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INNOVATION MANAGEMENT



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PREFACE

Background

Innovation plays a key role in economic growth, business competitiveness, and social change. Advances in technology, digital transformation, growing sustainability concerns, and globalization have changed how organizations create value and respond to uncertainty. Innovation now extends beyond research and development to include activities across the organization, such as technological development, knowledge management, collaboration, green innovation, and strategic partnerships. To remain competitive, firms need to keep learning, adapt to change, and make effective use of their resources.

This book was developed to address the growing importance of innovation management in both academic research and business practice. Although existing studies offer valuable theoretical insights, there is still a need for an integrated and practical approach that reflects the challenges of managing innovation in today's digital and rapidly changing environment. By bringing together established theories and emerging trends, this book provides a broader understanding of how innovation can help organizations build and sustain a competitive advantage.

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Objective

The main aim of this book is to provide a clear and practical understanding of innovation management by connecting key theories with real-world applications. It focuses on the following objectives:

1. Explain how innovation can serve as a strategic capability that supports organizational success.

2. Examine the processes, sources, and systems that drive innovation within organizations.

3. Explore how technology, knowledge, and digital transformation influence innovation outcomes.

4. Analyze how strategic alliances, joint ventures, franchising, branding, licensing, and cooperation support innovation and business growth.

5. Emphasize the role of green innovation and responsible business practices in promoting sustainability.

By linking theory with practice, this book aims to contribute to academic knowledge and managerial decision-making. It also helps readers critically evaluate and apply innovation strategies in different organizational and business contexts.

Target Audience

This book is intended for readers who study, teach, or work in innovation management. It is particularly useful for:

1. Undergraduate and postgraduate students in business administration, management, and related fields.

2. Researchers looking for a clear and up-to-date overview of innovation management concepts.

3. University lecturers and professors seeking a comprehensive textbook for innovation-related courses.

4. Business professionals, managers, and entrepreneurs who want to strengthen their innovation capabilities and improve strategic decision-making.

5. Policymakers and practitioners working to promote innovation, economic growth, and sustainable development.

The book combines academic depth with clear explanations and practical examples, making its content accessible and relevant to real-world situations.

Scope of the Book

This book takes an integrated approach to innovation management, covering key topics that reflect the complexity of innovation in modern organizations. Its chapters follow a logical sequence, moving from basic concepts to practical applications.

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The book begins by introducing innovation and its role in business. It then explores technological innovation management, including diffusion processes, organizational capabilities, and innovation projects. The discussion moves on to strategic innovation management, with a focus on capability development, competitive positioning, and organizational change.

The following chapters examine the sources of innovation, from internal capabilities and external networks to digital ecosystems. They also explore new product and service development as a means of creating value and strengthening market competitiveness. Innovation operations management is discussed in relation to digital transformation, sustainability, and Industry 4.0 and 5.0.

Knowledge management is another key topic, highlighting how processes, systems, and technologies support organizational learning and innovation performance. The book also examines collaborative approaches to innovation, including strategic alliances, joint ventures, franchising, branding, licensing, and cooperation, and explains how these arrangements can support innovation ecosystems and business growth.

The final section focuses on green innovation management, addressing sustainable practices, environmental responsibility, and the balance between economic, social, and environmental goals. Through case studies and empirical insights, the book illustrates how innovation can address practical challenges, particularly in emerging and developing economies.

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INTRODUCTION

Innovation is central to organizational success and economic development in today's complex and interconnected world. Advances in technology, globalization, digital transformation, and growing sustainability concerns have changed how organizations compete and create value. Innovation is no longer limited to research and development departments. It has become a strategic capability that influences organizational activities, decision-making, and long-term growth.

Innovation involves developing and applying new ideas to create value for organizations and society. This value can take many forms, including new products and services, improved processes, new business models, and better customer experiences. Innovation also extends beyond technology to include managerial, organizational, and social changes. Managing innovation effectively therefore requires strategic thinking, strong organizational capabilities, and effective implementation.

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This book responds to the need for a comprehensive and up-to-date understanding of innovation management. Although existing literature offers valuable theoretical insights, advances in digital technologies and artificial intelligence, together with growing sustainability challenges, call for a broader and more integrated perspective. The book brings together established theories and emerging trends to help readers understand how innovation can be managed systematically and strategically.

The book begins with the basic concepts of innovation and its role in business. It examines how innovation has evolved from traditional, linear processes toward more dynamic and interactive approaches. It then explores technological innovation management, including innovation diffusion, the roles of organizational actors, and the alignment of technology with business objectives. Building on these foundations, the book considers how organizations develop and implement innovation strategies to strengthen their capabilities and competitive advantage.

The discussion also covers the sources of innovation, including internal capabilities, external networks, and interactions within innovation ecosystems. In a knowledge-driven economy, innovation often depends on combining knowledge from different sources. Organizations must therefore make effective use of their internal resources while building relationships with external partners. The book also examines new product and service development, focusing on how customer involvement, digital transformation, and entrepreneurship help turn ideas into market value.

Another important topic is operations management and its contribution to innovation, particularly in the context of digitalization and Industry 4.0 and 5.0. Organizations need to align their operational processes with innovation goals to improve efficiency, flexibility, and responsiveness. The book also explores knowledge management, highlighting how knowledge creation, sharing, and application support organizational learning and performance.

Collaboration is another major theme. The book examines strategic alliances, joint ventures, franchising, branding, licensing, and other forms of cooperation as ways to access external resources, share risks, and strengthen innovation capabilities. These approaches are particularly important in a globalized economy, where organizations increasingly depend on partnerships to develop and implement new ideas.

The book also addresses green innovation management and the growing need to integrate sustainability into business activities. Organizations face increasing pressure to consider environmental and social concerns alongside economic performance. Green innovation can support this goal through environmentally friendly products and services, more sustainable processes, and business models that balance profitability with environmental responsibility.

Overall, this book combines established theories with practical applications to provide an integrated understanding of innovation management. By examining innovation as a strategic process that depends on organizational capabilities, collaboration, and continuous adaptation, it aims to help students, researchers, and practitioners address the challenges of modern business environments. The book ultimately seeks to show how effective

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innovation management can support sustainable competitive advantage and long-term organizational success.

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Chapter 1: Foundations of Innovation Management: Concepts, Breakthroughs, and Strategic Processes

Course Learning Outcomes (CLO):

1. Define innovation and distinguish it from invention and imitation based on novelty, implementation, and value creation.
2. Analyze the role of innovation in enhancing organizational performance and competitiveness.
3. Differentiate incremental and breakthrough innovation and explain their key characteristics.
4. Explain innovation management as a strategic process for transforming ideas into value.
5. Describe the core concepts and stages of the innovation management process.

Contents and Concepts of This Chapter:

1.1 What Is Innovation?

1.2 The Role of Innovation

1.3 Innovation Breakthroughs

1.4 What Is Innovation Management?

1.5 Key Concepts and Processes in Innovation Management

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1.1 What Is Innovation?

Innovation refers to the intentional development and implementation of novel ideas that generate value. It extends beyond invention the mere creation of something new to encompass the successful commercialization or practical application of new or significantly improved products, services, processes, or business models.

Conceptually, innovation can be understood as a structured sequence of activities that transforms ideas into usable or marketable solutions. This process typically includes opportunity recognition, idea generation, evaluation and selection, development and prototyping, and eventual commercialization or implementation. Thus, innovation is not an isolated creative act but a coordinated and purposive process.

From a socio-mathematical systems perspective, innovation represents a specific type of systems change. A system may be described by a state vector comprising characteristic properties (dimensions) and their corresponding values (parameters). First-order change (ordinary change) occurs when parameter values shift while the system's dimensional structure remains constant; the system moves within its existing space. In contrast, second-order change (innovation) arises when new characteristic properties must be introduced to describe the system adequately, thereby expanding the system space itself. Innovation, therefore, is not merely incremental adjustment or perceived novelty, but a qualitative transformation that alters the system's conceptual and structural configuration (DeJong & de Vries, 2025).

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An inclusive definition conceptualizes innovation as the implementation of a novel idea into an outcome that creates value for stakeholders. Three essential elements define innovation: (1) a novel idea, (2) its implementation into a concrete outcome (e.g., a new or significantly improved product, process, or practice), and (3) value creation for relevant stakeholders. Novelty distinguishes innovation from imitation; implementation differentiates innovation from mere ideation or invention; and value creation economic, functional, environmental, and/or social serves as the purposive criterion separating innovation from ordinary change. This

framework provides a template for systematically defining specific innovation types by specifying the idea, outcome, and value dimensions involved (Varadarajan, 2024).

From a diffusion-oriented perspective, innovation is defined as an object, idea, or practice perceived as new by individuals or units of adoption and deployed for commercial or social value creation. Innovation encompasses new or improved products, services, technologies, administrative systems, and organizational practices aligned with strategic objectives and competitive advantage. Importantly, innovation is inherently processual. Drawing on diffusion theory, it unfolds through structured stages problem recognition, idea development, evaluation, implementation, and confirmation requiring managerial coordination, knowledge integration, and organizational support. However, innovation achieves practical significance only when diffused and adopted within a social system. Diffusion is a specialized communication process through which an innovation is transmitted over time via communication channels among members of a social system. Accordingly, innovation and diffusion are analytically interdependent: innovation concerns the creation and implementation of perceived newness, whereas diffusion determines its rate of adoption, institutionalization, and ultimate economic and social impact (Dr. Muhammad Tariq et al., 2020).

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The relationship between innovation and imitation is more nuanced than a simple dichotomy between originality and replication. Although innovation is associated with the introduction of new or significantly improved solutions, it does not guarantee market success. Imitation, often perceived negatively, may represent a rational and strategic choice. Rather than passive copying, imitation can involve the creative adaptation, recombination, and refinement of existing solutions to generate market or organizational value. Strategies such as innovative or creative imitation reduce technological and financial risk while preserving competitive potential. When imitation incorporates meaningful improvement or contextual adaptation, it may create new value and even outperform pioneering firms. Thus, imitation can function as an alternative, lower-risk development strategy and, in some cases, as a foundation for competitive success (Wierzbicki & Nowodziński, 2019).

Finally, innovation may be conceptualized as an integrated process synthesizing three core elements: idea, invention, and diffusion. An innovation emerges when an idea is transformed into an invention that achieves successful diffusion and generates meaningful change. Innovation strategy, in turn, refers to a coordinated set of actions that establishes strategic objectives and guidelines for innovative activities within an organization. Rather than treating innovation as an isolated creative event embedded within broader strategic architecture, this perspective situates innovation strategy within a five-dimensional paradigm: technological, temporal, market, competition, and cooperation orientations. Consequently, innovation is best understood as a strategically guided process whose manifestation depends on the selected strategic dimension and organizational positioning (Wolf et al., 2021).

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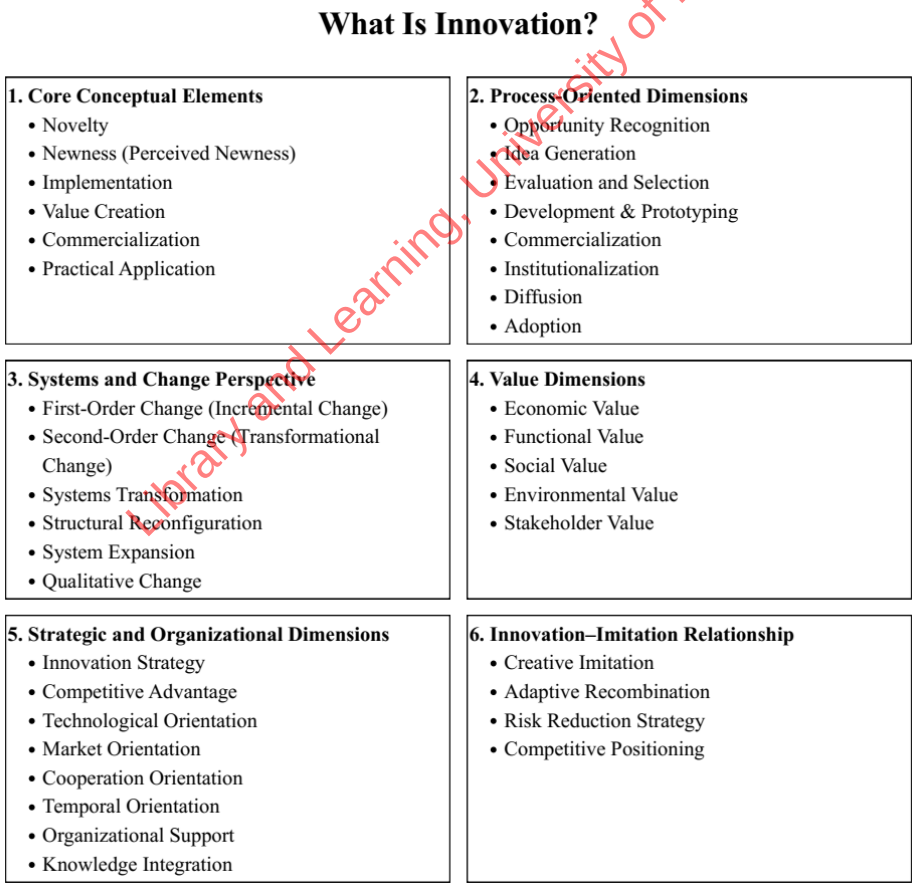

Figure 1.1 What Is Innovation?

Source: Adapted from OECD. (2023). Measuring Innovation in Education 2023: A Framework for Assessing Innovation in Education. OECD Publishing.

As illustrated in Figure 1.1, innovation can be understood as a multidimensional construct encompassing core conceptual elements, process-oriented dimensions, systems and change perspectives, value dimensions, strategic and organizational dimensions, and the innovation–imitation relationship.

Innovation management in this framework is conceptualized as a systemic governance and capability architecture that reconciles insights from both Diffusion of Innovations theory and socio-mathematical change theory by integrating the social dynamics of innovation adoption with the structured modeling of organizational transformation. Diffusion theory explains how innovations spread across individuals, organizations, and networks through mechanisms such as communication channels, social systems, and adopter categories, emphasizing the behavioral and institutional processes that shape adoption. In contrast, socio-mathematical change theory interprets innovation as a structured transformation process that can be modeled, measured, and optimized through formal systems, metrics, and feedback mechanisms within organizations. Reconciling these perspectives, innovation management is therefore defined as the coordinated orchestration of governance structures, cultural and leadership orientations, and hybrid human–AI capabilities that systematically generate, evaluate, diffuse, and institutionalize innovations across organizational and ecosystem levels, while being continuously guided by both social adoption dynamics and analytically modeled decision processes to transform ideas into sustainable organizational value.

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In conclusion, innovation is a structured and strategic process that transforms novel ideas into implemented outcomes that create value for stakeholders. It goes beyond invention by requiring implementation, diffusion, and measurable value creation. Innovation may involve incremental improvements or transformative system-level change, and it is closely linked to strategic orientation and organizational capability. While distinct from imitation, adaptive imitation can also serve as a viable pathway to competitive value creation.

1.2 The Role of Innovation

Innovation plays a central role in shaping organizational competitiveness, sustainability, and long-term performance across industries and economic contexts. It extends beyond the mere introduction of new products or technologies and is better understood as a multidimensional organizational capability embedded within processes, culture, digital transformation initiatives, and strategic orientation. As such, innovation mediates and amplifies the effects of key organizational drivers including digitalization, quality management, branding, sustainability practices, and entrepreneurial ecosystems on firm growth and performance.

Innovation as the critical mechanism through which firms convert digitalization efforts into superior performance outcomes. Performance gains associated with digital technologies become significantly stronger when innovation is incorporated as a mediating capability. The mere adoption of digital technologies is insufficient to generate tangible economic and financial returns; rather, digital resources must be leveraged through effective innovation management. When innovation is included in analytical models, the explained variance of business performance increases considerably, underscoring its strategic importance. In this perspective, digital technologies function as infrastructural enablers enhancing connectivity, data processing capacity, and operational flexibility while innovation represents the organizational capability that transforms these digital assets into new products, improved processes, and enhanced firm performance (Fernández-Portillo et al., 2022).

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Within entrepreneurial SMEs, innovation is positioned as a key capability underpinning business sustainability. It reflects firms' strategic emphasis on developing innovative approaches to access new markets, retain customers, and continuously enhance products and services. Innovation contributes directly to business sustainability across different national contexts and may also operate as a complementary mechanism through which corporate social responsibility (CSR) initiatives translate into sustainable outcomes. Together with social media usage, innovation represents the technological dimension of SMEs, enabling flexible responses to market changes and improved stakeholder communication. Through these

mechanisms, innovation supports organizational continuity and long-term viability, although its impact may vary across countries (Çera & Ndou, 2025).

In transition and emerging economies, innovation plays a pivotal role in strengthening enterprise performance, particularly under conditions of structural transformation and market instability. It encompasses improvements in service delivery, technological advancement, business model development, and brand-related activities. These forms of innovation enhance operational efficiency, product quality, and market positioning. In environments characterized by limited production capacity, weak export performance, and strong consumer preference for imported goods, innovation becomes essential for upgrading domestic products and improving competitiveness. Technological modernization serves as a foundation for innovative activities, while brand innovation strengthens organizational identity, market visibility, consumer trust, and recognition beyond local markets. Overall, innovation functions as a mechanism for enterprise sustainability, quality enhancement, adaptability, and long-term economic strengthening (Elezaj et al., 2023).

Similarly, product, process, and service innovations generate tangible organizational benefits, including improved efficiency, increased sales, enhanced service quality, and higher profitability. Innovation facilitates work processes, supports technological upgrading, and reinforces long-term sustainability in competitive and evolving environments. It is therefore conceptualized as a strategic organizational practice that enhances firm performance and supports enterprise development (Shala et al., 2021).

From a managerial systems perspective, innovation is closely integrated with Total Quality Management (TQM). TQM is conceptualized as a comprehensive philosophy engaging all organizational levels in continuous quality improvement through customer orientation and systematic process control. It comprises soft dimensions such as leadership, employee involvement, human resource management, and customer focus and hard dimensions, including process management, strategic quality planning, and quality measurement systems. Within this framework, continuous improvement and innovation are embedded components rather than peripheral outcomes. Structured feedback systems, formal evaluation mechanisms, and systematic problem-solving routines foster both incremental

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improvements and the development of new ideas and enhanced service offerings. Accordingly, TQM extends beyond procedural compliance and is substantively aligned with innovative capability and systematic organizational enhancement (Ershadi et al., 2019).

In the environmental domain, innovation serves as a central mechanism enabling the implementation of green supply chain management (GSCM) practices. While GSCM practices are not synonymous with innovation, their effective integration often requires complementary product and process innovations. Product innovation such as redesigning offerings to meet environmental standards and process innovation such as modifying production technologies and workflows facilitate the embedding of environmental practices into organizational routines. Through these adaptive mechanisms, innovation supports the institutionalization and sustained functioning of green supply chain initiatives within manufacturing contexts (Silva et al., 2019).

At the ecosystem level, innovation emerges through coordinated intermediation and resource orchestration within entrepreneurial environments. Innovation hubs, often operating as accelerators, function as intermediary organizations that structure interactions among startups and other ecosystem actors. Beyond providing co-working spaces or funding access, these hubs act as organizational platforms integrating accelerators, incubators, investors, universities, development agencies, and policymakers within structured institutional arrangements. They establish formal linkages between startups and market actors, mobilize financial capital and industrial networks, and facilitate access to complementary assets necessary for scaling. Through mentorship, knowledge exchange, structured training, and evaluation processes, innovation hubs strengthen business model refinement and technological development. In developing economies, they may also play a catalytic role in fostering cultural change and supporting systemic transformation within broader sectoral ecosystems (Ayamga et al., 2026).

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Table 1.1 The Role of Innovation

Level	Function of Innovation
Organizational	Converts digital and operational resources into performance gains
Managerial	Embedded in TQM and structured continuous improvement systems
Environmental	Enables green transformation and adaptive processes
Ecosystem	Orchestrates inter-organizational collaboration and scaling

Source: Adapted from World Intellectual Property Organization. (2025). Global Innovation Index 2025: Innovation at a Crossroads. Geneva: WIPO.

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Overall, as illustrated in Table 1.1, *The Role of Innovation*, innovation can be conceptualized as a multi-level strategic capability operating across the organizational, managerial, environmental, and ecosystem levels. It functions not merely as an outcome, but as a dynamic mechanism that transforms digital, managerial, environmental, and institutional resources into sustainable competitive advantage, enhanced performance, and long-term economic development.

1.3 Innovation Breakthroughs

Having established innovation as a structured value-creating process (Section 1.1) and a multidimensional strategic capability (Section 1.2), we now examine the extreme form of innovation breakthrough transformation.

Innovation breakthroughs represent discontinuous advances that substantially alter existing knowledge trajectories, technological paradigms, or market structures. Unlike incremental innovations, which refine existing practices, breakthroughs introduce novel knowledge combinations that redirect scientific development or technological evolution. Contemporary research increasingly focuses on how such breakthroughs can be identified, measured, and strategically cultivated within organizations and innovation ecosystems.

In the scientific domain, innovation breakthroughs refer to research outputs that fundamentally redirect the trajectory of knowledge development and exert significant influence on subsequent scholarship. Rather than constituting incremental progress, breakthrough innovation involves a decisive shift that restructures knowledge flows and potentially reshapes paradigmatic foundations. Two core dimensions characterize scientific breakthroughs. First, trajectory change captures the extent to which subsequent research builds directly upon the focal work rather than its antecedents, indicating originality and disruptive influence. Second, impact breadth and depth reflect the scope, intensity, and structural influence of citation networks generated by the work. Conceptualizing breakthrough innovation as a continuous rather than binary phenomenon, the Degree of Innovation Breakthrough (DIB) metric, which integrates trajectory disruption and citation-based impact into a composite quantitative indicator to more precisely assess the magnitude of scientific breakthroughs (Runhui et al., 2025).

From a technological and market perspective, breakthrough innovations are rare but transformative developments that significantly depart from prevailing practices and have the potential to reshape markets, create new ones, and redirect technological paths. Distinct from incremental improvements, such innovations are associated with paradigm discontinuities and play a central role in long-term processes of creative destruction. Breakthrough innovation should not be identified solely by technical novelty such as atypical knowledge recombination or high citation intensity but also by demonstrable economic significance. To address limitations of patent-based proxies, they propose an integrated identification approach linking patent indicators with award-winning and successfully commercialized innovations, thereby capturing both technological discontinuity and realized market impact (Capponi et al., 2022).

At the organizational level, structural arrangements and interorganizational strategies play a critical role in enabling breakthrough innovation. Ambidextrous alliance strategies comprising exploratory and exploitative alliances are particularly salient. Exploratory alliances, typically formed with upstream partners such as universities and research institutes, emphasize new knowledge creation and technological experimentation. In

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contrast, exploitative alliances, often established with downstream partners including suppliers and customers, focus on refining existing capabilities and enhancing commercialization efficiency. In high-technology contexts, both forms of alliances function as complementary mechanisms through which firms pursue technological and market breakthroughs (Fan et al., 2025).

Leadership and governance structures further shape firms' breakthrough innovation capacity. CEO overconfidence defined as a persistent overestimation of one's abilities and control can stimulate technological breakthrough innovation, operationalized as patents within the top 1% of citations that underpin new technological paradigms and long-term competitive advantage. However, its effectiveness depends on governance conditions. Overconfident CEOs are most conducive to breakthrough outcomes when supervised by boards characterized by heterogeneous expertise in breakthrough innovation and substantial structural and ownership-based power. Board expertise enhances strategic guidance and decision quality under high uncertainty, while balanced power structures reflected in board independence, separation of CEO and chair roles, tenure balance, and ownership distribution ensure effective oversight of executive discretion. Firms combining overconfident leadership with powerful, expert boards exhibit significantly higher levels of breakthrough innovation than those lacking such governance configurations (Kraft et al., 2025).

The role of artificial intelligence (AI) in shaping breakthrough innovation engagement. AI ambidexterity refers to the concurrent routine and innovative use of AI in employees' work processes. Routine AI standardizes and automates established tasks to enhance efficiency, whereas innovative AI involves exploratory applications that redefine job design and expand problem-solving capacity. Within this framework, hybrid intelligence denotes the structured integration of human cognitive capabilities such as intuition, creativity, and judgment with AI-driven computational power in complex, knowledge-intensive tasks. Breakthrough innovation engagement captures employees' sustained behavioral involvement in generating and implementing radically novel ideas, products, and processes. Together, AI ambidexterity and hybrid intelligence provide micro-foundational mechanisms that facilitate individual-level engagement in breakthrough innovation (Tariq et al., 2024).

