experimentation that no single actor could realize independently.

The BlackCycle project illustrates how coupled open innovation operates as a coordination mechanism for systemic exploration. BlackCycle brings together industrial partners, research institutes, and EU agencies to establish a closed-loop value chain from end-of-life tires (ELT) to high-value secondary raw materials (SRM) ([BLACKCYCLE, 2020](#); [Michelin, 2024a](#)). Beyond advancing technologies such as material recycling and carbon black substitution, BlackCycle coordinates interdependent activities across R&D, pilot testing, material recovery, and industrial scaling ([BLACKCYCLE, 2020](#); [Michelin, 2025g](#)), enabling systemic exploration that would not be feasible through isolated firm-level initiatives.

With this arrangement, Michelin acts as a core participant contributing technical expertise and industrial capabilities while aligning task interdependencies through joint R&D and collective implementation. Value creation thus depends not merely on collaboration but on structured coordination of interdependent activities across the ecosystem, consistent with the ecosystem-as-structure perspective ([Adner, 2017](#)). Movin'On provides a second illustration of coupled open innovation, emphasizing problem framing and agenda alignment rather than technological coordination alone. As a global co-innovation platform initiated by Michelin, which connects public and private stakeholders to address long-term challenges in green and smart mobility ([MOVIN'ON, 2025](#)).

While Movin'On facilitates global knowledge exchange, its primary function lies in aligning exploratory agendas, coordinating initiatives among heterogeneous actors, and selectively translating shared problems into collaborative projects and policy-relevant initiatives ([MOVIN'ON, 2024, 2025](#)). Through this alignment mechanism, exploratory ideas are jointly refined and embedded into coordinated actions, supporting systemic exploration at the level of mobility systems rather than discrete technologies ([MOVIN'ON, 2025](#)).

The coordination mechanism is supported by convergent evidence from EU project reports, Michelin's corporate disclosures, and independent sustainability and mobility-policy documentation. Specifically, EU project and third-party sustainability reports indicate that BlackCycle operated as an institutionalized coordination structure, while evidence from Michelin's corporate reports and Movin'On platform documentation shows that Movin'On functioned as an agenda-alignment mechanism coordinating shared problem framing and exploratory initiatives across heterogeneous actors.

In summary, Michelin's coupled open innovation enables bidirectional knowledge exchange and joint problem-solving by aligning interdependent activities across organizational boundaries. By simultaneously acquiring external knowledge and disseminating internal advancements, coupled open innovation primarily contributes to organizational ambidexterity by supporting systemic exploration while remaining connected to existing exploitation activities.

Taken together, inbound, outbound, and coupled open innovation operate through complementary but distinct mechanisms to support organizational ambidexterity. Inbound open innovation builds exploratory capacity through absorption and recombination, outbound open innovation scales exploration into ecosystem-level exploitation through dif-

fusion and institutionalization, and coupled open innovation enables systemic exploration by aligning interdependent activities across organizational boundaries.

6.4. Organizational Ambidexterity: Trade-Off of Exploitation and Exploration

Michelin sustains organizational ambidexterity by combining structural and domain separation as governance mechanisms that regulate how exploration and exploitation coexist and interact within the firm. Rather than treating separation as a static organizational design, Michelin deploys these arrangements to structure knowledge flows, resource allocation, and performance expectations, thereby enabling open innovation processes to operate without destabilizing its exploitation-oriented core. As illustrated in Figure 5, these separation mechanisms are coordinated under the Michelin Group (CGEM), which oversees strategy, capital allocation, and governance across both exploitation- and exploration-oriented activities.

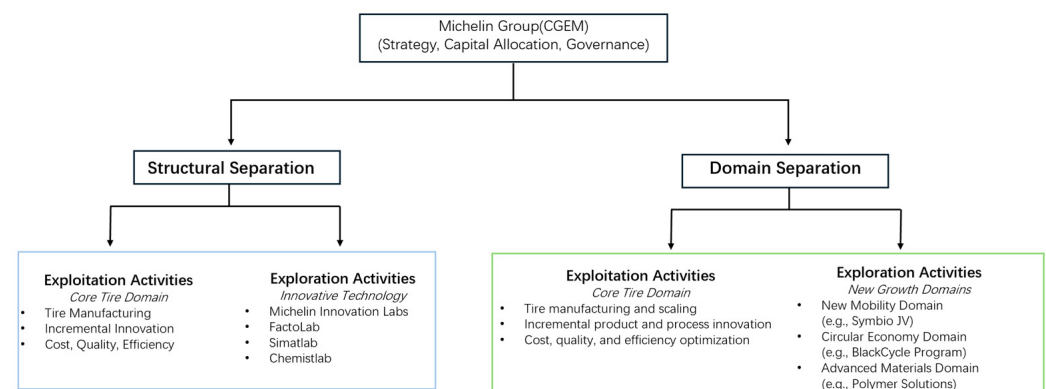


Figure 5. Organizational Arrangements for Structural and Domain Separation at Michelin.

First, in terms of exploitation, Michelin relies on a global network of R&D centers, production facilities, and distribution channels to ensure efficiency, responsiveness, and quality consistency (Michelin, 2022). Vertical integration of raw materials such as rubber further supports cost control and consistency. These exploitation-oriented operational strengths, concentrated within the core tire domain in Figure 5, sustain Michelin’s leadership in safety, durability, and sustainability while generating the surplus resources and financial basis required to fund exploratory initiatives.

Furthermore, in response to a highly uncertain technological environment and increasingly dynamic external demands, Michelin has shifted its technology strategy from an efficiency-oriented improvement strategy toward exploration-driven innovation, as outlined in its 2030 plan, Michelin in Motion (Michelin, 2025d). This plan directs increasing investments toward emerging fields such as connected tires and polymer solutions, signaling a deliberate reconfiguration of internal priorities to enable future-oriented growth. Rather than replacing exploitation, this strategic orientation reflects an expansion of exploratory activities alongside the preservation of core operational routines, consistent with the dual structure depicted in Figure 5.

As illustrated on the left side of Figure 5, Michelin’s core tire business is organized around exploitation-oriented activities, including large-scale manufacturing, quality control, and incremental innovation. In parallel, the firm establishes dedicated exploratory units such as Michelin Innovation Labs across Europe, North America, and Asia through structural separation. These labs operate independently of core business divisions, with distinct resource allocation and evaluation criteria, allowing flexible experimentation and effective absorption of external knowledge (Michelin, 2024a), which reduces short-term

performance pressures and enables engagement with high-uncertainty technologies and external partners while maintaining proximity to the core technological base.

At the domain level, as illustrated on the right side of Figure 5, Michelin assigns its core tire business to exploitation-oriented activities while placing high-risk projects—such as hydrogen mobility (e.g., the Symbio JV) and recycling technologies—into separate business lines and partnerships.

As reflected in Figure 5, this domain-level separation limits resource competition and cognitive interference between exploration and exploitation without implying organizational fragmentation. Instead, by establishing interfaces through inbound, outbound, and coupled open innovation processes, Michelin enables selective knowledge transfer across domains, allowing exploratory insights generated in new domains to be selectively recombined with its exploitation capabilities. Organizational ambidexterity thus emerges not from resolving the exploration-exploitation trade-off once and for all, but from continuously managing it through separation, coordination, and selective integration. Exploitation secures the operational efficiency and financial resources necessary for survival, while exploration, facilitated by open innovation, positions the company at the forefront of technological and market transformation. This dual approach exemplifies organizational ambidexterity and illustrates how traditional manufacturing firms can align open innovation practices with structural mechanisms to achieve resilience and long-term competitiveness.

Table 3 provides a direct comparison of the three open innovation modes, highlighting that inbound open innovation primarily strengthens exploration through absorptive capacity building, outbound open innovation reinforces exploitation by scaling and standardizing exploratory outputs, and coupled open innovation integrates both by aligning interdependent activities to enable systemic exploration. This comparison clarifies their differentiated yet complementary contributions to organizational ambidexterity.

Table 3. Michelin’s Open Innovation Practices.

Organizational Architecture	Key Mechanisms	Exploration Contribution	Exploitation Contribution	Ambidexterity Linkage
Inbound OI	Partnerships with universities and startups; strategic investments	Expands knowledge base, enhances absorptive capacity, and accelerates access to emerging technologies	Generates knowledge inputs that can later be recombined with existing capabilities and incorporated into exploitation activities	Builds a learning foundation that supports exploration while supplying input that enables future recombination with exploitation
Outbound OI	Technology spillover; industry standards (RFID); service platforms (Watèa)	Generates feedback loops and cross-domain learning that redirect and refine exploratory search	Scales, standardizes, and commercializes internally developed technologies, extending their impact beyond firm boundaries	Converts exploratory outcomes into ecosystem-level exploitation; reinforces industry impact
Coupled OI	Strategic alliances (BlackCycle); co-innovation platforms (Movin’On)	Fosters systemic co-exploration and cross-industry knowledge co-creation	Facilitates the coordinated translation of exploratory outcomes into exploitative applications through joint implementation	Aligns interdependent activities across actors, allowing exploration and exploitation to co-evolve through coordinated innovation processes
Structural and Domain Separation	Dedicated innovation labs; separation of emerging businesses from core tire lines	Provides structural support for high-risk, high-reward innovation projects	Preserves the efficiency and reliability of exploitation-oriented core operations	An institutional mechanism that reconciles exploration with exploitation, ensuring both stability and renewal

7. Discussion and Conclusions

The tire industry is undergoing a significant transformation driven by electrification, automation, and sustainability imperatives, while simultaneously facing market saturation and intensifying competition. Within this context, the high-end tire market represents one of the few strategic arenas with sustainable growth potential. However, this segment is characterized by high entry barriers, complex and heterogeneous customer demands, diversified technological trajectories, and heightened uncertainty.