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Finally, innovation breakthroughs are embedded within broader innovation ecosystems composed of interdependent actors, complementary resources, and symbiotic relationships. These ecosystems are organized around shared innovation elements such as technology, talent, and markets and operate through modular, non-hierarchical coordination rather than linear value chains. Within such systems, cooperation and competition function as co-evolutionary mechanisms. Cooperation enables actors to address bottlenecks, share knowledge, and pursue collective value creation, whereas competition drives resource acquisition, market positioning, and the pursuit of status and dominance. Sustainable breakthrough performance requires a dynamic equilibrium between these forces: excessive competition may destabilize the ecosystem, while insufficient competition weakens innovation incentives. Thus, innovation ecosystems sustain long-term breakthrough innovation through a balanced interplay between cooperative value creation and competitive value appropriation (Zhao, 2021).

Table 1.2 Innovation Breakthroughs

Level	Core Construct	Mechanism	Outcome
Scientific	Trajectory disruption	Knowledge restructuring	Paradigm shift
Technological/Market	Discontinuity + Economic impact	Radical recombination & commercialization	Market transformation
Organizational	Alliance ambidexterity	Exploration–exploitation synergy	Breakthrough capability
Leadership/Governance	Risk-oriented CEO + Expert board	Strategic risk governance fit	High-impact patents
Individual/Micro	AI ambidexterity + Hybrid intelligence	Human–AI integration	Breakthrough engagement
Ecosystem	Coopetitive balance	Modular interdependence	Sustained transformation

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Source: Adapted from McKinsey & Company. (2025). Technology Trends Outlook 2025.

As illustrated in Table 1.2, innovation breakthroughs emerge from multilevel interactions encompassing the scientific, technological/market, organizational, leadership/governance, individual/micro, and ecosystem domains.

The Degree of Innovation Breakthrough (DIB) metric can be theoretically reframed as the outcome indicator of breakthrough innovation, while the remaining elements represent structural conditions that enable or amplify breakthrough potential within innovation systems. In this structure, patent-based economic discontinuity captures the technological manifestation of radical novelty by identifying discontinuities in knowledge trajectories; alliance ambidexterity reflects a firm's capability to simultaneously explore new technological domains while exploiting existing partnerships; governance structure provides the institutional coordination mechanisms that align decision rights, resource allocation, and strategic direction across innovation actors; AI ambidexterity extends organizational ambidexterity into human–AI collaboration by enabling both generative exploration and data-driven exploitation; and ecosystem coopetition describes the inter-organizational dynamic in which firms engage in simultaneous cooperation and competition to accelerate knowledge recombination and innovation scaling. Collectively, these five mechanisms operate as structural enabling conditions, while the DIB metric functions as the measurable outcome, allowing the framework to conceptualize breakthrough innovation as an emergent phenomenon arising from the interaction of technological discontinuity, organizational capabilities, governance arrangements, and ecosystem dynamics.

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To avoid conceptual conflation among different types of innovation in the innovation management literature, the distinctions between incremental, breakthrough, and disruptive innovation are presented in Table 1.3.

Table 1.3 Comparison of Incremental, Breakthrough, and Disruptive Innovation

Dimension	Incremental Innovation	Breakthrough Innovation	Disruptive Innovation
Definition	Gradual improvements to existing products, services, or processes that enhance efficiency, quality, or performance without fundamentally altering the underlying system.	Significant technological or scientific advances that generate substantial performance improvements or open new technological trajectories.	Innovations that initially target overlooked or low-end markets and eventually displace established technologies, firms, or business models.
Degree of Novelty	Low to moderate novelty	High technological or knowledge novelty	Often moderate technological novelty but high market or business model novelty
Scope of Change	Enhances existing systems and capabilities	Creates major performance jumps or new technological paradigms	Restructures industries and market structures
Market Impact	Sustains competitiveness within existing markets	Enables new market opportunities or technological platforms	Redefines market boundaries and can displace incumbents
Risk Level	Relatively low	High technological and investment risk	High strategic and market uncertainty
Typical Outcome	Continuous improvement and efficiency gains	Radical advancement in technological capability	Industry disruption and value network transformation

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Source: Adapted from Verhoeven, D., et al. (2025). More or the same? Radical, disruptive, discontinuous, and breakthrough innovation. *Industrial and Corporate Change*, 34(4), 744–774.

Conceptually, incremental innovation focuses on continuous improvement within existing technological trajectories, breakthrough innovation reflects major technological discontinuities that significantly enhance performance, whereas disruptive innovation primarily concerns market and business model transformation that reconfigures industry structures, even when the underlying technology itself is not radically superior. This distinction is critical in innovation management research because technological breakthrough does not necessarily imply market disruption, and disruptive innovation may emerge from comparatively modest technological advances but powerful shifts in value creation and market positioning.

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1.4 What Is Innovation Management?

If innovation is a multilevel capability and breakthrough phenomenon, the central managerial question becomes: how can it be systematically governed?

Innovation management refers to the systematic and strategic coordination of structures, processes, capabilities, and governance mechanisms that enable organizations to generate, develop, implement, and scale novel ideas into valuable products, services, processes, or business models. Rather than viewing innovation as a discrete event or isolated R&D activity, innovation management conceptualizes innovation as an end-to-end organizational process that must be deliberately aligned with strategy, culture, leadership, and market objectives.

Innovation management involves the structured identification, prioritization, and orchestration of multidimensional determinants of innovation performance across organizational, project, and market domains. These determinants include strategic orientation, leadership commitment, organizational culture, technological focus, training and development, systems and tools, team effectiveness, communication quality, management

style, quality orientation, and time-to-market suitability. Effective innovation management therefore requires alignment between internal capabilities (strategy, culture, leadership), operational mechanisms (team coordination, communication structures, quality systems), and external market readiness (customer acceptance and competitive timing). In this sense, innovation management functions as an integrated governance system that enhances organizational innovativeness through coordinated enabling factors rather than relying solely on technological advancement or isolated R&D efforts (Abbasi et al., 2022).

A more structured articulation of innovation management is reflected in the design of an Innovation Management System (IMS). Drawing on the ISO 56002 framework, an effective IMS extends beyond formalized procedures to encompass a systemic configuration of interrelated elements. Designing such a system requires (1) understanding organizational context including external drivers, internal capabilities, and cultural characteristics; (2) articulating a clear innovation vision and strategy; and (3) aligning leadership, planning, support functions, operational processes, performance evaluation, and continuous improvement mechanisms so that they mutually reinforce one another. Leadership commitment is central, not only in allocating resources and defining roles, but also in legitimizing experimentation, fostering learning, and embedding innovation priorities across organizational levels. By integrating strategic and operational dimensions, the systems perspective prevents innovation from becoming fragmented across isolated organizational units. Furthermore, structured yet adaptable governance mechanisms and portfolio management practices enable firms to balance incremental improvement with breakthrough initiatives. Continuous evaluation and improvement mechanisms institutionalize adaptability, ensuring that the IMS evolves in response to dynamic environmental conditions. Innovation management thus emerges as a professionalized managerial discipline embedded within corporate structures rather than an ad hoc entrepreneurial activity (Kihlander et al., 2024).

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The professionalization of innovation management reflects its transition into an emerging corporate profession. The field increasingly satisfies core criteria associated with established business professions: the

expansion of specialized academic programs; the growth of a codified and cumulative scholarly knowledge base; the emergence of professional associations and certification initiatives aligned with standards such as ISO 56002; and sustained labor-market demand for senior innovation roles, including Director of Innovation and Chief Innovation Officer. However, unlike collegiate professions, innovation management lacks mandatory licensure, a universally governing association, or enforceable ethical standards. Accordingly, it remains in a structured yet evolving stage of professionalization, where experiential expertise often complements formal credentials (Robbins & O'Connor, 2023).

Technological transformation particularly the integration of artificial intelligence (AI) is fundamentally reshaping innovation management by reconfiguring organizational information-processing architectures and decision-making routines. Drawing on behavioral theory, AI functions as an advanced information-processing mechanism that can augment bounded managerial cognition by overcoming information constraints and inefficient local search patterns. Across innovation stages idea generation, development, and selection AI enhances opportunity recognition through large-scale pattern detection, supports development via advanced data modeling and knowledge recombination, and strengthens evaluation through predictive analytics. Depending on its capability level (exploiting, expanding, or exploring), AI can either optimize existing solution spaces or redefine problem framing. Importantly, AI augments rather than replaces managerial judgment, preserving human oversight in strategic interpretation and organizational integration (Haefner et al., 2021).

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Building on this logic, AI-based innovation management applies artificial intelligence to extend, complement, or partially substitute human capabilities throughout the innovation process. Beyond accelerating routine tasks, AI enables systematic opportunity sensing, data-driven experimentation, and structured evaluation of alternatives. While enhancing effectiveness and efficiency, AI adoption requires organizational adaptation in structure, governance, and skills. Innovation management therefore increasingly incorporates digital intelligence to manage complexity and uncertainty, signaling the emergence of a data-augmented innovation paradigm (Füller et al., 2022).

Generative AI (GenAI) further advances this evolution by augmenting creativity, ideation, prototyping, and knowledge synthesis. Organizations deploy GenAI to process unstructured data, enrich brainstorming processes, accelerate iterative development, and shorten innovation cycles. Although GenAI supports both incremental and radical innovation, it does not fundamentally replace established innovation processes. Instead, firms selectively adapt existing governance and operational structures to leverage its speed and scalability advantages. Final problem framing, strategic interpretation, and accountability remain human-centered, consistent with a human-in-the-loop logic. Empirical typologies such as explorers, technology specialists, human-centered visionaries, and combiners demonstrate that effective GenAI implementation depends on the alignment between technological capabilities and managerial intent. Consequently, contemporary innovation management evolves into a hybrid human–machine collaboration model in which digital technologies extend organizational capabilities while leadership judgment, strategic foresight, and governance remain anchored in human agency (Mix et al., 2025).

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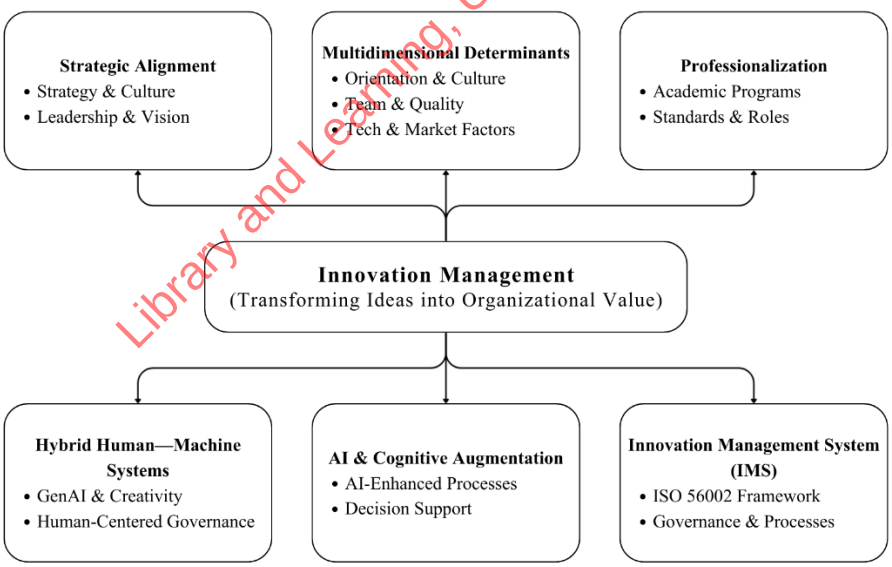

Figure 1.2 An Integrated Innovation Management Governance Architecture

Source: Adapted from Kihlander, I., Magnusson, M., & Karlsson, M. (2024). Critical factors to consider when designing an innovation management system. *Research-Technology Management*, 67(4), 34–43.

As illustrated in Figure 1.2, innovation management represents an integrated governance and capability architecture that enables organizations to systematically transform ideas into organizational value through the alignment of strategy, culture, and leadership vision with multidimensional determinants such as orientation, team quality, and technological–market factors, supported by professionalization through standards and defined roles. Within this framework, Strategic Alignment, Multidimensional Determinants, and Professionalization function as antecedents that establish the foundational strategic orientation, organizational culture, capabilities, and institutional structures necessary for innovation activities. Innovation Management serves as the central governance core that orchestrates the innovation process, while Hybrid Human–Machine Systems, AI and Cognitive Augmentation, and the Innovation Management System (IMS) operate as enabling mechanisms, facilitating implementation, coordination, and scalability through advanced technologies, decision-support capabilities, and structured governance frameworks such as ISO 56002. Through the interaction of these organizational, technological, and managerial components, the system enables the conversion of ideas into measurable organizational value, which represents the outcome of the model; therefore, the framework is best conceptualized as a systemic governance model in which interdependent elements collectively shape the effectiveness and sustainability of innovation management.

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Innovation management can be reconciled through the integration of Strategic Capability Theory and systems-based governance as articulated in the International Organization for Standardization standard ISO 56002 Innovation Management System Standard, where innovation is viewed simultaneously as an organizational capability and as a governed system. From the perspective of strategic capability theory, innovation management represents a dynamic organizational capability that enables firms to purposefully mobilize knowledge, resources, and competencies to sense opportunities, develop novel solutions, and sustain competitive advantage. From the systems governance perspective of ISO 56002, innovation is

institutionalized through structured processes, leadership commitment, strategic alignment, and continuous improvement mechanisms that ensure transparency, accountability, and coordination across the organization. Integrating these perspectives, innovation management can be defined as a strategically embedded and systematically governed organizational capability that orchestrates people, processes, technologies, and knowledge to continuously generate, develop, and implement innovations, thereby transforming opportunities into sustainable value and long-term competitive advantage.

In conclusion, innovation management is a strategic and systemic governance discipline that aligns organizational capabilities, processes, leadership, and market orientation to transform ideas into scalable value. Institutionalized through structured systems such as ISO 56002 and increasingly professionalized, it integrates continuous improvement, portfolio balance, and leadership commitment. With the integration of AI and generative AI, innovation management evolves into a hybrid human–machine model that enhances opportunity recognition and decision quality while maintaining human-centered strategic oversight.

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1.5 Key Concepts and Processes in Innovation Management

Innovation management refers to the systematic orchestration of organizational structures, processes, capabilities, and cultural elements that enable firms to generate, select, implement, and scale novel ideas into value-creating outcomes. It is no longer confined to research and development (R&D) functions but operates as an organization-wide capability aligned with corporate strategy, digital transformation, and stakeholder engagement.

In established firms, digital transformation serves as a structural and methodological enabler of innovation management. Beyond the mere adoption of technology, it provides governance mechanisms, digital tools, and formalized interaction platforms that enhance coordination between business units and innovation functions. By disseminating an innovation-oriented culture, promoting agile methodologies, and designing operating models that clarify roles, decision rights, and information flows, digital transformation strengthens synchronization, reduces interdepartmental

friction, and enhances the continuity and effectiveness of innovation initiatives (Borges et al., 2024).

Within complex organizations, innovation management is conceptualized as a strategically embedded capability integrated into core business processes. Strategic alignment, adaptive leadership, technological infrastructure, and cross-functional collaboration collectively ensure that innovation initiatives support long-term corporate objectives while remaining responsive to dynamic market conditions. Rather than functioning as isolated R&D activities, innovation efforts are structured as interconnected systems supported by decentralized decision-making, digital integration, and coordinated stakeholder engagement, thereby fostering sustained competitiveness and organizational agility (Pandey et al., 2025).

In sustainable high-technology contexts, innovation management is operationalized as a structured, stage-based, and iterative co-creation process grounded in design thinking and stakeholder relationship management. A seven-stage trajectory guides innovation development within multi-stakeholder networks (Moons et al., 2021). As illustrated in Figure 1.3, the co-creation process in innovation management comprises seven sequential stages.

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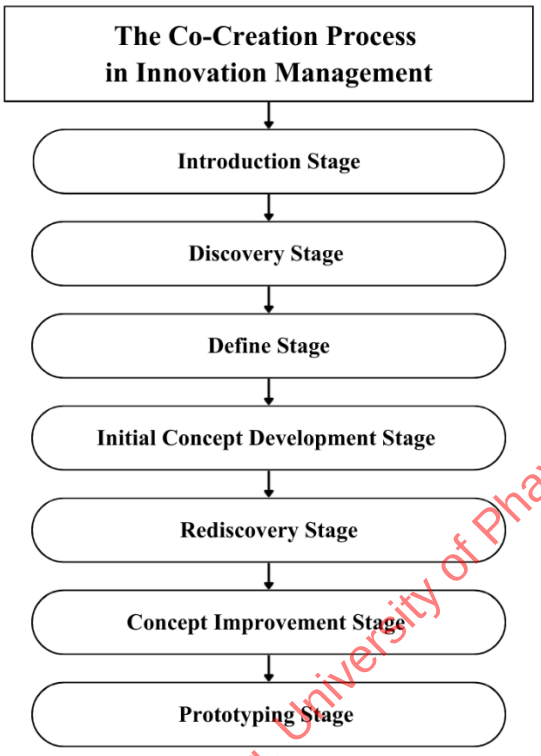

Figure 1.3 The Co-Creation Process in Innovation Management

Source: Adapted from Sońta-Drączkowska, E., Cichosz, M., Klimas, P., & Pilewicz, T. (2025). Co-creating innovations with users: A systematic literature review and future research agenda for project management. *European Management Journal*, 43(2), 321–339.

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The process begins with the Introduction Stage, during which team composition, stakeholder alignment, and expectation management are established. Given the diversity of actors involved such as research institutions, engineers, growers, and marketing experts early clarification of goals, roles, communication norms, and milestones is essential. Structured tools including stakeholder mapping, goal-alignment workshops, and explicit role allocation mechanisms reduce the risk of misalignment in heterogeneous networks.

The Discovery Stage expands the innovation network to include end-users and external partners. Data are collected through interviews, workshops,

experiments, and market exploration. Trust-building and transparent communication are particularly critical in technologically complex environments where disciplinary jargon may impede collaboration.

During the Define Stage, insights from discovery activities are analyzed and synthesized to converge on clearly articulated innovation concepts. Instruments such as SWOT analysis and structured evaluation matrices support collective decision-making and reconcile differing perspectives, for example between technological feasibility and product quality considerations.

The Initial Concept Development Stage involves refining and materializing selected concepts. At this stage, knowledge gaps between technical specialists and marketing or communication actors often become salient. Visualization tools, simplified communication frameworks, and iterative feedback mechanisms help bridge these gaps, strengthen internal alignment, and prepare concepts for external validation.

In the Rediscovery Stage, broader stakeholder groups are re-engaged to test revised concepts. Timing and contextual sensitivity are especially important in sector-specific environments such as greenhouse horticulture, where production cycles influence experimentation. Feedback loops are intentionally embedded to enable iterative refinement.

The Concept Improvement Stage focuses on convergent optimization based on empirical testing and stakeholder input. As trust accumulates, conflicts become more manageable and collaboration shifts from alignment-building toward performance enhancement.

Finally, the Prototyping Stage translates refined concepts into functional high-tech prototypes. Clear communication becomes central to facilitate user understanding and adoption. Importantly, innovation management does not conclude with prototype development; issues of scalability, ecosystem integration, and adoption intention remain ongoing strategic considerations.

Across these stages, five core management constructs shape process effectiveness:

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1. Project management structure
2. Team composition (size, diversity, and role clarity)
3. Partner alignment (goals, expectations, and intentions)
4. Communication quality (shared language and transparency)
5. Expertise integration and conflict management

Notably, early-stage decisions exert disproportionate influence on downstream outcomes. Misaligned goals or ambiguous role definitions during the introduction phase frequently generate friction later in the process. Structured facilitation, systematic stakeholder engagement, and iterative evaluation checkpoints are therefore foundational to effective innovation management in sustainable, high-tech, multi-stakeholder settings.

More broadly, innovation management should not be conceptualized as a rigid, linear stage-gate sequence. Traditional linear models characterized by milestone-driven progression across functional silos often suffer from path dependency and limited feedback integration, constraining responsiveness to evolving customer requirements and environmental uncertainty. In contrast, contemporary frameworks emphasize structured yet adaptable systems incorporating sustainable iterative cycles (Miller et al., 2020).

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These iterative mechanisms are activated when discrepancies emerge between technical specifications, market demands, feasibility constraints, or environmental conditions. By embedding feedback loops particularly before critical procurement or production-release decisions organizations can validate assumptions, reduce uncertainty, and avoid costly late-stage redesigns. Importantly, iterative cycles complement rather than replace formal structures. Through controlled regression, recalibration, and organizational learning, innovation management becomes a holistic system that integrates cross-functional expertise, parallelizes business and technical activities, and strengthens long-term project viability and competitive sustainability.

In small and medium-sized enterprises (SMEs), innovation management comprises structured administrative and technical practices that enable effective execution under resource constraints (Pertuz & Pérez, 2021). Rather than relying exclusively on informal leadership-driven routines, SMEs typically implement:

- Fundamental project management practices
- Continuous product and process improvement
- Structured idea generation mechanisms
- Human resource practices that support creativity
- Collaboration, alliances, and open innovation

Because no universal model applies across contexts, innovation practices are contingent upon industry characteristics, firm size, and institutional environments. Given financial and structural limitations, SMEs often emphasize externally sourced knowledge, strategic alliances, project-oriented coordination, and incremental innovation. Emerging practices include competitive intelligence, technological surveillance, external knowledge acquisition, intellectual property management, and systematic performance evaluation. Effective SME innovation management therefore requires context-sensitive configuration while preserving strategic coherence.

Digital technologies further reshape innovation management by enabling specific functional capabilities rather than merely facilitating communication. Chatbots, for instance, are task-oriented conversational systems that leverage natural language processing, structured dialogue logic, and information retrieval functions to support discrete innovation activities (Johannsen et al., 2021). They accelerate information access, structure idea submissions, facilitate collaboration, support decision-making, automate repetitive tasks, and enhance organizational knowledge accessibility.

Their value lies in translating technological capabilities such as systematic information extraction, guided idea elicitation, workflow automation, and database integration into measurable performance improvements across time, quality, flexibility, and cost dimensions. By embedding structured conversational interfaces within idea management systems, chatbots reduce cognitive load, improve submission completeness, and strengthen coordination across stages of the innovation lifecycle.

A further critical dimension of innovation management concerns user adoption and value realization. Technological sophistication alone does not guarantee impact; value materializes only when end users recognize benefits and experience manageable operational complexity. For example, evidence from the adoption of soil nutrient analyzers among Thai smallholder farmers

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highlights the relevance of constructs derived from the Technology Acceptance Model (TAM) (Suvittawat, 2026).

Three user-side constructs are particularly influential:

- Technology awareness: knowledge of the technology's existence, functions, benefits, and accessibility
- Perceived usefulness: expectations of improved decision-making, productivity, cost efficiency, and environmental performance
- Perceived ease of use: perceptions of simplicity, interface usability, maintainability, and time efficiency

Awareness functions as a prerequisite cognitive condition for evaluation, while usefulness and ease of use determine adoption intentions. From an innovation management perspective, value realization is mediated by users' interpretive frameworks. Accordingly, effective innovation management must extend beyond technological development to include structured awareness-building, user-centered design, training mechanisms, and context-sensitive communication strategies. Such integration ensures that innovations evolve from technical artifacts into adopted, value-generating practices within real-world settings.

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Case Study

Determinants of Farmers' Intention to Adopt Soil Nutrient Analyzers

Adapted Reprint from:

Suvittawat, A. (2026). Drivers of Farmers' Adoption Intention for Soil Nutrient Analyzers: Roles of Awareness, Perceived Usefulness, and Ease of Use. Agriculture, 16(3), 390. https://doi.org/10.3390/agriculture16030390

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1. Introduction

Agriculture is central to global food security, economic development, and poverty alleviation, yet it faces mounting pressures from population growth and climate change. Sustainable agricultural productivity depends heavily on soil health and precise nutrient management. Conventional soil testing methods often lack accuracy, leading to inefficient fertilizer use that can reduce crop yields and harm the environment. Soil nutrient analyzers have emerged as advanced tools aligned with precision agriculture, providing real-time, data-driven insights into soil nutrient status. Despite their demonstrated benefits in improving productivity and reducing resource waste, adoption remains uneven, particularly among smallholder farmers.

The implementation of soil nutrient analyzers integrates advanced sensing technologies such as spectrometry and electrochemical sensors with user-friendly interfaces to deliver actionable recommendations. Although governments and agricultural agencies promote these technologies through subsidies, training, and awareness initiatives, uptake remains limited in many developing regions. Barriers include financial constraints, technical challenges, insufficient awareness, and inadequate supporting infrastructure such as calibration services and extension support. These constraints highlight the need for a comprehensive strategy that addresses both technological capabilities and socio-economic conditions influencing adoption.