For Michelin, sustaining its leadership under such conditions requires more than technological accumulation alone. The central challenge lies in designing organizational mechanisms that continuously absorb external knowledge, transform it into internal capabilities, and respond flexibly to evolving market dynamics. Our findings demonstrate that Michelin achieves this by integrating open innovation practices with organizational design, thereby constructing organizational ambidexterity and reinforcing resilience under environmental uncertainty.

7.1. Theoretical Contributions

This study advances the theoretical understanding of organizational ambidexterity and open innovation by demonstrating how these two streams are structurally integrated within a mature manufacturing firm. While prior research has extensively examined the tension between exploration and exploitation (March, 1991; Tushman & O'Reilly, 1996; Lavie et al., 2010), empirical evidence on how incumbent manufacturing firms operationalize this balance through concrete organizational mechanisms remains limited. Our analysis of Michelin addresses this gap.

First, this study repositions the strategic role of open innovation in constructing organizational ambidexterity. Most existing studies have focused on the role of open innovation in enhancing firms' innovation performance or accelerating new product development (H. W. Chesbrough, 2003; Greco et al., 2015; Rauter et al., 2019), while paying comparatively less attention to its organizational implications for managing the exploration–exploitation tension. In contrast, our findings show that open innovation at Michelin functions not only as a knowledge acquisition channel but also as an organizational mechanism that systematically embeds exploratory activities into the firm's existing exploitation-oriented structure through structural and domain separation. But have largely overlooked its function in resolving the tension between exploitation and exploration. This study, by contrast, highlights the role of open innovation in alleviating the tension between exploration and exploitation. Open innovation is shown to serve not only as a channel for knowledge inflow but also as a strategic mechanism that embeds exploratory activities into dedicated units and platform networks through structural and domain separation. This perspective expands the strategic meaning of open innovation and clarifies how firms reconcile competing demands within an ambidextrous system.

Second, the study extends ambidexterity theory by demonstrating that structural and domain separation operate as dynamic organizational processes rather than static design choices. Prior research has identified multiple pathways to ambidexterity, including structural, contextual, temporal, and domain-based approaches (Tushman & O'Reilly, 1996; Lavie et al., 2010; Stettner & Lavie, 2014). Our case illustrates how these mechanisms interact with open innovation practices over time, allowing Michelin to protect exploratory initiatives from efficiency pressures while maintaining coherence across core operations. This finding supports and deepens existing arguments that ambidexterity emerges from the continuous alignment between organizational design and innovation strategy.

Third, this study refines the understanding of heterogeneity in open innovation modes. Although open innovation is often treated as a unified construct, prior research has increasingly recognized the importance of distinguishing among inbound, outbound, and coupled modes (H. W. Chesbrough, 2003; Gassmann & Enkel, 2004; Greco et al., 2015). Building on this distinction, our findings develop a “mode–mechanism–capability” framework that explains how different open innovation modes contribute to ambidexterity through distinct pathways of exploration, knowledge diffusion, and co-creation. In doing so, the study provides a more granular explanation of how diverse innovation practices jointly sustain organizational adaptability.

Finally, this research expands the empirical boundary of both open innovation and ambidexterity theories beyond their dominant focus on high-technology firms and startups. By examining Michelin—a mature, capital-intensive manufacturing incumbent—this study demonstrates that the integration of open innovation and ambidexterity is not confined to fast-moving digital industries but is equally critical in traditional manufacturing contexts characterized by path dependence and slower technological renewal. This contribution enriches existing theory by incorporating a broader range of organizational environments.

At the same time, our findings suggest that the ambidexterity-enabling role of open innovation is contingent on several organizational conditions. Prior research has emphasized that external knowledge inflows generate value only when firms possess effective internal integration mechanisms and appropriate business models to absorb and commercialize them (H. W. Chesbrough, 2003). Without such integrative interfaces, externally sourced ideas may remain disconnected from core routines, limiting their contribution to either exploration or exploitation.