This study addresses a research gap by examining the behavioral determinants of farmers' adoption of soil nutrient analyzers through an extended Technology Acceptance Model (TAM). Specifically, it integrates technology awareness as an exogenous factor influencing perceived usefulness and ease of use, which in turn shape adoption intention. By focusing on smallholder farmers and incorporating psychological constructs alongside contextual considerations, the study seeks to refine TAM's application in precision agriculture and provide practical guidance for policymakers, extension agents, and technology developers to promote equitable and sustainable technology diffusion.

2. National Context: Drivers of Farmers' Intention to Adopt Soil Nutrient Analyzers in Thailand

Thailand's agricultural sector plays a central role in national food security, rural employment, and export competitiveness. However, Thai agriculture is characterized by a predominance of smallholder farmers operating under constraints such as fragmented landholdings, fluctuating commodity prices, limited access to capital, and increasing climate variability. In this context, the transition toward precision agriculture technologies, including soil nutrient analyzers, has emerged as a strategic pathway to enhance productivity, optimize fertilizer usage, and improve environmental sustainability. Despite government support programs and extension initiatives, the adoption of such technologies remains uneven across regions and farmer segments, underscoring the importance of understanding behavioral and contextual drivers at the national level.

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At the behavioral level, farmers' intention to adopt soil nutrient analyzers in Thailand is strongly influenced by psychological determinants rooted in the Technology Acceptance Model (TAM), particularly technology awareness, perceived usefulness, and perceived ease of use. Within the Thai smallholder context, awareness is not merely knowledge of existence but includes understanding of operational processes, benefits, and accessibility. Awareness is frequently shaped through informal social networks especially peer farmers as well as through extension services and digital channels. When farmers develop clearer cognitive representations of how soil analyzers

function and how they can improve fertilizer decision-making, they are more likely to form favorable evaluations of the technology. Thus, awareness functions as a foundational driver that activates subsequent cognitive assessments regarding utility and usability.

Beyond psychological factors, national structural conditions in Thailand also shape adoption intention. Socio-economic characteristics—such as age distribution skewed toward middle-aged farmers, moderate income levels, and crop-specific production systems (e.g., rice, durian, orange cultivation) interact with technological perceptions. Access to training, demonstration programs, and technical support infrastructure further mediates how farmers interpret the complexity and value of soil nutrient analyzers. Consequently, adoption intention in Thailand is not solely a function of individual attitudes but reflects an integrated system of awareness diffusion, socio-economic capacity, and institutional support mechanisms. Understanding these interrelated national drivers is essential for designing policy interventions that accelerate the diffusion of precision agriculture technologies among Thai smallholders.

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3. Methodology and Research Framework

The empirical foundation of this case study is based on a quantitative survey administered to 390 respondents in Thailand, focusing on smallholder farming communities in Chanthaburi, Kanchanaburi, and Udon Thani provinces representing distinct agro-climatic zones that capture the country's agricultural diversity where data were collected through structured questionnaires and analyzed using structural equation modeling (SEM) to test the proposed hypotheses, with the survey including measures of four key constructs.

Awareness of Technology – knowledge of existence, awareness of benefits, awareness of usage process, and awareness of accessibility.

Perceived Usefulness – improve decision-making, increased productivity, cost saving, and environmental benefits.

Ease of Use – simplicity of operation, user interface friendliness, accessibility and maintenance, and time and effort efficiency.

Adoption Intention – likelihood of purchase, willingness to invest, recommendation to others, and intention to use regularly.

Reliability and validity assessments reveal factor loadings ranging from 0.630 to 0.739 and Cronbach's alpha coefficients exceeding 0.80, indicating high internal consistency. The model fit indices (RMSEA = 0.025, GFI = 0.955, CFI = 0.984) further confirm an excellent model fit.

Eight hypotheses examine the direct and mediating effects among the variables, providing a comprehensive understanding of how awareness of technology, perceived usefulness, ease of use, and adoption intention interact within Thailand context.

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4. Findings and Discussion

4.1 Awareness of Technology: knowledge of existence, awareness of benefits, awareness of usage process, and awareness of accessibility

Among all variables, Awareness of Technology exhibits the strongest and broadest influence. Awareness of Technology significantly affects:

- Perceived Usefulness (β = 0.245)
- Ease of Use (β = 0.412)
- Adoption Intention (β = 0.638)

These results indicate that awareness functions as a foundational antecedent shaping both cognitive evaluations and behavioral intention. The results confirm that greater awareness enhances farmers' perceptions of the soil nutrient analyzer's functional value. As farmers gain clearer knowledge about operational benefits, productivity gains, and decision-support capabilities, their perceived usefulness increases. Awareness reduces informational asymmetry and uncertainty, thereby strengthening value perception and reinforcing positive evaluations of technology in farm management contexts. Technology awareness significantly improves perceived operational simplicity. Training, demonstrations, and communication initiatives increase familiarity with tool functions, strengthen self-efficacy, and reduce perceived complexity. Conversely, insufficient knowledge contributes to usability concerns and reinforces resistance. Thus, awareness operates as a capability-building mechanism that lowers cognitive and technical barriers to adoption. The strongest structural effect is observed between awareness and adoption intention, highlighting awareness as a direct motivational driver. Awareness not only enhances perceived usefulness and

ease of use but also independently strengthens farmers' intention to adopt. It sharpens perceived benefits, diminishes uncertainty, and increases perceived behavioral control. However, the magnitude of this relationship may be conditioned by socio-economic characteristics (e.g., age, farm size, digital literacy) and contextual facilitators such as extension services and financial access.

4.2 Perceived Usefulness: improve decision-making, increased productivity, cost saving, and environmental benefits

Perceived Usefulness significantly influences Adoption Intention (β = 0.249).

This finding indicates that farmers are primarily motivated by the expected functional benefits of the technology particularly improvements in productivity, profitability, and farm management efficiency when forming adoption intentions. Utility-driven evaluations appear to shape favorable attitudes and strengthen behavioral commitment, positioning perceived usefulness as a central cognitive determinant in the decision-making process. However, structural constraints such as digital illiteracy among older farmers, labor burdens, and infrastructural limitations may moderate the translation of perceived benefits into actual adoption. Therefore, enhancing farmers' digital readiness, providing targeted training programs, facilitating financial support mechanisms, and improving rural connectivity are critical managerial and policy interventions to amplify the impact of perceived usefulness on technology uptake.

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4.3 Ease of Use: simplicity of operation, user interface friendliness, accessibility and maintenance, and time and effort efficiency

Ease of Use significantly influence:

- Adoption Intention (β = 0.305)
- Perceived Usefulness (β = 0.161)

The findings confirm that perceived ease of use exerts a positive and statistically significant influence on both adoption intention and perceived usefulness of soil nutrient analyzers among farmers. Ease of use directly strengthens farmers' intention to adopt the technology and indirectly reinforces adoption by enhancing their perception of its usefulness. This indicates that when soil nutrient analyzers are perceived as simple, user-friendly, and operationally manageable, farmers are more likely to recognize their practical value and develop stronger behavioral intentions to adopt

them. The results underscore usability as a critical driver in shaping cognitive evaluations and intentional decisions, particularly in contexts where varying levels of literacy, digital capability, and resource constraints may shape how farmers assess and accept agricultural technologies.

4.4 The Mediating Roles of Perceived Usefulness and Ease of Use in the Relationship between Awareness of Technology and Adoption Intention

The findings confirm that technology awareness influences adoption intention both directly and indirectly, through the core mediating constructs of the Technology Acceptance Model (TAM): perceived usefulness and perceived ease of use. Perceived usefulness significantly mediates the relationship between technology awareness and adoption intention. Greater awareness enhances farmers' cognitive evaluation of the technology's performance benefits (e.g., productivity, efficiency, decision quality), which in turn strengthens their intention to adopt. This mechanism aligns with performance expectancy logic: when farmers recognize that the soil nutrient analyzer improves farm outcomes, their attitudinal evaluation becomes favorable, thereby increasing behavioral intention. The mediation pattern suggests that awareness shapes intention primarily through enhanced performance-based value perceptions, while still retaining a residual direct influence. Perceived ease of use also partially mediates the awareness–intention relationship. Increased awareness reduces uncertainty and complexity perceptions, leading farmers to perceive the technology as easier to operate. Lower perceived effort strengthens adoption intention by mitigating psychological and operational barriers. This pathway highlights that beyond performance gains, usability perceptions are critical in agricultural technology contexts, particularly among smallholder farmers who may face skill or resource constraints.

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5. Synthesis: An Innovation Perspective

The case study illustrates that the adoption of soil nutrient analyzers among Thai smallholder farmers can be understood as an innovation diffusion process in which cognitive, perceptual, and usability factors jointly shape behavioral intention. From an innovation management perspective, technology awareness functions as the primary activation mechanism that

reduces uncertainty and initiates the evaluation stage of the innovation-decision process. Within the extended Technology Acceptance Model, awareness not only exerts a strong direct influence on adoption intention but also operates indirectly through perceived usefulness and perceived ease of use, both of which act as value-creation and complexity-reduction mechanisms. The structural relationships confirm that operational simplicity enhances perceived usefulness, reinforcing the notion that usability and performance expectations are dynamically interlinked rather than independent drivers. Collectively, the findings position soil nutrient analyzers as a user-centered process innovation whose diffusion depends less on technological sophistication per se and more on structured awareness-building, experiential learning, and interface simplification strategies. In this sense, successful innovation implementation in precision agriculture requires orchestrated efforts that align cognitive readiness, perceived performance gains, and ease-of-use perceptions to accelerate sustainable technology uptake among smallholder farmers.

The integration of the Technology Acceptance Model (TAM) into innovation management theory in this study serves to operationalize the micro-level behavioral mechanisms through which technological innovations translate into realized value within agricultural systems. While innovation management frameworks typically explain how innovations are generated, governed, and diffused at the organizational or systemic level, TAM provides a complementary behavioral lens that clarifies how individual actors evaluate and ultimately adopt those innovations. In the context of soil nutrient analyzers, TAM constructs perceived usefulness and perceived ease of use represent cognitive evaluation mechanisms through which farmers transform exposure to a technological innovation into adoption intentions. Empirically, the case demonstrates the micro-foundations of innovation diffusion, as individual farmers' perceptions and decision processes collectively determine the spread of precision agriculture technologies across farming communities. Within this process, technology awareness functions as an activation trigger in the innovation ecosystem, initiating the cognitive evaluation cycle that shapes perceptions of usefulness and usability and ultimately stimulates adoption intention. In this sense, the case provides a micro-level illustration of innovation value realization within a national agricultural system, showing how awareness-building mechanisms such as peer networks, demonstrations,

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and extension programs activate farmer-level decision processes that enable the diffusion and value creation of precision agriculture technologies at the system level.

6. Conclusion

This study contributes to the adoption of agricultural technology by refining the Technology Acceptance Model (TAM) within the context of precision agriculture, particularly for soil nutrient analyzers among smallholder farmers. Theoretically, it positions technology awareness as a critical upstream antecedent that indirectly shapes adoption intention through perceived ease of use and perceived usefulness, while confirming the hierarchical structure in which ease of use influences both usefulness perceptions and behavioral intention. By empirically validating this structured pathway, the study enhances the explanatory precision of TAM in farmer decision-making contexts. Practically, the findings emphasize the need for awareness-building initiatives, user-centered design, peer-based diffusion mechanisms, and institutional support systems including training, calibration services, and financing to reduce adoption barriers. Targeted segmentation and continuous performance feedback are recommended to sustain usage, improve agronomic outcomes, and facilitate the scalable adoption of precision agriculture technologies.

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Case Study Questions

1. How does farmers' awareness of soil nutrient analyzers influence their perception of the technology's usefulness in improving farm productivity and decision-making?
2. To what extent does increased awareness of soil nutrient analyzers enhance farmers' perceptions of ease of use?
3. Among technology awareness, perceived usefulness, and perceived ease of use, which factors directly and significantly influence farmers' intention to adopt soil nutrient analyzers?
4. Does perceived ease of use strengthen farmers' perceptions of the usefulness of soil nutrient analyzers?
5. Do perceived usefulness and perceived ease of use mediate the relationship between technology awareness and adoption intention among smallholder farmers?

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Chapter Summary

Innovation is the intentional implementation of novel ideas that create value through successful application or commercialization. It requires novelty, implementation, and stakeholder value creation, and may involve incremental improvement or transformative system change. Innovation gains significance through diffusion and adoption, and even adaptive imitation can serve as a strategic value-creating mechanism.

Innovation is a strategic capability that converts digital, managerial, and organizational resources into competitiveness, sustainability, and performance. It strengthens the impact of digitalization, quality management, branding, sustainability initiatives, and ecosystem collaboration, operating across firms, managerial, environmental, and ecosystem levels.

Innovation breakthroughs are discontinuous advances that reshape knowledge trajectories, technologies, or markets. They are characterized by paradigm shifts, measurable impact, and structural disruption, and are enabled by alliances, governance structures, leadership dynamics, AI integration, and balanced ecosystem cooperation and competition.

Innovation management is the systematic coordination of structures, processes, strategy, and governance to generate, develop, and scale innovation. It integrates leadership, culture, technology (including AI), and continuous evaluation into a coherent organizational system aligned with strategic objectives.

Innovation management functions as an organization-wide, strategically aligned capability supported by digital transformation and iterative processes. It emphasizes stakeholder alignment, cross-functional coordination, structured stage-based development, adaptive feedback loops, and user adoption to ensure scalable and sustainable value creation.

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Chapter Review Questions

Review Question 1:

How does innovation differ from invention, ordinary change, and imitation, and why are novelty, implementation, and value creation considered the three indispensable elements in defining true innovation?

Review Question 2:

Explain how innovation functions as a multidimensional strategic capability that mediates the relationship between digitalization, managerial systems (e.g., TQM), sustainability practices, and firm performance across organizational and ecosystem levels.

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Review Question 3:

What distinguishes breakthrough innovation from incremental innovation, and how do trajectory disruption, economic impact, governance structures, AI ambidexterity, and ecosystem dynamics collectively influence breakthrough outcomes?

Review Question 4:

Why should innovation management be conceptualized as an integrated governance system rather than an isolated R&D function, and how do leadership, strategy alignment, Innovation Management Systems (IMS), and AI integration shape its effectiveness?

Review Question 5:

How do structured stage-based processes, iterative feedback loops, stakeholder alignment, digital enablers, and user adoption mechanisms

jointly determine the effectiveness and value realization of innovation management initiatives?

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Chapter Exercises

Exercise 1:

Distinguish between "ordinary change" and "innovation" based on the socio-mathematical systems perspective provided in the text.

- Define First-order change (ordinary change).
- Define Second-order change (innovation).
- List the three essential elements that must be present for a novel idea to be classified as an innovation.

Exercise 2:

Innovation is described as a "mediating capability". Briefly explain how innovation transforms the following two organizational drivers into superior performance:

1. Digitalization: Why is the mere adoption of digital technologies insufficient for financial returns?
2. Sustainability (SMEs): How does innovation help small and medium-sized enterprises (SMEs) achieve long-term viability?

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Exercise 3:

Breakthroughs are discontinuous advances that reshape markets or knowledge. Answer the following:

- Scientific Breakthroughs: Identify the two core dimensions used to characterize a scientific breakthrough.
- Organizational Strategy: Compare Exploratory vs. Exploitative alliances. Which partners are typically involved in each, and what is their primary goal?
- Leadership: Under what specific governance conditions does CEO overconfidence most effectively stimulate breakthrough innovation?

Exercise 4:

Review the framework for an Innovation Management System (IMS) based on the ISO 56002 standards discussed in the text.

- Identify the three steps required to design an effective IMS.
- Explain why innovation management is considered an "evolving" profession rather than a "collegiate" one (like medicine or law).
- How does Artificial Intelligence (AI) augment bounded managerial cognition during the innovation process?

Exercise 5:

Successful innovation management requires a structured yet adaptable trajectory.

- The 7-Stage Trajectory: In the "Discovery Stage", what is the primary goal of expanding the network to include end-users?
- Management Constructs: Name at least three of the five core management constructs that shape process effectiveness.
- User Adoption: According to the Technology Acceptance Model (TAM), what three user-side constructs determine whether a technical artifact becomes a value-generating practice?

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References

Abbasi, E., Amin, I., & Siddiqui, S. (2022). Towards developing innovation management framework (IMF) for ICT organizations at Pakistan. *Journal of Innovation and Entrepreneurship, 11*(1), 45. https://doi.org/10.1186/s13731-022-00231-6

Ayamga, M., Kassahun, A., & Tekinerdogan, B. (2026). Exploring the role of innovation hubs on agritech startups' innovation and success. *Journal of Engineering and Technology Management, 79*, 101942. https://doi.org/10.1016/j.jengtecman.2026.101942

Borges, R. P., Bitte, M. F., Adorno, O. A., & Nascimento, P. T. S. (2024). Digital Transformation as a driver of Innovation Management in established companies. *International Journal of Innovation, 12*(2), Article e25910. https://doi.org/10.5585/2024.25910

Capponi, G., Martinelli, A., & Nuvolari, A. (2022). Breakthrough innovations and where to find them. *Research Policy, 51*(1), 104376. https://doi.org/10.1016/j.respol.2021.104376

Çera, G., & Ndou, V. (2025). The role of innovation and social media in explaining corporate social responsibility–business sustainability nexus in entrepreneurial SMEs. *European Journal of Innovation Management, 28*(8), 3549-3569. https://doi.org/10.1108/EJIM-01-2024-0062

DeJong, W. M., & de Vries, H. J. (2025). A socio-mathematical definition of innovation – The distinction with ordinary change. *Technovation, 143*, 103220. https://doi.org/10.1016/j.technovation.2025.103220

Dr. Muhammad Tariq, K., Dr. Tariq Iqbal, K., & Dr. Shiraz, K. (2020). Innovation & Its Diffusion in Business: Concept, Stages & Procedural Practices. *sjesr, 3*(4). https://doi.org/10.36902/sjesr-vol3-iss4-2020(174-186)

Library and Learning University of Phayao

Elezaj, S., Ramaj, V., & Elezaj, R. (2023). The Role of Innovation and Branding on Enterprise Sales Growth in Transition Countries. *Academic Journal of Interdisciplinary Studies, 12*(3), 123-134. https://doi.org/10.36941/ajis-2023-0065

Ershadi, M. J., Najafi, N., & Soleimani, P. (2019). Measuring the impact of soft and hard total quality management factors on customer behavior based on the role of innovation and continuous improvement. *TQM Journal, 31*(6), 1093-1115. https://doi.org/10.1108/TQM-11-2018-0182

Fan, B., Shao, Y., Dong, Z., & Zhou, X. (2025). Ambidextrous Alliances, Complementary Assets, and Firms' Breakthrough Innovations: Evidence from High-Tech Firms in China. *Sustainability, 17*(7), 2812. https://doi.org/10.3390/su17072812

Fernández-Portillo, A., Almodóvar-González, M., Sánchez-Escobedo, M. C., & Coca-Pérez, J. L. (2022). The role of innovation in the relationship between digitalisation and economic and financial performance. A company-level research. *European Research on Management and Business Economics, 28*(3), 100190. https://doi.org/10.1016/j.iedeen.2021.100190

Füller, J., Hutter, K., Wahl, J., Bilgram, V., & Tekic, Z. (2022). How AI revolutionizes innovation management – Perceptions and implementation preferences of AI-based innovators. *Technological Forecasting and Social Change, 178*, 121598. https://doi.org/10.1016/j.techfore.2022.121598

Haefner, N., Wincent, J., Parida, V., & Gassmann, O. (2021). Artificial intelligence and innovation management: A review, framework, and research agenda☆. *Technological Forecasting and Social Change, 162*, 120392. https://doi.org/10.1016/j.techfore.2020.120392

Johannsen, F., Schaller, D., & Klus, M. F. (2021). Value propositions of chatbots to support innovation management processes. *Information Systems and e-Business Management, 19*(1), 205-246. https://doi.org/10.1007/s10257-020-00487-z

Library and Learning University of Phayao

Kihlander, I., Magnusson, M., & Karlsson, M. (2024). Critical Factors to Consider When Designing an Innovation Management System. *Research-Technology Management, 67*(3), 34-43. https://doi.org/10.1080/08956308.2024.2323893

Kraft, P. S., Dickler, T. A., & Withers, M. C. (2025). When do firms benefit from overconfident CEOs? The role of board expertise and power for technological breakthrough innovation. *Strategic Management Journal, 46*(2), 381-410. https://doi.org/10.1002/smj.3657

McKinsey & Company. (2025). Technology Trends Outlook 2025. https://www.mckinsey.com/capabilities/tech-and-ai/our-insights/the-top-trends-in-tech?utm_source=chatgpt.com: Access on 2 February 2026

Miller, C., Thomas, B. C., & Roeller, M. (2020). Innovation management processes and sustainable iterative circles: an applied integrative approach. *Journal of Work-Applied Management, 12*(1), 69-90. https://doi.org/10.1108/jwam-11-2019-0037

Mix, K. A., Quiel, J., Salmony-Wust, F., Kanbach, D. K., & Kraus, S. (2025). Genius innovation management – a typology of GenAI use in innovation management. *European Journal of Innovation Management*, 1-22. https://doi.org/10.1108/ejim-12-2024-1483

Moons, I., Daems, K., & Van de Velde, L. L. J. (2021). Co-Creation as the Solution to Sustainability Challenges in the Greenhouse Horticultural Industry: The Importance of a Structured Innovation Management Process. *Sustainability, 13*(13), 7149. https://doi.org/10.3390/su13137149

OECD. (2023). Measuring Innovation in Education 2023: A Framework for Assessing Innovation in Education. OECD Publishing.

Pandey, M., Gardasu, S., John Paul, M., Homavazir, M., Gupta, M., Sunil, J., & Daso, J. R. (2025). Strategic Integration of Innovation Management Practices within Complex Organizations: Emerging Models and Conceptual Insights. *Management (Montevideo), 3*, Article 168. https://doi.org/10.62486/agma2025168

Library and Learning, University of Phayao

Pertuz, V., & Pérez, A. (2021). Innovation management practices: review and guidance for future research in SMEs. *Management Review Quarterly, 71*(1), 177-213. https://doi.org/10.1007/s11301-020-00183-9

Robbins, P., & O'Connor, G. C. (2023). The professionalization of innovation management: Evolution and implications. *Journal of Product Innovation Management, 40*(5), 593-609. https://doi.org/10.1111/jpim.12670

Runhui, L., Yalin, L., Ze, J., Qiqi, X., & Xiaoyu, C. (2025). Quantifying the degree of scientific innovation breakthrough: Considering knowledge trajectory change and impact. *Information Processing & Management, 62*(1), 103933. https://doi.org/10.1016/j.ipm.2024.103933

Shala, V., Bytyçi, S., & Dodaj, P. (2021). The role of innovation in the growth of the company: A case of the emerging country. *Journal of Governance and Regulation, 10*(4), 175-182. https://doi.org/10.22495/JGRV10I4ART16

Silva, G. M., Gomes, P. J., & Sarkis, J. (2019). The role of innovation in the implementation of green supply chain management practices. *Business Strategy and the Environment, 28*(5), 819-832. https://doi.org/10.1002/bse.2283

Sońta-Drączkowska, E., Cichosz, M., Klimas, P., & Pilewicz, T. (2025). Co-creating innovations with users: A systematic literature review and future research agenda for project management. European Management Journal, 43(2), 321–339. https://doi.org/10.1016/j.emj.2024.07.001

Suvittawat, A. (2026). Drivers of Farmers' Adoption Intention for Soil Nutrient Analyzers: Roles of Awareness, Perceived Usefulness, and Ease of Use. *Agriculture, 16*(3), 390. https://doi.org/10.3390/agriculture16030390

Tariq, S. B., Zhang, J., & Gilal, F. G. (2024). Stepping into the future: unravelling breakthrough innovations through AI ambidexterity, hybrid intelligence, and transformational leadership. *International*

Library and Learning, University of Phayao

Journal of Information Systems and Change Management, 14(1), 3-29. https://doi.org/10.1504/IJISCM.2024.138078

Varadarajan, R. (2024). Mitigating the definitional quagmire in innovation research: An inclusive definition of innovation as a template for defining various types of innovations uniformly. *Journal of Product Innovation Management, 41*(4), 703-723. https://doi.org/10.1111/jpim.12729

Verhoeven, D., Kovacs, A., Marullo, C., Van Looy, B. (2025). More or the same? Radical, disruptive, discontinuous, and breakthrough innovation. Industrial and Corporate Change, 34(4), 744–774. https://doi.org/10.1093/icc/dtae045

Wierzbicki, M., & Nowodziński, P. (2019). Imitation and innovation in business environment. *Production Engineering Archives, 22*(22), 36-40. https://doi.org/10.30657/pea.2019.22.07

Wolf, V., Dobrucka, R., Przekop, R., & Haubold, S. (2021). Innovation strategies in the context of the paradigm of the five dimensions of innovation strategy. *Logforum, 17*(2), 205-211. https://doi.org/10.17270/J.LOG.2021.587

World Intellectual Property Organization. (2025). Global Innovation Index 2025: Innovation at a Crossroads. Geneva: WIPO.

Zhao, X. (2021). Cooperation and Competition in the Innovation Ecosystem From the Perspective of Evolutionary Psychology. *Frontiers in Psychology, 12*, Article 769847. https://doi.org/10.3389/fpsyg.2021.769847

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Chapter 2: Strategic Innovation as a Core Business Capability: Processes, Sustainability, and Ecosystems

Course Learning Outcomes (CLO):

1. Explain the innovation process and its key components in transforming ideas into valuable products, services, or business models.
2. Analyze the major stages of innovation from idea generation to commercialization and their role in managing innovation effectively.
3. Evaluate how organizational resources, knowledge management, and human capabilities support the development of innovation capability.
4. Explain the concept of sustainable innovation and its role in balancing economic, environmental, and social performance.
5. Examine how interactions among multiple stakeholders within innovation ecosystems influence the development and diffusion of innovation.

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Contents and Concepts of This Chapter:

2.1 The Innovation Process

2.2 Stages of Innovation

2.3 Organizational Innovation Capability

2.4 The Concept of Sustainable Innovation

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2.1 The Innovation Process

This chapter integrates multiple theoretical perspectives in innovation management, including the knowledge-based view of the firm, dynamic capability theory, and innovation ecosystem theory. Together, these perspectives explain how organizations develop innovation capabilities, coordinate innovation processes, and collaborate with external stakeholders to create sustainable value.

The innovation process refers to a structured and iterative set of activities through which organizations generate, develop, and implement ideas to create value for the firm and its stakeholders. Traditionally, the innovation process has been conceptualized as a sequence of stages that include idea generation, concept development, experimentation, implementation, and commercialization.

In contemporary digital environments, the innovation process is increasingly understood as a dynamic, iterative, and interactive set of activities through which ideas are generated, developed, and transformed into marketable products, services, processes, or business models. The process typically progresses from the initial stage of ideation through development and experimentation to the final stage of market diffusion, while involving continuous learning, coordination, and feedback among organizational actors. Conceptually, the innovation process can be explained through the Input–Process–Output (IPO) framework. Within this framework, inputs refer to the organizational, technological, and managerial antecedents that enable innovation, including resources, digital technologies, knowledge assets, and human competencies. The process stage represents the activities through which organizations transform these inputs into innovative outcomes, such as idea generation, knowledge sharing, experimentation, product or service development, and coordination among teams. Finally, outputs represent the results of innovation activities, including new products, improved processes, novel business models, or digital platforms that create value in the marketplace (Agostini et al., 2020).

The integration of artificial intelligence (AI) into the innovation process is increasingly recognized as a transformative development that reshapes how organizations generate ideas, evaluate alternatives, design

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solutions, and commercialize innovations. By leveraging advanced AI technologies such as natural language processing, image processing, and data analytics firms can enhance the efficiency and effectiveness of innovation activities across multiple stages of the process. AI enables organizations to analyze large volumes of data, support complex decision-making, and augment human creativity, thereby improving workforce productivity, reducing time and costs, and enhancing the overall quality of innovation outcomes. More specifically, the innovation process can be described as consisting of four key stages: idea generation, idea selection, project design and implementation, and commercialization. AI technologies can support each of these stages by enabling data-driven insights and more efficient knowledge discovery. In the idea generation stage, AI analyzes large datasets to identify emerging trends and generate novel ideas. During idea selection, machine learning and analytics assist organizations in evaluating and prioritizing ideas based on feasibility and potential impact. In the project design and implementation stage, AI supports prototyping, simulation, and design optimization. Finally, during commercialization, AI facilitates market analysis, demand forecasting, and targeted marketing strategies. Overall, the integration of AI improves workforce efficiency and enhances the time and cost effectiveness of innovation activities (Cetinguc & Calik, 2025).

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In addition to AI, big data has increasingly become an integral component of firms' innovation processes and can be conceptualized as an important stakeholder that supports and influences various stages of innovation. Rather than functioning solely as a technological tool, big data contributes to innovation by providing extensive internal and external information that enhances organizational learning, decision-making, and knowledge management. Through advanced analytics and large-scale data processing, firms can generate insights that support idea generation, idea evaluation, product development, testing and validation, commercialization, and continuous improvement. Consequently, big data enables firms to manage innovation activities in a more data-driven, collaborative, and responsive manner (Yordanova, 2023).

Social media platforms also play a significant role in strengthening digital innovation processes by enabling firms to access diverse external knowledge sources and interact with key stakeholders, including customers,

suppliers, and competitors. Through these interactions, organizations can collect ideas, feedback, suggestions, and market intelligence that support multiple stages of the innovation process, including idea generation, idea screening, experimentation, commercialization, and implementation. Social media facilitates the creation, sharing, and exchange of knowledge among stakeholders, allowing firms to better understand customer needs, monitor competitor activities, and collaborate with partners in developing new solutions. As a result, firms can more effectively integrate external information into internal innovation activities, accelerate the development of new products and services, and enhance overall innovation performance (Al-Omar et al., 2024).

Understanding the types of innovation provides an important foundation for examining how innovation processes unfold within organizations. Five major types of innovation have been identified: product innovation, process innovation, service innovation, marketing innovation, and management innovation. This classification highlights the diverse ways in which firms introduce improvements and create value for customers and stakeholders (Lui et al., 2025).

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Product innovation refers to the development of new products or the modification of existing products to better satisfy customer needs or comply with regulatory requirements. In SMEs, this often involves incremental improvements such as adding new features, redesigning product specifications, or adapting products to meet industry standards and safety requirements. Product innovation may also involve encouraging employees or franchise partners to contribute ideas for new product offerings.

Process innovation involves improvements in internal operational processes that enhance efficiency, reduce costs, or increase delivery speed. Examples include the adoption of digital systems, automation technologies, and new logistics arrangements that streamline production and distribution. SMEs frequently pursue process innovation to optimize the use of limited resources and improve operational performance.

Service innovation focuses on improving how organizations deliver value to customers through enhanced service experiences. SMEs may introduce new service methods such as real-time information dashboards,

improved customer communication channels, or redesigned service delivery systems that better respond to evolving customer expectations.

Marketing innovation refers to the introduction of new marketing approaches related to branding, promotion, customer engagement, or distribution channels. SMEs may revise branding strategies, redesign sales channels, introduce new customer feedback mechanisms, or develop innovative promotional methods to reach target markets more effectively.

Management innovation involves changes in organizational structures, managerial practices, or decision-making processes that enhance organizational effectiveness. Examples include introducing new management systems, decentralizing decision-making authority, implementing digital management platforms, or adopting workplace policies that improve employee engagement and productivity.

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Beyond these innovation types, firms increasingly pursue business model innovation (BMI), which refers to organizational activities aimed at redesigning the logic through which firms create, deliver, and capture value. Business model innovation is widely recognized as a key mechanism that enables firms to adapt to technological change, evolving market conditions, and shifting stakeholder expectations. Unlike traditional product or process innovation, BMI focuses on modifying the architecture of value creation, including elements such as value propositions, revenue models, customer relationships, and the configuration of resources and capabilities. One influential perspective conceptualizes BMI as a problem formulation and problem-solving process. According to this perspective, firms initiate business model innovation when managers perceive a gap between current performance and desired strategic outcomes. Managers then formulate strategic problems related to value creation, value delivery, or value capture and search for potential solutions that may lead to new or improved business models. These problems often arise from declining profitability, technological disruption, changing customer needs, or emerging competitive dynamics. During the search for solutions, firms typically rely on two complementary search mechanisms: backward-looking search and forward-looking search. Backward-looking search draws upon experiential learning and organizational routines, where firms rely on past experiences, existing capabilities, and accumulated knowledge to identify incremental improvements in their

business models. In contrast, forward-looking search involves cognitive exploration and the envisioning of future possibilities, enabling firms to imagine novel business model configurations that may significantly depart from existing practices. The interaction between these two search approaches shapes the trajectory of business model innovation and influences how firms discover and evaluate alternative business model designs. Another important characteristic of the BMI process is its iterative and experimental nature. Because the outcomes of business model innovation are often uncertain and difficult to predict, firms frequently rely on experimentation and trial-and-error learning. Alternative business model concepts are developed, tested, and refined through pilot projects, prototypes, or market experiments. Through this iterative learning process, organizations gradually identify viable configurations that align with both market needs and internal capabilities (Björkdahl et al., 2022).

In addition to experimentation, business model innovation frequently requires system-level evaluation and stakeholder integration. Particularly in the context of sustainable business model innovation, firms must evaluate not only economic outcomes but also social and environmental impacts. Sustainability assessment frameworks can be incorporated into the BMI process to analyze the potential impacts of different business model designs and support strategic decision-making. These evaluations help organizations compare alternative configurations, identify trade-offs between sustainability objectives, and guide the development of more sustainable value creation systems. Furthermore, the business model innovation process typically involves multi-stakeholder collaboration and cross-functional coordination. Firms often need to coordinate internal departments, external partners, customers, and other stakeholders to co-create and implement new business models. Such collaboration facilitates knowledge integration, resource mobilization, and the alignment of diverse stakeholder interests throughout the innovation process (Bhatnagar et al., 2022).

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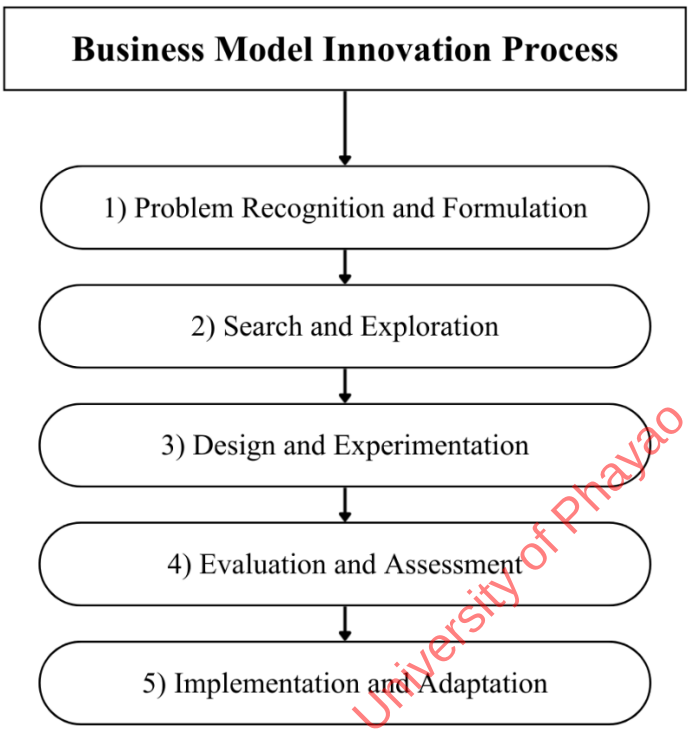

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Figure 2.1 Business Model Innovation Process

Source: Adapted from Andreini, D., Bettinelli, C., Foss, N. J., & Mismetti, M. (2022). Business model innovation: A review of the process-based literature. *Journal of Management & Governance*, 26, 1089–1121.

Overall, as illustrated in Figure 2.1, the business model innovation process can be conceptualized as a dynamic and iterative cycle comprising several interconnected activities:

1. Problem recognition and formulation, where firms identify strategic challenges or opportunities that require changes in the existing business model.
2. Search and exploration, involving both backward-looking learning from past experiences and forward-looking cognitive exploration of new possibilities.
3. Design and experimentation, where alternative business model configurations are developed and tested through iterative experimentation.

4. Evaluation and assessment, including economic, strategic, and sustainability evaluations of alternative business models.
5. Implementation and adaptation, where the selected business model is implemented and continuously refined based on feedback and changing environmental conditions.

Through these interconnected activities, firms progressively identify and refine business model configurations that enhance competitiveness, unlock new sources of value, and enable effective responses to technological, market, and sustainability challenges (Bhatnagar et al., 2022; Björkdahl et al., 2022).

While the innovation process explains how organizations convert various inputs into innovative outputs, a deeper understanding of these activities requires examining the sequential stages through which innovations progress. Accordingly, the following section discusses the key stages of innovation development that guide organizations from the generation of ideas to the commercialization of new products, services, or processes.

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2.2 Stages of Innovation

While the innovation process describes the overall system through which organizations convert resources and knowledge into innovative outcomes, the stages of innovation represent the sequential phases through which individual innovation initiatives evolve from initial ideas to market implementation.

The stages of innovation refer to the sequential yet iterative phases through which new ideas are transformed into valuable products, services, processes, or business models that create organizational and market value. In innovation management literature, innovation is commonly conceptualized as a multi-stage process that encompasses idea generation, development and validation, and the large-scale implementation or commercialization of successful outcomes. Understanding these stages is essential for organizations seeking to manage innovation systematically, allocate resources effectively, and reduce the uncertainty associated with developing new solutions. Although the specific configuration of innovation processes may vary across industries and organizational contexts, most frameworks converge around

several core phases that guide the transformation of ideas into scalable innovations.

One influential framework describing the stages of innovation is proposed by O'Reilly and Binns (2019), who identify three key phases of disruptive innovation: idea generation (ideation), incubation, and scaling.

The first stage, idea generation (ideation), involves the systematic discovery and development of potential ideas for new businesses or innovations. During this phase, organizations explore emerging technological opportunities, customer problems, and market gaps that may lead to novel solutions. Ideation frequently relies on mechanisms that expand the firm's knowledge base, such as open innovation initiatives, corporate venture capital investments, design thinking practices, and employee-driven innovation programs. These approaches enable organizations to capture insights from both internal and external sources, thereby fostering creativity and generating a broad range of potential opportunities. However, ideation alone is insufficient because many early ideas remain exploratory and highly uncertain. Consequently, organizations must guide this process strategically by establishing clear innovation ambitions and defining specific "hunting zones" that focus attention on areas with strong potential for new business creation.

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The second stage, incubation, focuses on validating and refining promising ideas to determine whether they can develop into viable business opportunities. At this stage, initial concepts are transformed into prototypes, experimental solutions, or preliminary business models through systematic testing and learning. Organizations often adopt methodologies such as the lean startup approach, business model experimentation, and iterative prototyping to facilitate this process. These methods emphasize rapid experimentation, continuous customer feedback, and iterative learning cycles that enable firms to test hypotheses regarding market needs and value propositions. Through repeated experimentation and validation, organizations reduce uncertainty and identify ideas with genuine market potential. Effective incubation therefore requires disciplined hypothesis testing, the use of forward-looking performance metrics to track progress toward strategic objectives, and active executive oversight to ensure that promising initiatives receive sustained support and resources.

The final stage, scaling, involves expanding successful innovations into fully operational businesses that contribute to organizational growth. Once a concept demonstrates market viability during incubation, organizations must commit substantial resources and organizational support to scale the innovation. Scaling entails expanding the customer base, increasing operational capacity, and strengthening organizational capabilities while integrating the new initiative into the broader strategic framework of the firm. This phase is often the most challenging because it requires balancing exploratory innovation with the efficiency demands of established operations. Organizations must address internal resistance, reallocate resources from existing businesses, and establish appropriate structures to support the new venture. Firms may scale innovations through various strategies, including acquisitions, internal development, strategic partnerships, and the leveraging of existing organizational assets and capabilities. Successful scaling also depends on strong senior leadership sponsorship, organizational structures that separate exploratory and exploitative activities, and ambidextrous leadership capable of managing the tension between innovation and operational efficiency.

Overall, this three-stage framework highlights that disruptive innovation requires an integrated innovation management approach that combines creative exploration, systematic validation, and strategic expansion. Organizations that generate ideas but fail to incubate them effectively risk wasting resources, whereas those that validate ideas but cannot scale them may miss significant market opportunities. Therefore, sustained innovation success depends on developing organizational capabilities that support all three stages simultaneously.

Complementing this perspective, innovation process models are widely used in innovation management literature to structure and guide the development of new ideas into commercially viable products, services, or processes. These models decompose the complex and uncertain nature of innovation into a sequence of manageable phases that enable organizations to evaluate opportunities systematically, allocate resources effectively, and reduce risk throughout the innovation journey. According to Yeboah (2023), many innovation development frameworks adopt a six-step innovation process model consisting of idea generation, screening, business analysis,

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concept development, final testing, and commercialization. Each stage represents a critical step in the transformation of creative ideas into marketable innovations, as illustrated in Figure 2.2.

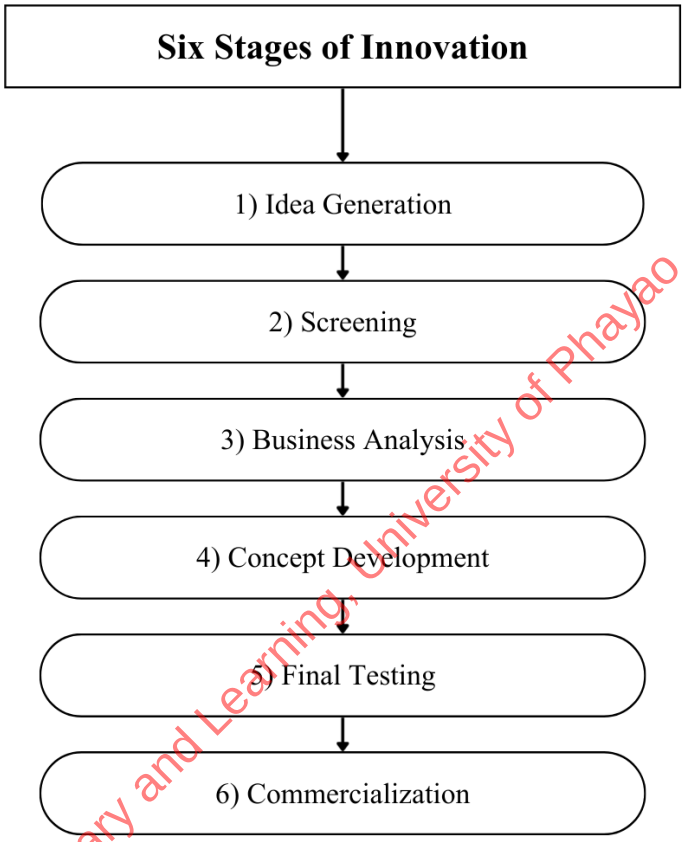

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Figure 2.2 Six Stages of Innovation

Source: Adapted from ISO 56001(2004). Innovation process framework.

The process begins with idea generation, which involves identifying potential opportunities through creativity, problem recognition, technological exploration, and market insights. During this phase, organizations typically encourage brainstorming, research and development activities, and collaboration among employees, customers, and external stakeholders in order to generate a diverse pool of innovative ideas. The primary objective at this stage is not immediate evaluation but rather the creation of a broad set of

potential concepts that may address emerging market needs or organizational challenges.

Following idea generation, the screening stage evaluates and filters the proposed ideas. Because not all generated ideas are feasible or aligned with the firm's strategic objectives, organizations assess them using predetermined criteria such as technical feasibility, market potential, organizational capability, and strategic alignment. The purpose of screening is to eliminate weak or impractical ideas at an early stage, thereby preventing unnecessary expenditure of resources on projects with a low likelihood of success.

The third stage, business analysis, examines the economic and strategic viability of selected ideas. During this phase, organizations conduct detailed market analysis, cost estimation, revenue projections, and risk assessments to determine whether the proposed innovation can generate sufficient value. This stage often includes financial forecasting, competitive analysis, and evaluation of production or operational requirements to ensure alignment with the organization's long-term strategic and financial objectives.

Once economic feasibility is established, the process moves to concept development, where the selected idea is transformed into a more structured concept or prototype. At this stage, the innovation is refined through design activities, technical development, and preliminary testing. Organizations may develop prototypes, product designs, or service models to visualize the concept and assess its functionality. Concept development also enables firms to obtain early feedback from potential users or stakeholders, allowing improvements before significant investment is made.

The fifth stage, final testing, involves validating the developed innovation through rigorous technical, operational, and market evaluations. This stage may include prototype testing, pilot projects, product trials, or limited market launches in order to assess performance under realistic conditions. Such evaluations help identify technical limitations, operational challenges, or issues related to customer acceptance before full market introduction. As a result, organizations can refine the innovation and reduce the risk of failure during commercialization.

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Finally, the commercialization stage represents the full-scale launch of the innovation into the market. This stage involves large-scale production, marketing, distribution, and customer support activities. Commercialization typically requires coordinated collaboration across multiple organizational functions, including marketing, operations, finance, and supply chain management. Successful commercialization enables organizations to capture value from their innovations by generating revenue, strengthening competitive advantage, and enhancing market position.

Overall, the six-step innovation process model provides a structured framework that enables organizations to manage innovation activities more effectively. By organizing innovation into sequential stages, firms can evaluate ideas systematically, manage uncertainty, allocate resources strategically, and improve the likelihood of successful innovation outcomes. Consequently, this model remains widely adopted in both academic research and managerial practice as a practical guideline for managing the development and commercialization of innovative products, services, and processes.

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In conclusion, the stages of innovation provide a structured perspective for understanding how ideas evolve into scalable and commercially viable innovations. While the three-stage framework emphasizes the strategic management of disruptive innovation through ideation, incubation, and scaling, the six-step innovation process model offers a more detailed operational pathway for transforming ideas into marketable outcomes. Together, these frameworks highlight the importance of systematic idea generation, rigorous evaluation and experimentation, and effective market implementation in achieving sustainable innovation performance.

2.3 Organizational Innovation Capability

Organizational innovation capability refers to a firm's systematic ability to generate, adopt, implement, and sustain new ideas, processes, products, or managerial practices that enhance organizational performance and competitiveness. It represents a dynamic organizational competence that integrates internal resources, knowledge assets, managerial processes, and human creativity to support continuous innovation. In contemporary

innovation literature, this capability is widely recognized as a critical strategic asset because organizations operate in increasingly complex, uncertain, and competitive environments that demand continuous adaptation and renewal. Accordingly, organizational innovation capability can be understood as the capacity of an organization to transform knowledge and ideas into valuable outcomes through structured learning processes, collaborative practices, and effective resource utilization.

From a knowledge-based perspective, innovation capability is strongly influenced by how effectively organizations manage and utilize knowledge resources. The knowledge-based view emphasizes that employee knowledge constitutes a critical strategic resource that supports innovation and competitive advantage. Organizations that promote knowledge creation, sharing, and application among employees are therefore more capable of developing innovative products, services, and processes. Human resource practices such as training, employee participation in decision-making, and incentive systems play a crucial role in strengthening innovation capability by enhancing employees' knowledge, skills, and motivation to engage in knowledge-sharing and innovative activities. Moreover, knowledge management functions as a mediating mechanism through which human resource practices facilitate the acquisition, sharing, and application of knowledge, thereby strengthening innovation capability (Iqbal et al., 2020).

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The integration of human resource management practices and individual creativity also forms an important foundation for innovation capability. Human resource practices influence employees' attitudes, abilities, and behaviors, thereby fostering an environment that encourages idea generation and creative problem solving. Individual creativity is essential for producing novel and useful ideas that serve as the basis for innovation within organizations. In this context, human resource practices can stimulate employee creativity through mechanisms such as training, performance appraisal systems, and reward structures that motivate employees to develop and apply creative ideas. Knowledge management processes further reinforce this relationship by facilitating the acquisition, sharing, and application of knowledge that enhances creative thinking. Consequently, creativity acts as a key mechanism linking human resource management practices and knowledge management to organizational innovation capability, enabling

firms to strengthen their capacity to generate and implement innovations (Parwita et al., 2022).

Innovation capability is also associated with broader organizational systems, particularly quality management practices. The implementation of Total Quality Management (TQM) contributes to improving organizational processes and encouraging employee participation in activities aimed at achieving higher levels of quality and performance. TQM emphasizes continuous improvement and the restructuring of organizational processes in order to enhance product quality, reduce waste and rework, and strengthen organizational competitiveness. Within this framework, TQM is commonly conceptualized through two complementary dimensions: hard quality management, which focuses on quality tools, techniques, and process control systems, and soft quality management, which emphasizes managerial and behavioral aspects such as leadership, employee development, and organizational culture. Empirical evidence indicates that both hard and soft TQM practices positively influence organizational innovation capability, which subsequently contributes to improved organizational performance. Accordingly, innovation capability functions as an important mediating mechanism linking TQM practices to performance outcomes (Bazrkar et al., 2022).