Moreover, extensive external collaboration can increase managerial complexity and coordination costs. As H. W. Chesbrough (2003) illustrates in the case of Xerox PARC, firms that lack flexible governance and adaptive decision processes may struggle to manage technological and market uncertainty, resulting in delayed responses and weakened strategic focus. In such contexts, the costs of coordinating interdependent partners may outweigh the benefits of openness.

Tensions may also arise when knowledge sharing conflicts with the protection of core technological assets. Open innovation requires firms to balance knowledge diffusion with appropriability and intellectual property management (H. W. Chesbrough, 2003). In highly competitive or IP-sensitive domains, excessive openness may expose firms to imitation risks and undermine internal capability development.

Taken together, these boundary conditions indicate that open innovation supports ambidexterity only when supported by sufficient governance capacity, integration routines, and knowledge protection mechanisms.

While this study primarily contributes to theory development, its findings also offer analytically grounded insights for managerial practice. Although based on a single-case analysis, the study demonstrates organizational mechanisms through which open innovation and ambidexterity can be integrated in mature manufacturing firms. Building on these insights, the following section discusses the practical implications of the findings.

7.2. Practical Implications

The managerial implications of this study are most relevant for mature, capital-intensive manufacturing incumbents operating in technologically dynamic and sustainability-driven environments, such as the tire, automotive, and advanced materials industries. In these contexts, firms face persistent tensions between preserving operational efficiency and pursuing strategic renewal under increasing environmental and technological uncertainty.

First, such firms should move beyond reliance on isolated internal innovation and develop a systematic open innovation architecture. As illustrated by Michelin's experience, multi-level collaboration with universities, startups, suppliers, and ecosystem partners enables firms to expand their knowledge base, accelerate learning, and respond more flexibly to technological disruption and regulatory pressure.

Second, the effectiveness of open innovation critically depends on its alignment with organizational structures and strategic intent. If firms simply introduce external cooperation mechanisms without corresponding organizational adjustments, it is likely to generate coordination problems and resource conflicts. This study highlights the importance of structural separation and domain separation as governance mechanisms that allow firms to protect exploratory initiatives from efficiency-driven pressures while maintaining coherence within core operations. Finally, firms can amplify the strategic impact of innovation by diffusing selected outcomes across broader industrial ecosystems. Michelin's engagement in standard-setting, service platforms, and collaborative programs demonstrates how manufacturing incumbents can move beyond product-based competition toward ecosystem participation. Through this shift, firms not only strengthen their own innovation capabilities but also shape industry trajectories in ways that reinforce long-term competitiveness.

7.3. Limitations and Future Research

This study is subject to several limitations that should be carefully considered. First, the exclusive reliance on secondary data constrains direct access to internal organizational processes, decision-making dynamics, and informal coordination mechanisms. Although the analysis draws on multiple data sources and applies systematic triangulation to mitigate this limitation, corporate disclosures and public documents may reflect strategic framing and impression management, which introduces the risk of reporting bias.

Second, the rapidly evolving nature of technological transformation in the tire industry implies that some strategic initiatives described in this study may change over time, limiting the temporal generalizability of the findings. Third, while the Michelin case offers rich theoretical insights, the single-case design restricts the ability to generalize across industries and organizational contexts. Future research could address these limitations by incorporating primary data collection methods such as interviews, internal archival materials, and longitudinal field studies. Comparative multi-case designs across different manufacturing sectors would also allow scholars to examine whether similar organizational mechanisms operate under varying technological, regulatory, and institutional conditions. Such efforts would further refine our understanding of how open innovation and organizational ambidexterity co-evolve over time.

Finally, the present study focuses on a case in which open innovation and organizational design are relatively well aligned. Prior studies suggest that when firms lack sufficient integrative capabilities, coherent business models, or mature governance structures, open innovation may fail to generate sustainable value (H. W. Chesbrough, 2003). In such settings, openness may intensify dependency risks, increase coordination burdens, or weaken incentives for internal capability development.

Accordingly, future research should examine not only successful cases of openness-driven ambidexterity but also instances of partial failure, strategic retreat, or unsuccessful ecosystem participation. Comparative studies across firms with varying levels of integration capacity, governance maturity, and intellectual property regimes would be particularly valuable for identifying the conditions under which open innovation supports, constrains, or destabilizes organizational ambidexterity.

In conclusion, this study shows that in mature, capital-intensive manufacturing industries, sustaining competitiveness requires more than technological accumulation alone. Through the case of Michelin, we demonstrate that organizational ambidexterity can be purposefully constructed by integrating open innovation practices with organizational design mechanisms. By conceptualizing open innovation as an organizational mechanism rather than merely a knowledge-sourcing activity, the study advances a more process-oriented understanding of ambidexterity in incumbent firms. Future research may build on these insights by examining how such mechanisms evolve over time and across different industrial contexts.

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