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Organizational innovation capability also plays a crucial role in enabling firms to remain competitive in dynamic business environments. In highly competitive markets, firms often face increasing pressure from stakeholders including regulators, communities, and other external actors to improve their products, services, and operational practices. To respond effectively to these pressures, firms rely on absorptive capacity, which refers to their ability to acquire, assimilate, and utilize external knowledge. Through absorptive capacity, firms integrate knowledge obtained from external stakeholders with their existing knowledge base, thereby strengthening their innovation capability. In this way, absorptive capacity acts as a key mechanism linking stakeholder pressure to the development of innovation capability, ultimately contributing to improved firm performance (Singh et al., 2022).

At the operational level, innovation activities are typically organized and implemented through projects within firms. Consequently, organizational

innovation capability influences project-level innovation outcomes, as projects draw upon the resources, knowledge, and capabilities embedded within the organization. In this context, project-level innovation capability operationalizes broader firm-level innovation capability, enabling project teams to search for ideas, recombine resources, and develop solutions that lead to innovation outputs. Empirical evidence suggests that both internal and external project innovation capabilities positively contribute to innovation outcomes, including technological innovations (such as new products or production processes) and non-technological innovations (such as marketing or organizational innovations). These capabilities enable organizations to navigate the uncertainty and complexity inherent in innovation processes and transform project activities into tangible innovation outputs that support organizational competitiveness (Molden et al., 2025).

Entrepreneurial enthusiasm among SME owners is reflected in their commitment to product or service development, enthusiasm for competition, passion for entrepreneurship, active pursuit of opportunity recognition, and motivation for continuous development. These factors encourage entrepreneurs to improve their products continuously, respond effectively to competitive environments, and pursue emerging opportunities, thereby contributing to the sustainability and persistence of their businesses (Suvittawat, 2019).

Organizational innovation capability may also influence employee behavior through underlying motivational mechanisms. Drawing on regulatory focus theory, employees who perceive strong innovation capabilities within their organizations are more likely to develop epistemic curiosity, defined as a motivation to acquire knowledge and explore new ideas. This curiosity encourages employees to engage in job crafting behaviors, such as modifying tasks, seeking new approaches to work, and proactively redesigning their roles to enhance performance and work meaningfulness. Moreover, the relationship between organizational innovation capability and epistemic curiosity becomes stronger when employees possess a promotion regulatory focus, which reflects a motivation toward growth, advancement, and achievement. Consequently, epistemic curiosity functions as a mediating mechanism through which innovation

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capability stimulates job crafting, particularly among employees with higher levels of promotion focus (Ali & Ishaq, 2025).

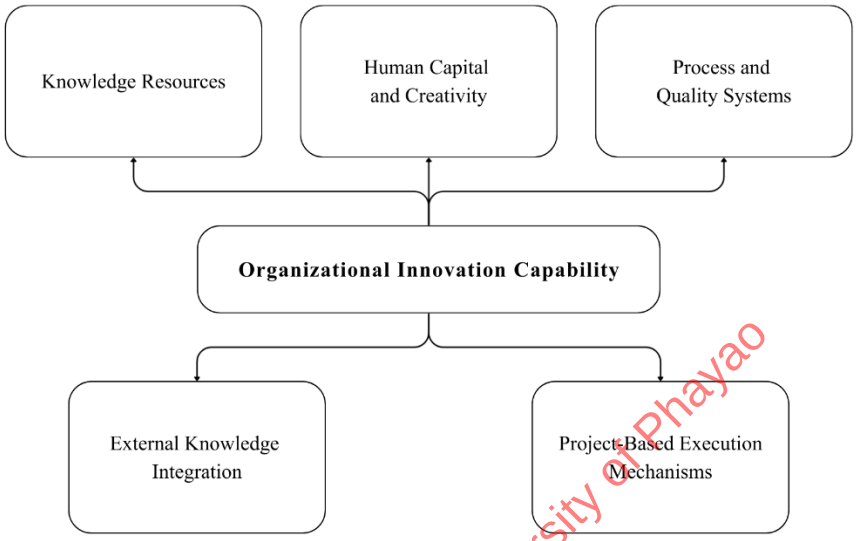

Figure 2.3 Organizational Innovation Capability

Source: Adapted from Daronco, E. L., Silva, D. S., Seibel, M. K., & Cortimiglia, M. N. (2023). A new framework of firm-level innovation capability: A propensity–ability perspective. *European Management Journal*, 41(2), 236–250.

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As illustrated in Figure 2.3, organizational innovation capability emerges from the integration of multiple strategic organizational components. Foundationally, it is supported by knowledge resources, human capital and creativity, and process and quality systems, which collectively provide the intellectual assets, creative potential, and structured operational frameworks necessary for innovation activities. These internal capabilities enable organizations to systematically generate and refine new ideas while maintaining operational reliability. Building upon these foundations, organizational innovation capability is further strengthened through external knowledge integration, which allows firms to absorb and apply insights from partners, networks, and external environments, as well as through project-based execution mechanisms that translate innovative ideas into concrete initiatives and implemented outcomes. Together, these interconnected elements form a comprehensive capability architecture that enables

organizations to continuously develop, implement, and sustain innovation in dynamic and competitive environments.

Although innovation capability equips organizations with the ability to generate and implement new ideas, modern innovation increasingly needs to respond to wider societal and environmental concerns. As a result, the concept of sustainable innovation expands the traditional notion of innovation capability by incorporating economic performance alongside environmental stewardship and social responsibility.

2.4 The Concept of Sustainable Innovation

Sustainable innovation refers to the development, improvement, or transformation of products, services, processes, or business models that generate economic value while simultaneously enhancing environmental and social performance in both the short and long term. This concept integrates sustainability principles into innovation activities, enabling organizations to address contemporary sustainability challenges while maintaining competitiveness and long-term viability. From this perspective, sustainable innovation aims to balance economic, social, and environmental objectives, creating a "win–win–win" outcome in which firms achieve financial performance while contributing positively to society and the natural environment. Moreover, sustainable innovation has increasingly been recognized as a strategic approach that enables organizations to improve resource efficiency, reduce environmental impacts such as energy consumption and waste emissions, and enhance social outcomes, including job quality, human rights, and stakeholder engagement. By incorporating sustainability considerations into innovation strategies, firms can foster responsible growth, strengthen competitive advantage, and support the broader transition toward sustainable development (Aldeanueva-Fernández & Contreras, 2025).

Industry 4.0 has emerged as a key enabler of innovation and sustainable development through the integration of advanced digital technologies such as artificial intelligence, the Internet of Things, cyber-physical systems, and big data analytics into industrial operations and value chains. Through digitalization and interconnected production systems,

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Industry 4.0 enhances organizational capabilities, facilitates knowledge sharing, and promotes collaboration among internal functions and external stakeholders. These capabilities enable firms to develop sustainable innovation by improving resource efficiency, reducing waste and energy consumption, and supporting the design and production of environmentally friendly products and processes. Consequently, Industry 4.0 not only strengthens firms' innovation performance but also contributes to broader sustainable development objectives by promoting economic productivity, environmental protection, and social well-being within industrial ecosystems (Ghobakhloo et al., 2021).

Changing the market for sustainable innovation refers to the process through which diverse actors within a value network such as firms, regulators, research organizations, and other stakeholders collectively influence and transform existing market structures, practices, and norms to facilitate the diffusion of sustainable innovations. This transformation occurs through the interaction of actors' intentions and activities, which may either directly support sustainable innovations or indirectly advance broader sustainability objectives that reshape the market environment. In this context, market change involves modifications in market representations, practices, institutional norms, and relationships among actors, thereby creating conditions that support the adoption and scaling of sustainable innovations within existing value networks (Keränen et al., 2023).

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The development of sustainable innovation requires complex interactions among multiple organizations across sectors, and these interactions extend beyond cocreation alone. Instead, sustainable innovation processes involve shifting and overlapping interaction logics, including coordination, cooperation, collaboration, and cocreation, which may dominate at different stages of an innovation project. These interaction logics shape how organizations organize activities, distribute responsibilities, and combine knowledge and resources to address complex environmental and societal challenges. Moreover, these logics often coexist and evolve dynamically throughout the innovation process, highlighting that sustainable innovation is shaped by fluid and processual interorganizational interactions rather than a single dominant collaborative approach (Perriton et al., 2025).

Environmental management accounting can contribute to sustainable performance by supporting sustainable innovation. Specifically, environmental management accounting provides environmental and cost-related information that enables organizations to identify sustainability-related risks and opportunities and make informed decisions regarding resource allocation and environmental initiatives. By translating environmental data into managerial and economic insights, environmental management accounting facilitates the development of sustainable innovation, including innovations in products, processes, and technologies that generate environmental, social, and economic value. These innovation activities subsequently enhance sustainable performance by improving resource efficiency, reducing environmental impacts, and creating long-term stakeholder value. Furthermore, the relationship between environmental management accounting and sustainable innovation can be strengthened when firms adopt a proactive sustainability strategy that prioritizes sustainability at the strategic level and encourages the use of environmental information to support innovation initiatives (Van et al., 2025).

Sustainable innovation can emerge through various mechanisms. One important mechanism is eco-innovation, which emphasizes the reduction of environmental impacts through technological advancements and environmentally efficient processes. Another mechanism is sustainable business model innovation, which involves redesigning value creation and delivery systems so that environmental and social objectives are integrated with economic performance. Together, these approaches enable organizations to pursue innovation while simultaneously addressing sustainability goals.

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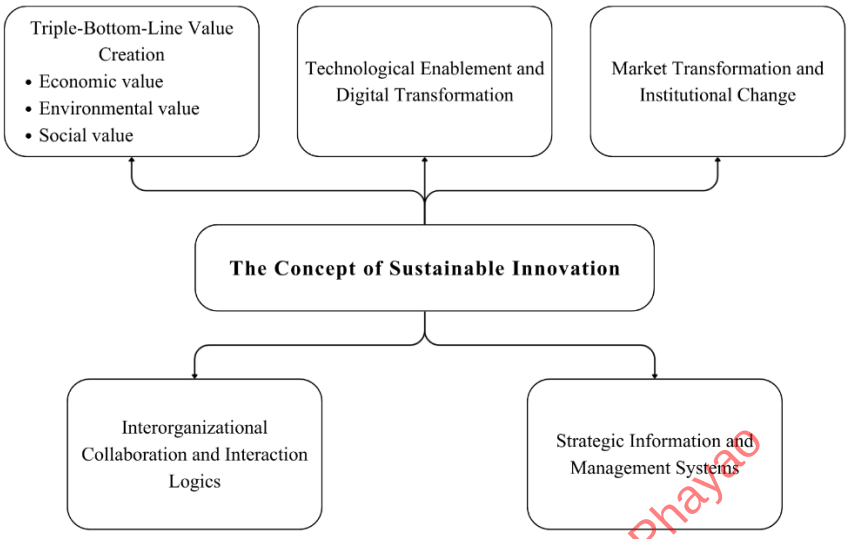

Figure 2.4 The Concept of Sustainable Innovation

Source: Adapted from Aldeanueva-Fernández, I., & Contreras, F. (2025). Drivers and outcomes of sustainable innovation in the business and management field: A systematic literature review. *Schmalenbach Journal of Business Research*, 77, 1141–1168.

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As illustrated in Figure 2.4, the concept of sustainable innovation can be understood as a multidimensional framework that integrates several interconnected drivers and outcomes. At its core, sustainable innovation emphasizes triple-bottom-line value creation, encompassing economic, environmental, and social value, which collectively ensure long-term organizational and societal sustainability. This value creation is supported by technological enablement and digital transformation, which provide the technological infrastructure and digital capabilities necessary to develop and implement innovative solutions. Simultaneously, market transformation and institutional change shape the broader environment by influencing industry structures, regulations, and stakeholder expectations that encourage sustainable practices. The framework further highlights the importance of interorganizational collaboration and interaction logics, where firms engage with partners, networks, and stakeholders to co-create sustainable solutions. In addition, strategic information and management systems play a crucial role in facilitating data-driven decision-making, monitoring sustainability

performance, and coordinating innovation processes. Together, these elements interact to form a holistic perspective of sustainable innovation, demonstrating how organizational capabilities, technological advancements, and institutional dynamics collectively contribute to sustainable value creation.

In conclusion, sustainable innovation represents an integrative approach that aligns economic performance with environmental stewardship and social responsibility. Through technological advancement, collaborative interorganizational interactions, and the strategic use of environmental management accounting information, organizations can develop innovative solutions that enhance sustainable performance while supporting broader sustainable development objectives.

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2.5 Complex Innovation Ecosystems

A complex innovation ecosystem refers to a dynamic network of heterogeneous actors including firms, universities, governments, users, intermediaries, and supporting institutions whose interactions collectively facilitate the creation, development, and commercialization of innovations. Unlike traditional linear models of innovation, innovation ecosystems emphasize interdependence, co-evolution, and value co-creation among multiple stakeholders operating within interconnected technological, institutional, and market environments. These ecosystems are inherently complex because actors possess diverse objectives, resources, and capabilities, and their interactions evolve continuously over time, generating nonlinear patterns of innovation development and diffusion.

Within complex innovation ecosystems, identifying and framing relevant stakeholders is a crucial step in understanding the broader context in which innovation emerges and evolves. Stakeholder analysis enables innovators to examine the actors associated with a technological solution and the various roles they may assume within the ecosystem. Rather than focusing solely on traditional stakeholder attributes such as power and interest, effective stakeholder identification also considers the diverse roles and capacities through which actors contribute to innovation development and commercialization. These roles may include beneficiaries, collaborators,

competitors, customers, suppliers, supporters, or even actors that oppose the innovation. Adopting a role-based perspective allows organizations and researchers to construct a more comprehensive map of the innovation ecosystem and recognize the complex interconnections among actors. Moreover, a single stakeholder may occupy multiple roles simultaneously depending on the stage and context of innovation development. Such multidimensional stakeholder mapping improves the identification of collaboration opportunities, highlights potential conflicts of interest, and broadens the range of perspectives considered during innovation processes. Consequently, systematic stakeholder identification contributes to a more holistic understanding of innovation ecosystems and supports more informed decision-making in engineering and development projects (Eriksson et al., 2023).

The structure and evolution of innovation ecosystems are shaped by complex and interdependent interactions among ecosystem actors, institutional arrangements, and environmental conditions. Innovation ecosystems function as dynamic and adaptive systems in which multiple stakeholders including firms, research institutions, financiers, customers, and regulators interact to co-create innovations that often require complementary technologies and coordinated development efforts. Because systemic innovations typically involve interconnected components and actors, the success of individual organizations is closely linked to the collective performance of the ecosystem. Consequently, innovation ecosystems should not be viewed as static networks but rather as evolving configurations of actors, roles, and collaborative relationships that continuously adapt to technological changes, market opportunities, regulatory influences, and resource availability.

The dynamics of innovation ecosystems arise from feedback mechanisms and causal relationships among key ecosystem elements, including idea generation, research collaboration, co-development activities, and pilot implementations. These processes interact through reinforcing and balancing feedback loops that influence the entry of new actors, the development of knowledge resources, and the overall attractiveness of the ecosystem for participants and investors. System dynamics modeling can therefore be applied to capture these interactions and illustrate how factors

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such as market size, financial resources, governance mechanisms, and knowledge-sharing practices shape the development and outcomes of innovation ecosystems over time. By modeling these dynamic relationships, organizations and policymakers can better understand how collaborative innovation processes evolve and how ecosystem orchestration, resource flows, and actor participation contribute to the long-term performance and sustainability of innovation ecosystems (Paasi et al., 2023).

From a systemic perspective, innovation ecosystems can also be conceptualized as multi-layered structures that integrate technological, institutional, and economic components into a coordinated system of innovation activities. Innovation emerges through interactions among multiple elements, including actors, activities, artifacts, and institutional relationships. Actors such as universities, industry organizations, and government agencies contribute knowledge, capabilities, and investments that support innovation development. These actors engage in various activities, including research and development, experimentation, knowledge exchange, and commercialization processes. In addition, innovation ecosystems incorporate both tangible and intangible resources, such as technological infrastructure, financial capital, intellectual property, and knowledge assets, which collectively enable the functioning of the system. The effectiveness of an innovation ecosystem therefore depends on the configuration and coordination of these elements and the relationships among them, including both collaborative complementarities and competitive interactions that influence value creation and innovation performance. Consequently, innovation ecosystems can be understood as evolving systems of actors, activities, and artifacts embedded within institutional frameworks and interconnected relationships that collectively shape innovation outcomes (Toth & Hary, 2024).

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Strategic positioning within innovation ecosystems has also become an important managerial concern for firms seeking to benefit from collaborative innovation. Industrial firms increasingly adopt ecosystem strategies that align internal innovation activities with external actors across the broader innovation system. These strategies involve coordinating relationships with a heterogeneous set of partners including suppliers, customers, research institutions, complementors, and other stakeholders

whose contributions collectively influence the development and commercialization of innovations. In this context, firms must deliberately manage their position within the ecosystem by aligning partners and activities while simultaneously securing and strengthening their role relative to other actors. Such ecosystem strategies require organizations to navigate complex interdependencies, determine when to cooperate or compete with partners, and continuously adapt their strategic positioning as the ecosystem evolves. Accordingly, an innovation ecosystem strategy can be understood as the approach through which a focal firm aligns partners and innovation activities while safeguarding and enhancing its position within a competitive ecosystem. Through effective alignment and positioning, firms can access complementary resources, coordinate innovation processes across organizational boundaries, and improve their ability to generate and deliver new value propositions in collaboration with ecosystem participants (Visscher et al., 2021).

Innovation ecosystems also enable firms to discover latent use contexts and create new opportunities for value creation that support both organizational growth and sustainability outcomes. Rather than innovating in isolation, firms can leverage innovation ecosystems as collaborative structures where multiple partners jointly develop and deliver value propositions. Through these ecosystems, firms gain access to complementary resources, technological expertise, and diverse perspectives that help reveal previously unrecognized applications for existing technologies. In this process, latent use contexts defined by potential users, unmet needs, and enabling or constraining environmental conditions can be transformed into manifest use contexts in which concrete value propositions are realized through coordinated innovation activities among ecosystem participants. This transformation typically requires collaboration among various actors, such as technology providers, industry partners, customers, and institutional stakeholders, who collectively align their capabilities and resources to materialize new solutions. By facilitating experimentation, joint development, and iterative learning, innovation ecosystems enable firms to expand the scope and scale of innovation beyond their core products, thereby generating economic value for participating firms while also producing broader societal benefits such as environmental sustainability and improved resource efficiency (Zhang et al., 2026).

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Complex innovation ecosystems can be conceptualized through eight interrelated dimensions: multi-actor network structure, stakeholder roles and interdependencies, dynamic system interactions, resource and knowledge integration, institutional context, ecosystem strategy and positioning, collaborative value co-creation, and opportunity discovery. Together, these dimensions explain how innovation emerges from coordinated interactions among diverse actors, resources, and institutional environments.

Innovation ecosystems can be conceptualized through several fundamental structural dimensions that clarify how diverse actors, resources, and institutional contexts interact to facilitate the development and advancement of innovation, as presented in Table 2.1.

Table 2.1 Complex Innovation Ecosystems

Dimension	Description
Multi-Actor Network Structure	Innovation ecosystems consist of heterogeneous actors—including firms, universities, governments, users, intermediaries, and supporting institutions—whose interactions collectively enable innovation creation, development, and commercialization. These actors contribute diverse resources, capabilities, and knowledge to the ecosystem.
Stakeholder Roles and Interdependencies	Stakeholders within innovation ecosystems perform multiple and evolving roles such as beneficiaries, collaborators, competitors, customers, suppliers, supporters, or opponents. Mapping these roles helps reveal complex interdependencies and collaboration opportunities across the ecosystem.
Dynamic System Interactions	Innovation ecosystems function as adaptive and evolving systems shaped by continuous interactions among actors, institutions, and environmental conditions. These interactions produce nonlinear innovation processes characterized by feedback loops and co-evolution.
Resource and Knowledge Integration	The ecosystem integrates tangible and intangible resources—including technological infrastructure, financial capital, intellectual

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Dimension	Description
	property, and knowledge assets—that support collaborative innovation and coordinated development activities.
Institutional and Environmental Context	Institutional frameworks, governance mechanisms, regulatory environments, and market conditions influence how innovation ecosystems evolve and how actors coordinate innovation activities.
Ecosystem Strategy and Strategic Positioning	Firms must strategically position themselves within innovation ecosystems by aligning internal capabilities with external partners. Effective ecosystem strategies involve managing collaboration, competition, and resource complementarities across the network.
Collaborative Value Co-Creation	Innovation ecosystems enable multiple stakeholders to jointly create and deliver value propositions. Through collaboration and co-development, firms can access complementary capabilities and accelerate innovation outcomes.
Opportunity Discovery and Use Context Development	Ecosystems facilitate the discovery of latent use contexts and new innovation opportunities. Through experimentation and joint development, potential applications of technologies are transformed into realized value propositions.

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Overall, complex innovation ecosystems represent evolving and interconnected systems in which multiple actors, resources, and activities interact to support collaborative innovation and value creation. Through stakeholder collaboration, dynamic system interactions, and strategic ecosystem positioning, organizations can enhance their ability to develop innovations, access complementary capabilities, and respond effectively to changing technological and market environments.

Case Study

Although the preceding sections have discussed innovation processes, capabilities, and ecosystems at the organizational level, innovation within small and medium enterprises frequently relies on the motivations and attitudes of individual entrepreneurs. The following case study therefore illustrates how entrepreneurial passion and enthusiasm shape the persistence and innovative behavior of SMEs.

The Role of Passion and Enthusiasm in Small and Medium Enterprises (SMEs)

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Adapted Reprint from:

Suvittawat, A. (2019). Passions and enthusiams of small and medium enterprises (SMES): A case study of Nakorn Ratchasima province, Thailand. Entrepreneurship and Sustainability Issues, 6(3), 1369-1379. https://doi.org/10.9770/jesi.2019.6.3(22)

1. Introduction

Entrepreneurs play a fundamental role in economic development, particularly through the establishment and expansion of small and medium enterprises (SMEs). Entrepreneurial passion and enthusiasm are critical motivational forces that stimulate effort, facilitate opportunity recognition, and sustain long-term engagement in entrepreneurial activities. These affective and cognitive attributes contribute to higher levels of self-efficacy, work engagement, and commitment to organizational objectives, which ultimately influence overall business performance. In Thailand, SME performance management typically follows a structured process that includes preparation, planning, implementation, evaluation, revision, and application. Due to their distinctive characteristics in terms of capital constraints, personal involvement, and organizational structure, Thai SMEs are required to formulate clear strategic directions and implement effective operational management in order to achieve sustainable competitive advantage. The

economic importance of SMEs in Thailand is evident in their substantial contribution to national GDP growth.

At the macroeconomic level, environmental conditions, public policy, and globalization exert significant influence on entrepreneurial behavior and the performance of SMEs. Government institutions play an essential role in maintaining economic stability and supporting recovery from crises. Nevertheless, administrative inefficiencies such as inadequate inter-departmental coordination and ineffective resource allocation may limit the effectiveness of policies aimed at supporting the SME sector. Concurrently, rapid technological advancement and the widespread diffusion of internet technologies have transformed contemporary business practices. In particular, the emergence of social commerce and social media marketing has reshaped market interactions, generating both new opportunities and challenges for SMEs. Although previous studies acknowledge the importance of entrepreneurial passion and enthusiasm in entrepreneurial activity, comprehensive understanding of how these psychological factors influence entrepreneurial processes and performance outcomes remains limited. Therefore, fostering entrepreneurial passion and enthusiasm has become increasingly important within a dynamic and globalized business environment that continually reshapes opportunities and competitive landscapes for SMEs.

This case study utilizes the concepts of entrepreneurial passion and enthusiasm as analytical lenses to deepen understanding of entrepreneurship and entrepreneur development. By doing so, the study contributes to the advancement of entrepreneurial scholarship and managerial practice, while also providing empirical insights into entrepreneurship at the provincial level, which represents a vital foundation of Thailand's economic development.

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2. National Context: Passion and Enthusiasm Driving Entrepreneurship in Small and Medium Enterprises (SMEs) in Thailand

Entrepreneurial passion and commitment constitute fundamental determinants of performance and growth among small and medium enterprises (SMEs) in Thailand. Commitment expressed through endurance, perseverance, passion, and self-determination plays a significant role in shaping entrepreneurial behavior and distinguishing high-performing ventures from less successful ones. A strong sense of commitment reinforces the entrepreneurial mindset, enabling entrepreneurs to persist through

challenging circumstances while facilitating informed and strategic decision-making.

In addition, enthusiasm for competition represents a critical capability within Thailand's dynamic and highly competitive SME environment. Entrepreneurs must demonstrate intrinsic motivation toward their business activities, develop comprehensive strategic plans, and maintain a deep understanding of their products, target markets, and competitors. Such enthusiasm encourages sustained effort and organizational adaptability, allowing SMEs to respond effectively to rapidly changing market conditions. Within the Thai context, factors such as entrepreneurship, corporate brand management, and competitive intensity collectively contribute to firm performance, reflecting the distinctive institutional and cultural characteristics that influence SME operations.

Entrepreneurial passion further refers to a strong emotional attachment to entrepreneurial activities, including opportunity recognition, venture creation, and innovation. Although this passion is often most intense during the early stages of venture formation, it continues to influence entrepreneurial intensity over time. Entrepreneurial intensity encompasses dimensions such as autonomy, innovativeness, proactiveness, risk-taking, and competitive aggressiveness. For Thai SMEs, heightened entrepreneurial intensity contributes to improved organizational performance through enhanced customer responsiveness, faster market adaptation, more effective competitor learning, and strengthened competitive advantage. Moreover, entrepreneurial passion has been found to positively influence entrepreneurial intentions and financing decisions, often mediated by factors such as self-efficacy and creativity.

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Finally, enthusiasm for identifying and developing opportunities serves as a key driver of sustainable business growth. Entrepreneurs who are capable of recognizing and exploiting emerging opportunities can transform environmental uncertainty into innovation and the creation of new market spaces. Continuous organizational development achieved through process innovation, human resource development, and technological integration has become an essential source of long-term competitive advantage. Despite the significant economic contributions of SMEs, particularly within Thailand's service sector, empirical research examining the influence of entrepreneurial passion and enthusiasm on entrepreneurial success remains limited. This gap highlights the importance of further investigation into the role of

entrepreneurial passion and enthusiasm within the specific context of Thai SMEs.

3. Methodology and Research Framework

This exploratory case study empirically examines emerging factors influencing entrepreneurial enthusiasm and business persistence among small and medium enterprises (SMEs) in Thailand. Specifically, it investigates the extent to which each factor affects both entrepreneurial enthusiasm and the persistence of business operations. The study adopts a quantitative research design, employing structured questionnaires as the primary data collection instrument, while qualitative contextual methods are used for initial factor identification. Secondary data are derived from a systematic review of relevant literature and are utilized to support and validate the research findings. Data collected from 335 SME entrepreneurs operating in the service, manufacturing, and trading sectors in Nakhon Ratchasima Province were analyzed using descriptive statistics, specifically mean values and standard deviations (SD).

The survey consists of measures capturing key constructs:

- Enthusiasm for Entrepreneurship Variables – commitment to the product or service, enthusiasm for competition, passion for entrepreneurship, enthusiasm for opportunity, and enthusiasm for development.
- Persistence of Business

Based on the research framework, to investigate the relationship between enthusiasm for entrepreneurship and persistence of business, this study advances five hypotheses, positing that entrepreneurs' commitment to the product or service, enthusiasm for competition, passion for entrepreneurship, enthusiasm for opportunity, and enthusiasm for development are all positively associated with the persistence of business.

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4. Findings and Discussion

4.1 Enthusiasm for Entrepreneurship Variables

The results indicate that entrepreneurs' responses to the enthusiasm for entrepreneurship variables are at an agreed level, with a mean score of 3.54 and a standard deviation (SD) of 0.85.

The means and standard deviations (SD) of the following independent variables:

- Commitment to the product or service (mean = 3.54, SD = 0.97)
- Enthusiasm for competition (mean = 3.36, SD = 0.81)
- Passion for entrepreneurship (mean = 3.63, SD = 0.80)
- Enthusiasm for opportunity (mean = 3.54, SD = 0.79)
- Enthusiasm for development (mean = 3.64, SD = 0.91)

Entrepreneurial enthusiasm can be conceptualized as a multidimensional construct consisting of five interconnected dimensions that collectively contribute to entrepreneurial behavior and firm performance. Commitment to the product or service plays a critical role in strengthening customer trust and satisfaction. Entrepreneurs and sales personnel who exhibit innovativeness, proactiveness, and a willingness to engage in calculated risk-taking are better positioned to create superior customer value. Enthusiasm for competition further enhances organizational competitiveness by encouraging employees to adopt an entrepreneurial mindset, thereby enabling firms to respond effectively to competitive pressures in global markets. In addition, passion for entrepreneurship reflects both emotional attachment and cognitive engagement with entrepreneurial activities. This passion stimulates deeper information processing, increases effort and perseverance, and ultimately contributes to improved entrepreneurial outcomes. Enthusiasm for opportunity represents the motivation and readiness of entrepreneurs to identify and capitalize on emerging opportunities, which is a critical determinant of entrepreneurial success. Finally, enthusiasm for development highlights the importance of continuous learning and capability enhancement. By drawing on diverse experiences and nurturing entrepreneurial talent, ongoing development driven by enthusiasm supports sustained entrepreneurial growth and long-term business success.

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4.2 The Impact of Enthusiasm for Entrepreneurship Variables on the Persistence of Business

The findings reveal a significant association between the dimensions of entrepreneurial enthusiasm and business persistence. In particular, commitment to the product or service exhibits a positive and statistically significant relationship with the persistence of business activities. Likewise, enthusiasm for competition, passion for entrepreneurship, and enthusiasm for opportunity are all positively and significantly related to business persistence, indicating that higher levels of these attributes contribute to entrepreneurs' ability to sustain their ventures. Conversely, although enthusiasm for

development demonstrates a positive relationship with business persistence, the effect is not statistically significant.

5. Synthesis

The case study illustrates that entrepreneurial enthusiasm functions as an important driver of innovation-oriented behavior among small and medium enterprises (SMEs). Specifically, the dimensions of commitment to the product or service, enthusiasm for competition, passion for entrepreneurship, and enthusiasm for opportunity contribute to the persistence of business by encouraging entrepreneurs to continuously improve products, identify market opportunities, and adapt to competitive environments. These behaviors reflect an innovation mindset in which entrepreneurs actively pursue differentiation, respond to changing customer needs, and seek new market possibilities.

From an innovation perspective, entrepreneurial enthusiasm stimulates the continuous development and refinement of products and services. Entrepreneurs who demonstrate strong commitment to their offerings are more likely to introduce new products, improve service quality, and utilize digital communication channels such as social media to strengthen customer engagement. At the same time, enthusiasm for competition motivates firms to innovate strategically in order to maintain competitive advantage, particularly through niche market focus and ongoing product development.

Furthermore, passion for entrepreneurship and enthusiasm for opportunity enhance the capacity of entrepreneurs to recognize emerging opportunities and transform them into innovative business initiatives. These dimensions encourage proactive learning, market analysis, and opportunity recognition, which are critical elements in the innovation process of SMEs. In contrast, although enthusiasm for development reflects an intention to allocate resources for improvement and human resource development, its direct relationship with business persistence is not statistically significant in the study.

Overall, the findings suggest that entrepreneurial enthusiasm fosters an environment conducive to innovation, enabling SMEs to sustain business operations through opportunity recognition, competitive adaptation, and continuous product or service improvement. Consequently, cultivating

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entrepreneurial enthusiasm can strengthen innovation capability and enhance long-term business persistence within SMEs.

6. Conclusion

Entrepreneurial passion and enthusiasm are critical psychological drivers that sustain business persistence among small and medium-sized enterprises (SMEs). Several key dimensions contribute to entrepreneurial enthusiasm, including commitment to the product or service, enthusiasm for competition, passion for entrepreneurship, enthusiasm for opportunity, and enthusiasm for development. Commitment to the product or service refers to the continuous effort to improve, refine, and differentiate offerings in order to achieve and maintain competitive advantage. In this context, social media platforms play an important role as channels for customer engagement, communication, and market interaction.

Enthusiasm for competition enables entrepreneurs to strategically position their businesses within niche markets and encourages ongoing innovation to maintain competitiveness. Passion for entrepreneurship reflects a strong orientation toward overcoming challenges, achieving business goals, and maintaining resilience in dynamic and uncertain business environments. Meanwhile, enthusiasm for opportunity allows entrepreneurs to proactively identify and respond to evolving customer needs and emerging market information. Finally, enthusiasm for development emphasizes the importance of investing in innovation and attracting high-potential employees to enhance operational efficiency and service quality.

Overall, these dimensions of entrepreneurial passion and enthusiasm demonstrate a positive and significant relationship with business persistence. Entrepreneurs who exhibit higher levels of enthusiasm and passion for entrepreneurial activities are more likely to sustain their ventures and maintain long-term commitment to their business operations.

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Case Study Questions

1. How does an entrepreneur's commitment to improving and differentiating products or services influence the long-term persistence of the business?
2. To what extent does enthusiasm for competition help SMEs maintain their market position and sustain business operations?
3. How does an entrepreneur's passion for entrepreneurial activities influence their ability to sustain the business during difficult periods?
4. How does an entrepreneur's enthusiasm for identifying and exploiting new opportunities affect business persistence?
5. How does enthusiasm for development and continuous improvement contribute to sustaining SME operations?

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Chapter Summary

This chapter conceptualizes innovation as a core organizational capability that emerges from the interaction of structured innovation processes, organizational resources, sustainable innovation strategies, and collaborative innovation ecosystems.

The innovation process refers to a structured and iterative set of activities through which organizations generate, develop, and implement ideas to create value. It involves transforming organizational resources, knowledge, and technologies into innovative outcomes such as new products, services, processes, or business models through stages including ideation, experimentation, development, and commercialization.

The stages of innovation describe the sequential phases through which ideas evolve into viable innovations. These stages generally include idea generation, validation or incubation, and scaling or commercialization, enabling organizations to systematically develop, test, and expand innovative solutions.

Organizational innovation capability refers to a firm's ability to generate, adopt, and implement new ideas, products, or processes. This capability is supported by effective knowledge management, human resource practices, creativity, and organizational learning that enable continuous innovation and competitive advantage.

Sustainable innovation involves developing products, services, processes, or business models that create economic value while improving environmental and social outcomes. It integrates sustainability principles into innovation activities to support long-term organizational performance and sustainable development.

A complex innovation ecosystem is a dynamic network of interconnected actors—such as firms, universities, governments, and stakeholders—whose collaborative interactions support the development and commercialization of innovations. These ecosystems enable value co-creation, knowledge exchange, and coordinated innovation activities.

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Chapter Review Questions

Review Question 1:

How does the innovation process transform organizational inputs into valuable innovation outputs, and what roles do digital technologies such as artificial intelligence, big data, and social media play in enhancing different stages of this process?

Review Question 2:

Explain the major stages of innovation development and discuss how organizations move from idea generation to the successful commercialization or scaling of innovations.

Review Question 3:

What is organizational innovation capability, and how do factors such as knowledge management, human resource practices, and absorptive capacity contribute to strengthening a firm's ability to innovate?

Review Question 4:

How does sustainable innovation integrate economic, environmental, and social objectives, and why is this approach increasingly important for achieving long-term organizational competitiveness and sustainable development?

Review Question 5:

What is a complex innovation ecosystem, and how do interactions among diverse stakeholders within such ecosystems influence the development and diffusion of innovation?

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Chapter Exercises

Exercise 1:

Explain the Input–Process–Output (IPO) framework in the innovation process.

Identify one real-world company and briefly describe:

1. The key inputs used for innovation (e.g., resources, knowledge, technology).
2. The innovation activities involved in transforming these inputs.
3. The resulting innovation outputs created by the firm.

Exercise 2:

Compare the three-stage model of disruptive innovation (ideation, incubation, scaling) with the six-step innovation process model.

Discuss:

1. Two similarities between the two frameworks.
2. Two differences in how they structure innovation development.
3. Which model might be more suitable for SMEs, and why.

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Exercise 3:

Select an organization (e.g., SME, startup, or large firm) and evaluate how it develops organizational innovation capability.

Discuss at least two factors that strengthen innovation capability, such as:

- knowledge management
- human resource practices
- absorptive capacity
- quality management systems

Exercise 4:

Provide an example of a sustainable innovation introduced by a company or industry.

Explain how the innovation simultaneously contributes to:

1. Economic value
2. Environmental sustainability
3. Social benefits

Exercise 5:

Choose a technological field (e.g., renewable energy, electric vehicles, AI, or smart agriculture).

Identify at least four key actors within its innovation ecosystem (e.g., firms, universities, government agencies, users).

Explain how the interactions among these actors contribute to innovation development and commercialization.

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References

Agostini, L., Galati, F., & Gastaldi, L. (2020). The digitalization of the innovation process: Challenges and opportunities from a management perspective. *European Journal of Innovation Management, 23*(1), 1-12. https://doi.org/10.1108/ejim-11-2019-0330

Al-Omar, S. Y., Alkhatib, S. F., & Alalawneh, A. A. (2024). Leveraging Social Media to Enhance Digital Innovation Process and Innovation Performance in Jordanian SMEs. *Journal of Logistics, Informatics and Service Science, 11*(6), 343-367. https://doi.org/10.33168/JLISS.2024.0620

Aldeanueva-Fernández, I., & Contreras, F. (2025). Drivers and Outcomes of Sustainable Innovation in the Business and Management Field: A Systematic Literature Review. *Schmalenbach Journal of Business Research, 77*(4), 1141-1168. https://doi.org/10.1007/s41471-025-00228-3

Ali, S. A., & Ishaq, R. (2025). Too curious to craft? A regulatory focus perspective on organizational innovation capabilities and job crafting. *International Journal of Innovation Science*. https://doi.org/10.1108/ijis-01-2025-0011

Andreini, D., Bettinelli, C., Foss, N. J., & Mismetti, M. (2022). Business model innovation: A review of the process-based literature. *Journal of Management & Governance*, 26, 1089–1121. https://doi.org/10.1007/s10997-021-09590-w

Bazrkar, A., Aramoon, E., Hajimohammadi, M., & Aramoon, V. (2022). IMPROVE ORGANIZATIONAL PERFORMANCE BY IMPLEMENTING THE DIMENSIONS OF TOTAL QUALITY MANAGEMENT WITH RESPECT TO THE MEDIATING ROLE OF ORGANIZATIONAL INNOVATION CAPABILITY. *Studia Universitatis Vasile Goldis Arad, Economics Series, 32*(4), 38-57. https://doi.org/10.2478/sues-2022-0018

Library and Learning, University of Phayao

Bhatnagar, R., Keskin, D., Kirkels, A., Romme, A. G. L., & Huijben, J. C. C. M. (2022). Design principles for sustainability assessments in the business model innovation process. *Journal of Cleaner Production, 377*, 134313. https://doi.org/10.1016/j.jclepro.2022.134313

Björkdahl, J., Fallahi, S., & Holmén, M. (2022). Explaining business model innovation processes: A problem formulation and problem solving perspective. *Industrial Marketing Management, 105*, 223-239. https://doi.org/10.1016/j.indmarman.2022.05.012

Cetinguc, B., & Calik, E. (2025). Navigating Innovation Process With Integration Of Artificial Intelligence. *IEEE Engineering Management Review*. https://doi.org/10.1109/EMR.2025.3624362

Daronco, E. L., Silva, D. S., Seibel, M. K., & Cortimiglia, M. N. (2023). A new framework of firm-level innovation capability: A propensity–ability perspective. *European Management Journal*, 41(2), 236–250. https://doi.org/10.1016/j.emj.2022.02.002

Eriksson, V., Keipi, T., & Björklund, T. (2023). Identifying and framing potential stakeholders in complex innovation ecosystems. *CERN IdeaSquare Journal of Experimental Innovation, 7*(3), 8-13. https://doi.org/10.23726/cij.2023.1477

Ghobakhloo, M., Iranmanesh, M., Grybauskas, A., Vilkas, M., & Petraitė, M. (2021). Industry 4.0, innovation, and sustainable development: A systematic review and a roadmap to sustainable innovation. *Business Strategy and the Environment, 30*(8), 4237-4257. https://doi.org/10.1002/bse.2867

Iqbal, S., Rasheed, M., Khan, H., & Siddiqi, A. (2020). Human resource practices and organizational innovation capability: role of knowledge management. *VINE Journal of Information and Knowledge Management Systems, 51*(5), 732-748. https://doi.org/10.1108/vjikms-02-2020-0033

ISO 56001(2004). Innovation process framework. https://gso-sims-preview-doc-aws.s3-eu-west-1.amazonaws.com/iso-56001-2024-en.html?utm_source=chatgpt.com. Access on 5 February 2026

Library and Learning, University of Phayao

Keränen, O., Lehtimäki, T., Komulainen, H., & Ulkuniemi, P. (2023). Changing the market for a sustainable innovation. *Industrial Marketing Management, 108*, 108-121. https://doi.org/10.1016/j.indmarman.2022.11.005

Lui, S., Ozdemir, S. Z., Jackson, C. J., Shinkle, G. A., & Walker, B. R. (2025). Managing the innovation process of small and medium-sized enterprises: The important roles of reflecting and employee involvement. *Australian Journal of Management, 50*(3), 917-938. https://doi.org/10.1177/03128962241270771

Molden, L. H., Vakulenko, M., & Clausen, T. H. (2025). Innovation at the project-level: the role of organisational innovation capabilities. *International Journal of Technology Management, 97*(1), 88-110. https://doi.org/10.1504/IJTM.2025.142962

O'Reilly, C., & Binns, A. J. M. (2019). The Three Stages of Disruptive Innovation: Idea Generation, Incubation, and Scaling. *California Management Review, 61*(3), 49-71. https://doi.org/10.1177/0008125619841878

Paasi, J., Wiman, H., Apilo, T., & Valkokari, K. (2023). Modeling the dynamics of innovation ecosystems. *International Journal of Innovation Studies, 7*(2), 142-158. https://doi.org/10.1016/j.ijis.2022.12.002

Parwita, G. B. S., Arsawan, I. W. E., Koval, V., Hrinchenko, R., Bogdanova, N., & Tamošiūnienė, R. (2022). ORGANIZATIONAL INNOVATION CAPABILITY: INTEGRATING HUMAN RESOURCE MANAGEMENT PRACTICE, KNOWLEDGE MANAGEMENT, AND INDIVIDUAL CREATIVITY. *Intellectual Economics, 15*(2), 22-45. https://doi.org/10.13165/IE-21-15-2-02

Perriton, E., Korsgaard, S., Gustafsson, S., Evald, Majbritt R., & Ingstrup, Mads B. (2025). Not Just Cocreation: Exploring the Shifting Interaction Logics in Sustainable Innovation. *Business Strategy and the Environment, 34*(4), 5095-5113. https://doi.org/10.1002/bse.4244

Library and Learning, University of Phayao

Singh, S. K., Del Giudice, M., Nicotra, M., & Fiano, F. (2022). How Firm Performs Under Stakeholder Pressure: Unpacking the Role of Absorptive Capacity and Innovation Capability. *IEEE Transactions on Engineering Management, 69*(6), 3802-3813. https://doi.org/10.1109/TEM.2020.3038867

Suvittawat, A. (2019). Passions and enthusiams of small and medium enterprises (SMES): A case study of Nakorn Ratchasima province, Thailand. *Entrepreneurship and Sustainability Issues, 6*(3), 1369-1379. https://doi.org/10.9770/jesi.2019.6.3(22)

Toth, C., & Hary, A. (2024). A Comprehensive Model for Innovation Ecosystems. *Triple Helix, 11*(2), 170-191. https://doi.org/10.1163/21971927-BJA10050

Van, H. V., Abu Afifa, M., & Bui, D. V. (2025). Linking Environmental Management Accounting to Sustainable Performance: The Mediating Role of Sustainable Innovation and the Moderating Role of Proactive Sustainability Strategy. *Business Strategy & Development, 8*(4), e70263. https://doi.org/10.1002/bsd2.70263

Visscher, K., Hahn, K., & Konrad, K. (2021). Innovation ecosystem strategies of industrial firms: A multilayered approach to alignment and strategic positioning. *Creativity and Innovation Management, 30*(3), 619-631. https://doi.org/10.1111/caim.12429

Yeboah, A. (2023). Innovation process model: An integration of innovation costs, benefits and core competence. *Cogent Business & Management, 10*(1), 2176445. https://doi.org/10.1080/23311975.2023.2176445

Yordanova, Z. (2023). Big Data as a Stakeholder of the Firm's Innovation Process. *TEM Journal, 12*(2), 1038-1047. https://doi.org/10.18421/TEM122-50

Zhang, W., Wang, L., White, S., Xie, Y., & Qian, L. (2026). Realizing Latent Use Contexts: Innovation Ecosystem Strategies to Drive Growth and Sustainability. *Journal of Product Innovation Management*. https://doi.org/10.1111/jpim.70023

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Chapter 3: Technological Innovation Management: Strategies, Diffusion, and Organizational Capabilities

Course Learning Outcomes (CLO):

1. Explain technological innovation and its strategic role.
2. Analyze the diffusion and adoption of innovations.
3. Evaluate organizational roles in innovation management.
4. Analyze organizational elements supporting innovation.
5. Evaluate success factors in development projects.

Contents and Concepts of This Chapter:

3.1 Technological Innovations

3.2 Diffusion of Technological Innovations

3.3 Roles in Technological Innovation Management

3.4 Elements of an Innovative Organization

3.5 Characteristics of Successful Development Projects

Case Study

Chapter Summary

Chapter Review Questions

Chapter Exercises

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3.1 Technological Innovations

Technological innovation refers to the development, adoption, and application of new technologies that transform how organizations create value, deliver services, and interact with consumers. In contemporary markets, technological innovation is closely associated with digital transformation, data-driven decision-making, and service-oriented business models. These innovations reshape organizational processes while simultaneously influencing marketing practices, consumer behavior, and the broader economic environment. As firms increasingly adopt advanced technologies such as artificial intelligence, big data analytics, cloud computing, and digital platforms, they are able to redesign value propositions, improve operational efficiency, and create more personalized and responsive customer experiences.

Technological innovation serves as a critical enabler for firms to reconfigure and renew their business models in response to evolving market conditions and technological advancements. By integrating digital technologies into core operations, organizations can accelerate digital transformation, enhance process efficiency, and create new value propositions. In technology-driven markets, such innovation not only improves responsiveness to customer needs but also strengthens competitive advantage by fostering differentiation, scalability, and long-term adaptability.

More specifically, technological innovation can be defined as the development or implementation of new or significantly improved products, processes, or technologically enabled services that enhance a firm's capabilities, competitiveness, and performance. Traditionally, technological innovation in manufacturing has been conceptualized primarily through product innovation and process innovation, which involve the introduction of new products or significant improvements in production and delivery methods. However, recent advancements in digitalization have expanded this perspective by incorporating digital service innovation as an additional technological dimension. Digital service innovation refers to the creation or enhancement of services through digital technologies that enable connected products, real-time data access, and improved interactions between providers and customers. Through these capabilities, firms can deliver value-added services such as remote monitoring, predictive maintenance, data analytics,

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and customized service solutions that complement their physical products. Consequently, technological innovation is increasingly viewed as a multidimensional construct integrating product, process, and digitally enabled service innovations, enabling firms to reconfigure their offerings, strengthen customer relationships, and improve organizational performance in technology-intensive industries (Opazo-Basáez et al., 2021).

Within the marketing domain, technological innovation involves the integration and application of advanced digital technologies to transform marketing processes, strategies, and customer interactions. Emerging technologies including artificial intelligence (AI), big data analytics, blockchain, cloud computing, and the Internet of Things (IoT) have fundamentally reshaped how organizations design marketing strategies, engage with customers, and create value in competitive markets. These technologies allow firms to collect and analyze vast volumes of real-time data, enabling marketers to better understand consumer behavior, personalize offerings, and deliver targeted and interactive marketing experiences. As a result, technological innovation enhances operational efficiency, strengthens customer relationships, and supports firms in achieving sustainable competitive advantage within dynamic digital ecosystems. Furthermore, technological innovation in marketing extends beyond organizational outcomes to influence individual-level performance, such as employee productivity and decision-making capabilities, as well as broader environmental dynamics including digital platform development and evolving consumer expectations. Accordingly, technological innovation functions as a strategic capability that enables organizations to integrate technological resources with marketing activities to enhance customer engagement, value creation, and overall firm performance in the digital economy (Chandiona, 2026).

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Technological innovations have also significantly transformed consumer behavior in the e-commerce environment by reshaping how consumers search for information, evaluate alternatives, interact with brands, and make purchasing decisions. Contemporary e-commerce ecosystems are increasingly driven by a range of digital technologies including websites, social media platforms, live-streaming commerce, artificial intelligence (AI), and immersive technologies such as augmented reality (AR) and virtual

reality (VR) which collectively enhance the accessibility, interactivity, and personalization of online shopping experiences. These technologies allow consumers to access extensive product information, interact with brands and other users, and participate in more engaging purchasing environments, thereby influencing their perceptions, emotions, and behavioral responses during the shopping process. For example, digital platforms and websites provide rich information resources that facilitate complex search behaviors and improve consumer decision-making by enabling comparisons of products, reviews, and detailed product information prior to purchase. Meanwhile, social media and social commerce platforms introduce interactive and community-driven elements into the purchasing process, where electronic word-of-mouth and peer interactions significantly influence consumer attitudes and purchase intentions. Emerging technologies such as live-streaming commerce further enhance engagement by enabling real-time interactions between consumers and sellers, combining entertainment, social engagement, and product demonstrations. Similarly, AI-driven tools including recommendation systems, chatbots, and personalized marketing algorithms improve the consumer experience by providing tailored product suggestions and supporting decision-making throughout the customer journey. Immersive technologies such as AR and VR further enhance online shopping by enabling consumers to visualize products in simulated environments, increasing perceived product value and reducing purchase uncertainty. Collectively, the integration of these technological innovations across e-commerce platforms has created more personalized, interactive, and consumer-centric digital environments, significantly influencing how consumers perceive value, interact with digital platforms, and make purchasing decisions in the modern digital marketplace (Wang et al., 2025).

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Technological innovation has also evolved beyond the traditional focus on product and process improvements, particularly as digital technologies enable new forms of value creation within manufacturing and industrial firms. In this context, the concept of treble innovation firms, referring to organizations that simultaneously implement process innovation, product innovation, and digital service innovation as an integrated technological innovation portfolio. This perspective builds on the resource-based view and the literature on strategic ambidexterity, suggesting that firms must balance exploitative innovations such as incremental improvements in

products and production processes with exploratory innovations, particularly digitally enabled service offerings. Digital service innovation involves integrating digital technologies such as sensors, real-time monitoring systems, artificial intelligence, and data analytics into product–service systems, enabling firms to generate new value through continuous customer interaction and data-driven services. By combining these three innovation domains, organizations can enhance operational efficiency, strengthen product differentiation, and create digitally enabled service ecosystems that support long-term competitive advantage and superior profitability in dynamic markets (Vendrell-Herrero et al., 2023).

Knowledge Innovation Matrix (KIM)

The Knowledge Innovation Matrix (KIM) is a conceptual framework developed by Gregor and Hevner (2014) to clarify the nature of innovation by focusing on the creation and application of knowledge. Rather than categorizing innovation solely through commonly used but often ambiguous labels such as radical versus incremental or exploratory versus exploitative the KIM framework evaluates innovation based on two fundamental dimensions: the maturity of the problem domain (application knowledge) and the maturity of solution knowledge. By combining these dimensions, the matrix provides a systematic typology for understanding how innovations emerge, how knowledge contributions are generated, and how innovations create real-world impact across organizations, industries, and societies. Consequently, the framework offers a shared conceptual language that can assist researchers, managers, entrepreneurs, and policymakers in analyzing and managing innovation processes more effectively.

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Organizations can utilize the Knowledge Innovation Matrix (KIM) as a strategic framework to systematically manage portfolios of innovation projects by categorizing initiatives based on the degree of knowledge novelty and application domain. This classification enables firms to maintain a balanced portfolio that includes both exploratory innovations focused on new knowledge creation and experimentation and exploitative innovations, which refine and extend existing capabilities for efficiency and incremental improvement. By mapping projects within the KIM, organizations can make informed decisions regarding resource allocation, ensuring that investments

are distributed appropriately across high-risk, high-reward initiatives and more predictable, performance-driven projects. Consequently, KIM supports strategic alignment between innovation efforts and organizational objectives while enhancing overall innovation performance.

At its core, the KIM framework conceptualizes innovation as the application of knowledge in tangible forms such as products, processes, or services to address human needs and generate societal or economic value. Innovations rarely arise from entirely new knowledge; rather, they typically build upon existing ideas, technologies, and prior research. Therefore, innovation projects vary depending on the maturity of both the problem domain and the available solution knowledge at the outset of the innovation process. The knowledge maturity dimension reflects the availability and development of solution knowledge, including technological expertise, theoretical insights, or design artifacts. Meanwhile, the application domain maturity dimension indicates the extent to which the problem context or market need is understood. Together, these dimensions form a 2×2 matrix that categorizes innovation into four types: Invention, Improvement (or Advancement), Exaptation, and Exploitation (Gregor & Hevner, 2014; Hevner & Gregor, 2022), as illustrated in Figure 3.1.

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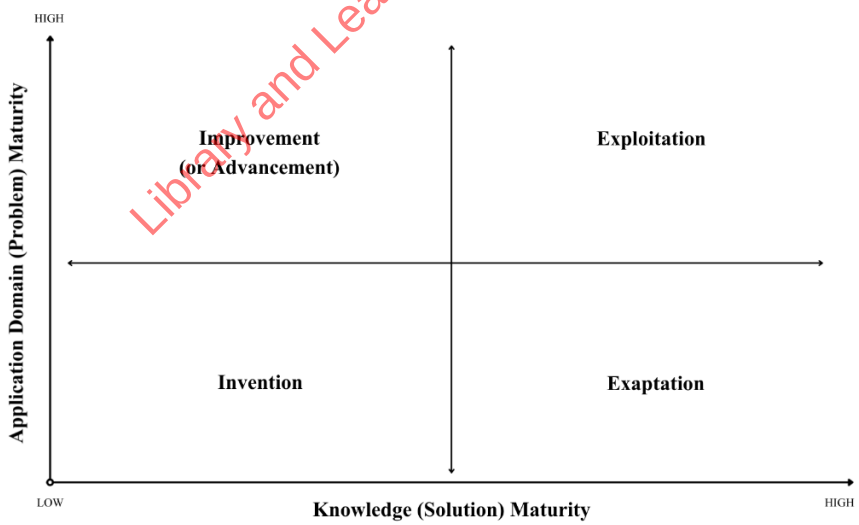

Figure 3.1 Knowledge Innovation Matrix (KIM)

Source: Adapted from regor, S., & Hevner, A. (2014). The Knowledge Innovation Matrix (KIM): A Clarifying Lens for Innovation. *Informing Science: The International Journal of an Emerging Transdiscipline*, 17, 217-239.

The first quadrant, Invention, represents situations where both the problem domain and solution knowledge exhibit low maturity. In such cases, innovators must simultaneously identify new problems or opportunities and develop entirely new solutions. These innovations are often considered radical breakthroughs because they represent fundamental departures from existing knowledge and practices. Since the problem context is poorly understood and effective solutions are not yet available, the innovation process typically involves exploratory experimentation, creative insight, and interdisciplinary collaboration. Examples include the early development of technologies such as the computer mouse, decision support systems, and data mining techniques. Although inventions often contribute significant new knowledge and may establish entirely new research fields or technological domains, their immediate practical impact may initially be uncertain (Gregor & Hevner, 2014).

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The second quadrant, Improvement (sometimes referred to as Advancement), describes innovation situations in which the problem domain is well understood but existing solutions remain incomplete or inefficient. In this context, innovators aim to develop improved solutions such as more efficient technologies, enhanced systems, or better service designs to address established problems. A significant proportion of research and development activities occur within this quadrant, where organizations build upon existing knowledge to produce better products, services, or processes. Improvements may involve incremental technological enhancements, performance optimization, or new design approaches that outperform previous solutions. Examples include improvements in digital camera resolution, advanced robotics systems, or more sophisticated decision-support technologies. While these innovations may not radically transform industries, their cumulative effects can significantly enhance productivity, competitiveness, and technological capability (Gregor & Hevner, 2014).

The third quadrant, Exaptation, occurs when solution knowledge is highly developed but the application domain is new or insufficiently

understood. In such cases, innovators transfer or adapt existing technologies or knowledge from one domain to solve problems in another. The concept of exaptation originates from evolutionary biology, where traits developed for one purpose later become useful for another. In technological innovation, exaptation often occurs when established technologies are repurposed for new applications. Examples include the integration of digital cameras into smartphones, the application of robotics in medical surgery, and the adaptation of data-warehouse technologies for healthcare information systems. Exaptation highlights the importance of interdisciplinary knowledge transfer and creative recombination of existing technologies in generating innovation (Gregor & Hevner, 2014).

The fourth quadrant, Exploitation, represents innovation situations in which both the problem domain and solution knowledge are highly mature. In these cases, organizations apply established knowledge and proven technologies to well-understood problems. Although this type of innovation typically generates limited new theoretical knowledge, it plays a critical role in translating innovations into widespread practical use. Exploitation activities include implementing best-practice technologies, adopting established systems within organizations, or commercializing previously developed innovations. For example, deploying enterprise resource planning systems or applying existing information technologies to organizational operations represents exploitation innovation. Despite limited knowledge novelty, the economic and societal impact of exploitation can be substantial because widespread adoption allows innovations to realize their full productivity and value potential (Gregor & Hevner, 2014).

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Beyond its descriptive function, the Knowledge Innovation Matrix also provides a strategic perspective for innovation management. Each quadrant involves different research opportunities, levels of uncertainty, and expected impacts. For instance, invention-oriented innovation emphasizes exploratory research and creative discovery, while improvement focuses on systematic research and development aimed at performance optimization. Exaptation requires interdisciplinary collaboration and knowledge transfer, whereas exploitation prioritizes implementation and organizational adoption. Understanding these distinctions allows organizations to strategically allocate

resources across different innovation types and balance exploratory innovation with practical application (Gregor & Hevner, 2014).

Subsequent research by Hevner and Gregor (2022) further extended the KIM framework within the context of digital innovation and design science research (DSR). Their work demonstrates how the four KIM quadrants correspond to different entrepreneurial innovation strategies invention, advancement, exaptation, and exploitation each requiring distinct organizational practices, stakeholder roles, and innovation processes. This extension emphasizes that digital innovation in modern organizations often requires an ambidextrous approach, in which firms simultaneously explore new technological opportunities while exploiting existing capabilities to create value. By integrating the KIM framework with design science research principles, the authors propose a structured approach for managing portfolios of digital innovation projects and navigating complex digital innovation ecosystems.

In conclusion, the Knowledge Innovation Matrix provides a comprehensive framework for understanding innovation through the interaction between knowledge creation and problem context. By distinguishing among invention, improvement, exaptation, and exploitation, the framework clarifies how innovations differ in terms of novelty, knowledge contribution, and practical impact. Consequently, KIM serves as a valuable analytical and managerial tool for researchers and practitioners seeking to conceptualize, evaluate, and strategically manage innovation in contemporary technological and organizational environments (Gregor & Hevner, 2014; Hevner & Gregor, 2022).

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To provide a coherent analytical structure, this chapter conceptualizes technological innovation as a multi-level system comprising five interrelated dimensions: (1) types of technological innovation, (2) diffusion and adoption mechanisms, (3) organizational roles in innovation management, (4) structural elements of innovative organizations, and (5) project-level implementation and success factors. This integrative perspective reflects the inherently systemic and dynamic nature of innovation, where technological change is not confined to isolated outputs but unfolds through interconnected processes across different levels of analysis. For instance, the opening section defines technological innovation and highlights its multidimensional

character, encompassing product, process, and digital service innovations. Subsequent sections extend this foundation by examining how innovations diffuse and are adopted, how organizations orchestrate and govern innovation activities, and how structural configurations enable or constrain innovative performance. Finally, the chapter addresses innovation at the project level, focusing on execution, coordination, and critical success factors. Collectively, these dimensions can be understood as sequential yet interdependent stages within a technological innovation system, offering a comprehensive framework for analyzing how innovations emerge, evolve, and generate value in contemporary organizational contexts.

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3.2 Diffusion of Technological Innovations

The diffusion of technological innovations refers to the process through which new ideas, practices, or technologies spread among members of a social system over time through communication channels.

Firms can accelerate the diffusion of technological innovations by deliberately managing key adoption drivers within target markets. One effective approach is to strategically target early adopters customers who are more open to experimentation and can serve as reference points for broader market acceptance. In parallel, firms should reduce perceived complexity by offering training programs, product demonstrations, and user-friendly interfaces that lower adoption barriers and enhance user confidence. Additionally, leveraging opinion leaders or influencers can significantly amplify diffusion dynamics, as these actors shape social norms and credibility within networks, thereby encouraging imitation and accelerating the transition from early adoption to mainstream acceptance.

Rooted in the Diffusion of Innovation (DOI) theory, diffusion is defined as the process by which an innovation is communicated among individuals or organizational units, influencing attitudes and adoption decisions within a community. The diffusion process involves four fundamental elements: the innovation itself, communication channels, time, and the social system in which diffusion occurs. An innovation is understood as any idea, practice, or object perceived as new by potential adopters, regardless of when it was originally introduced. The diffusion process

typically unfolds through a sequence known as the innovation–decision process, which includes five stages: knowledge, persuasion, decision, implementation, and confirmation. In this process, individuals first become aware of an innovation, develop attitudes toward it, decide whether to adopt or reject it, implement the innovation, and finally seek reinforcement for their adoption decision. Importantly, diffusion should not be viewed as a simple linear transfer of technology; rather, it represents a complex socio-technical phenomenon shaped by interpersonal communication, social networks, cultural norms, and institutional contexts that influence how innovations are interpreted and adopted within society (Al-Razgan et al., 2021).

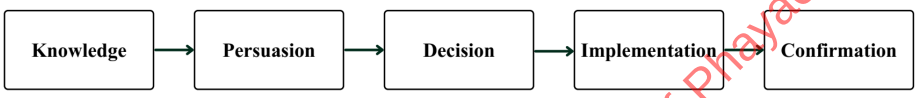

Figure 3.2 Innovation-Decision Process

Source: Adapted from Jierasup, S., & Leelasantitham, A. (2024). A change from negative to positive of later adoption using the innovation decision process to imply sustainability for HR chatbots of private companies in Thailand. *Sustainability*, 16(13), 5641

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As illustrated in Figure 3.2, the Innovation-Decision Process describes the sequence of cognitive and behavioral stages through which individuals or organizations move when adopting an innovation. The process begins with the knowledge stage, where actors become aware of the innovation and gain an initial understanding of how it functions. This is followed by the persuasion stage, during which attitudes toward the innovation are formed through evaluation of its perceived advantages, compatibility, and potential risks. In the decision stage, individuals or organizations choose whether to adopt or reject the innovation based on the information and perceptions developed earlier. If adoption is chosen, the implementation stage involves putting the innovation into practical use within operational activities. Finally, the confirmation stage occurs when adopters seek reinforcement for their decision and evaluate the outcomes of the innovation, which may either strengthen continued adoption or lead to reconsideration if the results do not meet expectations. This sequential process highlights how innovation

adoption evolves through progressive stages of awareness, evaluation, action, and validation.

The DOI framework further explains that the rate and extent of innovation adoption are influenced by several perceived attributes of the technology, including relative advantage, compatibility, complexity, trialability, and observability. These attributes shape individuals' perceptions of an innovation and consequently affect their willingness to adopt it. In the context of emerging technologies such as artificial intelligence (AI) in higher education, the DOI perspective provides a useful framework for understanding how users evaluate and integrate new digital tools. Empirical research suggests that perceived benefits, alignment with existing practices, opportunities for experimentation, and observable outcomes can significantly encourage adoption, whereas perceived complexity may act as a barrier. Moreover, diffusion theory highlights the heterogeneity of adopters, classifying them into categories such as innovators, early adopters, early majority, late majority, and laggards. These categories illustrate that technological adoption typically occurs gradually across social groups rather than simultaneously among all users (Gutiérrez-Leefmans et al., 2025; Reis & Junior, 2025).

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In addition to technological attributes, the diffusion of innovations is strongly influenced by the dynamics of social systems and the role of influential actors. Early adopters, in particular, often play a critical role in shaping diffusion trajectories because they serve as opinion leaders and credible sources of information for other potential adopters. Their experiences with new technologies can reduce uncertainty and demonstrate practical benefits, thereby encouraging broader adoption within the market or organization. Consequently, organizations and firms may strategically identify and engage early adopters during the commercialization stage of new technologies. Individuals possessing technological expertise, reputational influence, and strong network connections are particularly capable of accelerating the diffusion process by disseminating knowledge and validating the value of innovations to later adopters (Bianchi et al., 2017).

Furthermore, the diffusion of technological innovations is shaped by broader contextual and developmental conditions, especially in emerging economies where economic resources, infrastructure, and institutional

environments vary significantly. In such contexts, innovations that are affordable and tailored to local conditions such as frugal digital technologies tend to diffuse more rapidly because they align with the needs and purchasing power of low-income populations. Therefore, the diffusion process is influenced not only by technological characteristics but also by socio-economic structures, including income distribution, market accessibility, and institutional support systems that affect individuals' ability to adopt new technologies (Zhang, 2018).

At the organizational level, technological diffusion is also influenced by internal capabilities that support the implementation of innovations. Extending the DOI perspective, studies on the adoption of business intelligence (BI) systems highlight the importance of organizational and project management maturity in facilitating successful technological integration. Project management maturity reflects the extent to which organizations possess structured processes, managerial competencies, and coordination mechanisms for planning and executing technology-related projects. Higher levels of maturity enhance key innovation attributes such as perceived relative advantage, compatibility, and reduced complexity which subsequently increase the likelihood of technology adoption. In addition, organizational practices such as change management and knowledge sharing contribute to strengthening project management maturity and improving the implementation of new systems. Consequently, successful technological diffusion within organizations depends not only on the characteristics of the technology itself but also on the development of managerial capabilities and organizational processes that enable structured adoption and integration (Zoubi et al., 2023).

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In conclusion, the diffusion of technological innovations is a multifaceted process shaped by technological attributes, social dynamics, institutional contexts, and organizational capabilities. While the DOI framework provides a foundational explanation of how innovations spread through communication channels over time, contemporary research highlights the importance of contextual conditions, influential actors, and organizational readiness in shaping diffusion outcomes. Understanding these factors is essential for explaining how new technologies are adopted and integrated across individuals, organizations, and societies.

3.3 Roles in Technological Innovation Management

Technological innovation management involves multiple organizational roles that coordinate the development, implementation, and commercialization of new technologies. These roles encompass strategic leadership, knowledge integration, collaborative coordination, and digital capability development to ensure that technological innovations contribute effectively to organizational performance and long-term competitiveness. Innovation management is therefore not confined to a single department; rather, it requires coordinated interaction among managers, technical experts, knowledge workers, and external stakeholders who collectively facilitate the innovation process.

Within organizations, various actors play critical roles in ensuring that innovation activities are effectively aligned with strategic objectives. Innovation processes rely heavily on the interaction between leadership, specialized technical teams, and organizational support structures that guide the development and implementation of new technologies. Senior managers and organizational leaders are responsible for defining innovation strategies, allocating resources for research and development (R&D), and cultivating an organizational environment that supports experimentation and long-term technological investment. At the operational level, engineers, researchers, and technical specialists transform scientific knowledge and technological capabilities into new products and processes. Meanwhile, cross-functional collaboration among departments such as R&D, marketing, finance, and engineering ensures that innovations are both technically feasible and commercially viable. In addition, actors involved in knowledge management and external collaboration, including partnerships with universities, suppliers, and research institutions, facilitate the exchange and integration of knowledge necessary for technological advancement. Consequently, technological innovation management requires coordinated roles across multiple organizational levels, where strategic leadership, technical expertise, and collaborative networks collectively support the successful development and commercialization of innovations (Matos et al., 2021).

Beyond managerial leadership, organizational culture plays a crucial role in facilitating cooperation in technological innovation, particularly in collaborative relationships between firms and research institutions.

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Technological innovation increasingly emerges through interorganizational collaboration, which requires cultural values and management practices that encourage cooperation, knowledge sharing, and joint problem solving. Organizational culture functions as an intangible resource embedded in shared values and routines that shape how organizations engage in cooperative innovation activities. Such a culture promotes knowledge mobilization between partners, supports creativity and technological learning, and encourages the formation of interorganizational teams capable of interacting across organizational boundaries. Through these cultural mechanisms, organizations can better integrate complementary expertise, strengthen collaborative relationships, and enhance the effectiveness of joint technological innovation initiatives (Parolin et al., 2020).

Innovation organization networks also play a significant role in facilitating cross-organizational technological innovation, particularly in large and complex projects. In megaproject contexts, technological innovation typically involves multiple stakeholders including government agencies, project owners, contractors, suppliers, universities, and research institutions whose collaboration forms an interdependent innovation network. These networks enable the integration of diverse technological resources, knowledge, and capabilities across organizational boundaries, thereby enhancing coordination and synergy in technological innovation activities. By structuring relationships among participating organizations and promoting communication, interaction, and resource integration, innovation networks help overcome resource limitations and support the achievement of collective innovation goals in cross-organizational settings (Zhao et al., 2023).

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Another important role in technological innovation management involves the strategic reconfiguration of organizational resources and capabilities. In rapidly evolving technological environments, firms must balance the simultaneous pursuit of exploration and exploitation, a capability widely referred to as organizational ambidexterity. Within this context, innovation managers increasingly engage in exnovation, defined as the deliberate termination or phase-out of obsolete technologies, infrastructures, or organizational routines that hinder technological renewal. Effective innovation management therefore involves not only adopting new technologies but also systematically eliminating outdated systems to release

financial, human, and cognitive resources that can be redirected toward emerging technological opportunities. Through such resource reconfiguration, firms can reduce organizational inertia and create capacity for both incremental improvements and exploratory innovation initiatives. Consequently, decision-makers play a crucial role in identifying legacy technologies, managing transitions from old systems to new ones, and maintaining a balance between operational continuity and technological transformation. This capability becomes particularly critical in industries characterized by rapid digital disruption, where organizations must continuously redesign their technological portfolios to sustain innovation and competitive advantage (Hadi et al., 2026).

Technological innovation management also involves managerial roles that guide how firms sense opportunities, make strategic investment decisions, and reconfigure organizational resources to support innovation outcomes. Drawing on the dynamic capability perspective, managers develop sensing, seizing, and reconfiguring capabilities that enable firms to identify technological opportunities, evaluate strategic alternatives, and mobilize resources for innovation activities. In the context of digital transformation, managers increasingly rely on digital technologies and analytical tools to process large volumes of information, monitor technological trends, and coordinate innovation processes across organizational units. These managerial functions help reduce information asymmetry, enhance organizational information processing, and facilitate the reallocation of resources such as R&D investments toward promising technological initiatives. Through these mechanisms, technological innovation management contributes to improving firms' technological innovation performance in terms of innovation quantity, quality, and efficiency (Xu et al., 2025).

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Recent developments in artificial intelligence (AI) further expand managerial roles in technological innovation. AI-driven management enhances knowledge creation and enables data-driven organizational learning. Technologies such as machine learning and big data analytics allow organizations to extract insights from large and complex datasets, thereby supporting more informed managerial decision-making and improving operational efficiency. Through the generation and application of data-based knowledge, AI strengthens strategic planning, enhances organizational

capabilities, and supports the development of innovative and sustainable business practices. Moreover, the integration of AI facilitates alignment between technological capabilities, knowledge management, and digital transformation initiatives, ultimately contributing to long-term organizational growth and competitiveness (Raina et al., 2026).

In addition, artificial intelligence can enhance technological innovation outcomes by strengthening firms' digital transformation processes and supporting improvements in environmental, social, and governance (ESG) performance. AI technologies enable organizations to process large volumes of data, optimize resource allocation, and improve decision-making efficiency, thereby facilitating green innovation, strengthening environmental management practices, and increasing transparency in corporate governance and social responsibility reporting. Through these mechanisms, AI-driven digital transformation restructures organizational processes and supports sustainable value creation. Consequently, effective AI integration requires technology managers and data specialists who can oversee digital innovation initiatives, manage data-driven systems, and ensure that AI-enabled technological development aligns with corporate sustainability and ESG objectives (Song et al., 2025).

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As illustrated in Figure 3.3, technological innovation management involves multiple organizational roles that collectively support the development, implementation, and diffusion of new technologies within an organization. These roles include strategic leadership, which provides direction and vision for innovation initiatives, and technical expertise combined with knowledge integration, which enables organizations to transform scientific and technological knowledge into practical applications. In addition, cross-functional collaboration and an organizational culture that supports collaborative innovation play crucial roles in facilitating communication, knowledge sharing, and coordinated problem-solving across different departments. The innovation process is further strengthened through interorganizational innovation networks, which allow firms to access external knowledge, partnerships, and technological capabilities. Furthermore, organizations must possess the ability to reconfigure resources and maintain organizational ambidexterity in order to balance exploration of new opportunities with the exploitation of existing capabilities. Finally, the

adoption of digital technologies and artificial intelligence, together with AI-driven digital transformation strategies aligned with sustainability goals, enables organizations to enhance innovation efficiency, create new value propositions, and maintain long-term competitiveness in rapidly evolving technological environments.

Collectively, these roles constitute an integrated organizational capability architecture that underpins effective technological innovation management. Rather than operating in isolation, strategic leadership, technical expertise, collaborative mechanisms, and digital capabilities function as interdependent components that jointly enable firms to sense opportunities, mobilize and recombine resources, and execute innovation initiatives. This architecture reflects a dynamic capability perspective, in which organizations continuously align knowledge integration, cultural support, network engagement, and AI-driven transformation to sustain both exploratory and exploitative innovation. As a result, firms are better positioned to adapt to technological change, enhance innovation performance, and maintain long-term competitive advantage in rapidly evolving environments.

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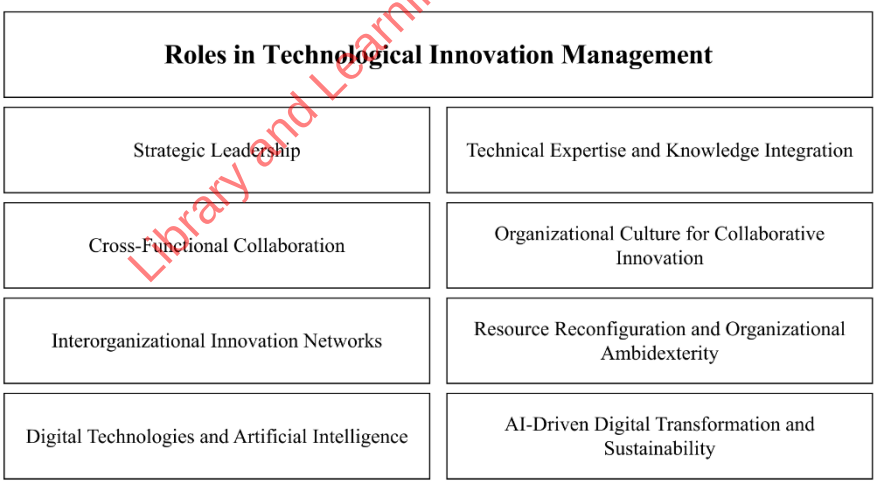

Figure 3.3 Roles in Technological Innovation Management

Source: Adapted from Steele, L. M., & Watts, L. L. (2022). Managing technical innovation: A systematic review of 11 leader functions. *Technovation*, 115, 102539

In conclusion, technological innovation management involves a diverse set of organizational roles that collectively support the development, coordination, and implementation of technological innovations. Strategic leadership, technical expertise, collaborative networks, and digital capabilities interact to shape how organizations generate, manage, and commercialize technological knowledge. As technological environments become increasingly digital and interconnected, the integration of AI, dynamic capabilities, and interorganizational collaboration further expands the scope of innovation management roles. These coordinated functions enable organizations to enhance innovation performance, adapt to technological change, and sustain long-term competitive advantage.

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3.4 Elements of an Innovative Organization

An innovative organization refers to an organization that systematically develops structures, capabilities, and cultural conditions that support the continuous generation, diffusion, and implementation of new ideas, technologies, processes, and services. Rather than relying solely on individual creativity, innovative organizations integrate strategic direction, organizational capabilities, human resources, knowledge management, and technological infrastructure to sustain long-term innovation performance. The development of such organizations therefore requires coordinated organizational elements that collectively enable adaptability, organizational learning, and value creation in rapidly changing environments.

Chutivongse and Gerdsri (2019) propose that innovative organizations are supported by a set of interrelated organizational capabilities and structural characteristics that enable firms to generate, implement, and sustain innovation. Based on literature review and empirical validation, these characteristics can be categorized into six key elements: organizational structure, organizational climate and culture, knowledge management, human resource management, leadership style, and strategic alliances. Together, these elements form the foundation that supports innovative activities and enhances long-term organizational competitiveness. As illustrated in Figure 3.4, they should not be viewed as isolated organizational components; rather, they constitute an integrated and mutually reinforcing system that underpins

innovation capability. Organizational structure, culture, leadership, and knowledge management interact dynamically with human resource practices and external partnerships to facilitate continuous idea generation, enable effective knowledge sharing, and support technological experimentation. Through this systemic alignment, organizations are better positioned to reduce uncertainty, accelerate learning cycles, and transform novel ideas into viable products, services, and processes. Ultimately, the integration of these elements enhances the organization's capacity to successfully commercialize innovations and sustain competitive advantage in rapidly evolving environments.

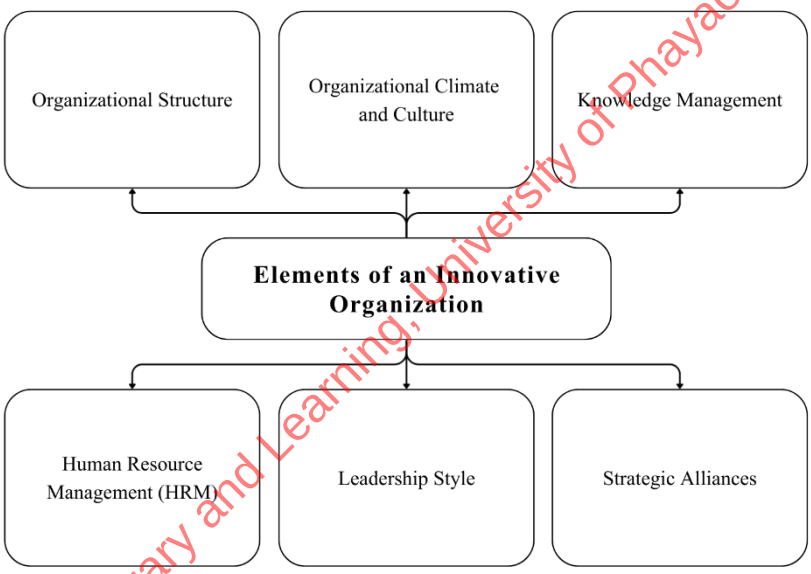

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Figure 3.4 Elements of an Innovative Organization

Source: Adapted from Daronco, E. L., Silva, D. S., Seibel, M. K., & Cortimiglia, M. N. (2023). A new framework of firm-level innovation capability: A propensity–ability perspective. *European Management Journal*, 41(2), 236–250.

1. Organizational Structure

Organizational structure refers to the formal arrangement of roles, responsibilities, communication channels, and authority relationships within

an organization. In innovative organizations, structures are designed to facilitate collaboration, flexibility, and cross-functional coordination rather than relying on rigid hierarchical control mechanisms.

Structures that support teamwork, flexible work processes, and informal communication across functional units are more conducive to innovation. Such structures enable faster decision-making, enhance knowledge sharing, and encourage employees to experiment with new ideas.

Key structural characteristics include:

- Decentralization – empowering employees and middle managers to make decisions related to innovation activities.
- Teamwork orientation – encouraging collaboration among multidisciplinary teams to address complex problems.
- Horizontal communication – promoting open communication across departments rather than relying solely on vertical command structures.

A flexible and collaborative organizational structure enables organizations to adapt more effectively to environmental changes and respond rapidly to emerging technological opportunities (Chutivongse & Gerdsri, 2019).

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2. Organizational Climate and Culture

Organizational climate and culture refer to the shared values, norms, attitudes, and working environment that shape employees' behaviors and perceptions toward innovation. An innovation-supportive culture encourages creativity, experimentation, and knowledge sharing.

Innovative organizations typically cultivate a culture characterized by:

- A clear innovation vision and strategy
- Open communication and mutual trust among employees
- Encouragement of idea generation and experimentation
- Acceptance of reasonable risk and tolerance for failure
- Employee involvement and a sense of ownership in innovation initiatives

Support mechanisms, such as providing time, technological tools, and financial resources for innovation activities, also play a critical role in fostering innovative behavior among employees. When employees feel psychologically safe and motivated to propose new ideas, organizations become better positioned to generate and implement innovative solutions (Chutivongse & Gerdsri, 2019).

3. Knowledge Management

Knowledge management represents a critical organizational capability that enables firms to capture, store, share, and utilize knowledge to support innovation processes. Knowledge is widely regarded as a strategic resource that drives idea generation, problem solving, and technological development.

Effective knowledge management systems facilitate:

- Knowledge creation – generating new knowledge through research, experimentation, and learning activities.
- Knowledge sharing – disseminating knowledge across departments and teams to prevent information silos.
- Knowledge accumulation – storing valuable experiences and lessons learned for future use.
- Organizational learning – transforming information and experiences into actionable knowledge.

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Through systematic knowledge management practices, organizations can transform individual knowledge into collective organizational capability, thereby strengthening innovation performance and long-term competitiveness (Chutivongse & Gerdsri, 2019).

4. Human Resource Management (HRM)

Human resource management plays a crucial role in developing employees' skills, competencies, and motivation to participate in innovation activities. Innovative organizations therefore emphasize the development of human capital rather than relying solely on technological resources.

Key HRM practices that support innovation include:

- Recruitment and selection – hiring employees with strong creative thinking and problem-solving abilities.
- Training and development – providing programs that enhance creativity, technical competence, and innovation management capabilities.
- Performance evaluation systems – assessing employees based on their contributions to innovation activities and outcomes.
- Reward systems – offering incentives and recognition for innovative ideas and successful innovation projects.

By aligning human resource practices with innovation objectives, organizations can develop a workforce that actively contributes to the creation of new products, services, and business models (Chutivongse & Gerdsri, 2019).

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5. Leadership Style

Leadership is a critical driver of innovation because leaders shape organizational vision, culture, and strategic direction. Innovative organizations require leaders who encourage exploration, support experimentation, and empower employees to contribute innovative ideas.

Innovation-oriented leadership typically includes the following characteristics:

- People-oriented leadership – emphasizing employee empowerment and personal development.
- Tolerance for uncertainty and failure – recognizing mistakes as part of the learning process in innovation development.
- Coaching and mentoring – guiding employees to enhance their innovative capabilities.
- Open communication – encouraging dialogue and knowledge exchange between leaders and employees.

Leaders who promote trust, autonomy, and continuous learning create an environment in which employees feel confident proposing and implementing innovative solutions (Chutivongse & Gerdsri, 2019).

6. Strategic Alliances

Strategic alliances refer to collaborative partnerships with external stakeholders such as suppliers, universities, research institutions, and other firms. These partnerships enable organizations to access external knowledge, technologies, and resources that may not be available internally.

Strategic alliances contribute to innovation through several mechanisms, including:

- Partner scanning – identifying potential partners with complementary capabilities.
- Coordination with partners – managing collaborative activities and aligning shared objectives.
- Evaluation of partnership outcomes – assessing the effectiveness and value of collaborative initiatives.
- Learning from partners – acquiring new knowledge and best practices from external networks.

Through such collaborations and open innovation practices, organizations can enhance their ability to develop new technologies, products, and services while reducing development costs and risks (Chutivongse & Gerdsri, 2019).

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Beyond internal structures and capabilities, knowledge transfer processes also play a crucial role in shaping innovative organizations. Organizations that effectively leverage internal knowledge assets and knowledge-sharing mechanisms can strengthen collaboration, learning, and innovation outcomes. In small innovative firms, particularly those operating in knowledge-intensive sectors such as software development, innovation heavily depends on employees' ability to exchange experiences, expertise, and problem-solving insights through both formal and informal interactions. These knowledge exchanges enable employees to acquire, absorb, and apply new knowledge, thereby strengthening the organization's innovative capability. To support knowledge transfer, organizations often employ various mechanisms such as communities of practice, project team collaboration, cross-team interactions, meetings, technological platforms, and informal social activities. Importantly, these mechanisms may vary in their

level of formalization, and innovation outcomes may emerge from different organizational configurations, suggesting that there is no single optimal structure for knowledge transfer in innovative firms (Spraggon & Bodolica, 2020).

Technological capability also plays a significant role in shaping innovative organizations. Organizations increasingly leverage advanced digital technologies and data-driven analytical approaches to enhance their operations, products, and services. In the context of e-commerce, innovative organizations utilize techniques such as text mining, sentiment analysis, and machine learning to extract meaningful insights from large volumes of user-generated content. By systematically analyzing customer reviews and feedback, organizations can identify product deficiencies, understand consumer preferences, and support strategic decision-making processes. These capabilities enable firms to improve operational efficiency, enhance customer experience, and strengthen their competitive position in rapidly evolving digital markets (Abudureheman, 2023).

From a broader organizational perspective, innovative organizations can also be conceptualized as smart organizations that integrate technological infrastructure with human-centered organizational elements to enhance innovation, collaboration, and knowledge creation. Drawing inspiration from the smart city framework, such organizations combine “hard” components such as digital technologies, systems, and structural arrangements with “soft” components including organizational culture, human capital, and knowledge-sharing practices. This integration supports flexible processes, collaborative ecosystems, participative governance, and continuous learning among employees. By aligning technological capabilities with human and social capital, organizations can create environments that foster creativity, productivity, and sustainable value creation in knowledge-intensive environments (Lima, 2020).

In service-oriented industries such as logistics, innovation is often associated with the development of service-based solutions aimed at improving customer experience, operational efficiency, and responsiveness to market demands. Service innovation in logistics organizations may manifest through several operational practices, including customer satisfaction guarantees, service guarantees, service blueprint design,

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installment payment options, product testing trials, and additional service offerings. These innovation practices enable logistics firms to respond effectively to rapidly changing customer demands driven by digitalization and the expansion of e-commerce. By integrating service innovations into their operations, logistics organizations can enhance service quality, differentiate themselves from competitors, and support long-term business growth. Moreover, entrepreneurs' ability to understand customer needs and continuously develop innovative service solutions is considered a critical factor in sustaining competitiveness and expanding market opportunities in the logistics sector (Suvittawat, 2020).

In conclusion, innovative organizations are characterized by the integration of supportive organizational structures, innovation-oriented culture, effective knowledge management systems, strategic human resource practices, empowering leadership, and collaborative external partnerships. Together with digital capabilities and knowledge-sharing mechanisms, these elements enable organizations to continuously generate, implement, and sustain innovation. By aligning internal capabilities with technological and collaborative networks, organizations can enhance adaptability, strengthen competitiveness, and achieve sustainable innovation-driven growth in dynamic business environments.

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3.5 Characteristics of Successful Development Projects

Successful development projects are characterized by a combination of effective project management practices, strong organizational capabilities, collaborative team dynamics, and alignment with broader sustainability and strategic objectives. In contemporary project environments, success is increasingly assessed through multidimensional performance indicators rather than relying solely on the traditional project management constraints of time, cost, and scope.

Innovation projects differ fundamentally from conventional projects in that they are characterized by substantially higher levels of uncertainty, greater technological complexity, and an inherent emphasis on knowledge creation processes. Unlike routine projects that operate within well-defined parameters and predictable outcomes, innovation projects involve ambiguous

goals, evolving requirements, and a significant risk of failure due to untested technologies or novel applications. This complexity necessitates iterative experimentation, cross-functional collaboration, and continuous learning, as new knowledge must be generated, integrated, and applied throughout the project lifecycle. Consequently, managing innovation projects requires more flexible structures, adaptive decision-making, and a tolerance for ambiguity, distinguishing them clearly from traditional project management approaches.

Development projects today often operate in complex environments characterized by economic volatility, regulatory changes, technological advancements, and the involvement of multiple stakeholders. These conditions increase the level of uncertainty surrounding project implementation. Consequently, effective project management requires flexible management approaches, systematic monitoring, and proactive risk management to maintain project efficiency and adaptability. The ability of project managers and teams to respond to changing market conditions, coordinate project participants, and integrate innovative management practices plays a critical role in ensuring successful project outcomes. In this context, structured evaluation models that incorporate financial indicators, quality performance, time efficiency, risk considerations, and stakeholder satisfaction provide a more comprehensive assessment of project effectiveness under uncertain conditions (Malykhin et al., 2025).

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Another important characteristic of successful development projects is the presence of clearly defined objectives and appropriate performance measurement systems. Evidence from new product development (NPD) projects in small and medium-sized enterprises (SMEs) indicates that monitoring project activities through relevant performance indicators enables managers to more effectively control resource allocation, evaluate project progress, and support decision-making throughout the development process. Such indicators allow organizations to assess whether project objectives are being achieved and provide guidance on whether projects should be continued, modified, or terminated at different stages of development. Consequently, structured performance measurement frameworks improve the management of NPD projects and contribute to reducing the risk of project failure (Blais et al., 2023).

Leadership and team dynamics also play a critical role in shaping the success of development projects. In particular, leader emotional intelligence (LEI) has been identified as an important factor influencing trust and collaboration within project teams. Leaders who demonstrate high emotional intelligence are better able to understand and regulate both their own emotions and those of their team members, thereby fostering stronger interpersonal relationships and more cohesive team environments. Higher levels of leader emotional intelligence have been shown to enhance trust among team members, which in turn promotes collaborative behaviors and knowledge sharing. In this context, trust acts as a key mechanism that encourages individuals to exchange information, share expertise, and cooperate in addressing project-related challenges. Such knowledge-sharing behaviors contribute to improved team performance and support the achievement of project objectives, thereby increasing the likelihood of project success (Anvari et al., 2026).

Learning capability within project teams represents another fundamental mechanism through which organizations accumulate and apply knowledge derived from experience. In the context of NPD, team learning is a collective process in which members acquire, share, and apply knowledge generated during project activities. Through continuous interaction and knowledge exchange, teams expand their shared knowledge base, improve problem-solving capabilities, and enhance their ability to respond to future project challenges. This learning process is further strengthened when teams reflect on their experiences, analyze project outcomes, and incorporate lessons learned into their practices and routines. As a result, insights derived from both successful and unsuccessful projects contribute to the development of team learning, enabling organizations to improve coordination, refine development processes, and strengthen their overall innovation capability over time (Balzano & Marzi, 2023).

The identification and effective management of critical success factors (CSFs) also constitute a central component in achieving successful project outcomes and enhancing organizational competitiveness. Several key factors significantly influence project success, including the competencies and experience of project managers, clearly defined user requirements and project goals, effective stakeholder relationship management, continuous

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project monitoring and control, and the capabilities of project team members. These factors collectively contribute to improving project execution, reducing uncertainty, and ensuring alignment between project objectives and organizational performance. Competent project leadership facilitates effective decision-making and coordination, while clearly defined project goals help prevent misunderstandings and implementation delays. Similarly, effective stakeholder management and systematic monitoring mechanisms support timely interventions and strengthen overall project performance (Blaskovics et al., 2026).

Successful development projects increasingly incorporate sustainability considerations and their broader societal implications. Within global development agendas, projects are expected to generate not only economic benefits but also positive social and environmental outcomes aligned with the Sustainable Development Goals (SDGs). Recognizing the complex interactions between development activities and SDG targets, researchers have proposed analytical tools to evaluate how specific projects contribute to sustainable development outcomes. For example, the Sustainable Development Goals Impact Assessment Framework for Energy Projects (SDGs-IAE) was developed to systematically identify potential synergies and trade-offs between energy projects and SDG targets. Such frameworks enable stakeholders to better understand how project activities may support or hinder sustainable development objectives. By integrating sustainability assessment tools into project evaluation processes, organizations can more effectively consider the broader social, environmental, and economic implications of development initiatives and support more informed decision-making toward sustainable development (Castor et al., 2020).

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As illustrated in Figure 3.5, successful development projects are characterized by six key components: effective project management, structured evaluation systems, strong leadership, collaborative learning, critical success factor management, and sustainability considerations. These elements collectively contribute to the successful implementation and long-term impact of development initiatives. Effective project management ensures the efficient allocation of resources, adherence to timelines, and coordination of project activities. Structured evaluation systems provide

mechanisms for monitoring progress and assessing project outcomes. Strong leadership plays a vital role in guiding teams, facilitating decision-making, and maintaining strategic direction. Collaborative learning encourages knowledge sharing and continuous improvement among stakeholders. Critical success factor management enables project teams to identify and prioritize essential elements that influence project outcomes. Finally, sustainability considerations ensure that development projects generate lasting social, economic, and environmental benefits beyond the project lifecycle.

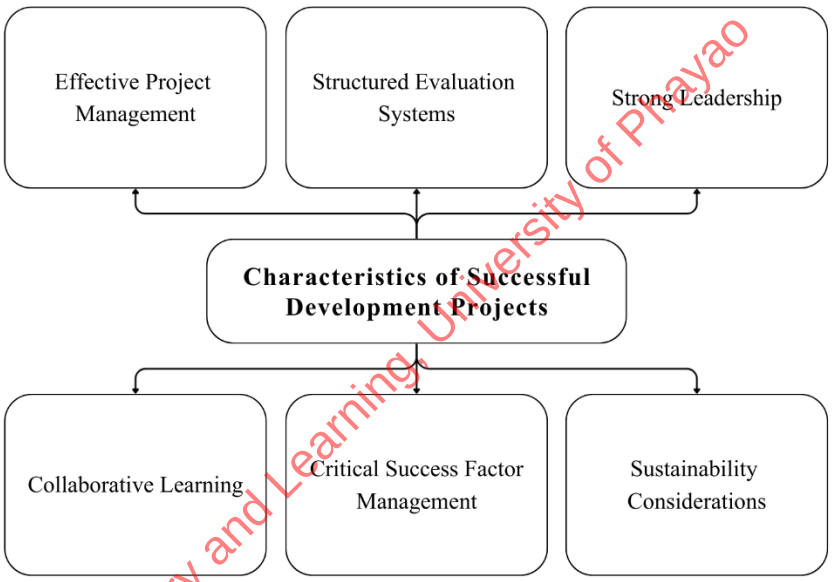

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Figure 3.5 Characteristics of Successful Development Projects

Source: Adapted from Shinde, B., Sanap, S., Pawar, S., & Wakchaure, V. (2025). Review of critical success factors and frameworks of new product development process. *International Journal of Product Development*, 29(2), 121–167

In conclusion, successful development projects require the integration of effective management practices, clear performance measurement systems, capable leadership, collaborative team learning, and the systematic management of critical success factors. In addition, incorporating

sustainability considerations into project evaluation further enhances the long-term value and societal impact of development initiatives. Together, these characteristics enable organizations to manage complexity, reduce uncertainty, and improve the overall success of development projects.

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Case Study

The following case illustrates how service innovation can be understood as a form of technological innovation, particularly through the integration of digital platforms and logistics systems. It highlights the critical role of customer-oriented innovation in enhancing service delivery, responsiveness, and value creation within logistics services. Furthermore, the case demonstrates how key innovation management concepts—such as adaptability, resource leveraging, and continuous improvement—can be effectively applied within SMEs to strengthen their competitiveness and sustain growth in dynamic market environments.

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Logistics Service Innovation as a Driver of Business Growth

Adapted Reprint from:

Suvittawat, A. (2020). Logistics service innovation for business growth: A case study of logistics service entrepreneurs. Polish Journal of Management Studies, 21(1), 394-407. https://doi.org/10.17512/pjms.2020.21.1.29

1. Introduction

Entrepreneurship is widely acknowledged as a fundamental driver of economic development, as it stimulates innovation, enhances the efficient allocation of resources, and contributes to wealth creation and employment generation. In the context of rapid transformations in the global economy, entrepreneurs and business organizations are increasingly required to adapt their strategic approaches, with particular attention to the development of service innovation. The expansion of market accessibility, the internationalization of products and services, and the accelerated growth of e-commerce have significantly increased the demand for effective and reliable logistics services. At the same time, evolving customer expectations especially the demand for rapid, on-demand delivery and cost-efficient operations have rendered traditional logistics models insufficient, thereby highlighting the necessity for continuous service innovation within the logistics sector.

Innovation is broadly recognized as a critical source of competitive advantage that can influence business growth both directly and indirectly. For logistics entrepreneurs, service innovation is especially crucial because business performance in this sector is closely linked to the quality and effectiveness of service delivery. Through the development of new service concepts, improved service processes, and the integration of emerging technologies, service innovation enhances operational performance and creates greater value for customers. As the service economy continues to expand globally, service innovation has increasingly become an important mechanism for stimulating economic progress and supporting sustainable business growth.

2. National Context: Logistics Service Entrepreneurs in Thailand

Thai logistics service entrepreneurs encounter substantial challenges due to limited capabilities in developing service-based innovations. Historically, innovation activities in the sector have focused predominantly on product development rather than the creation of service-oriented solutions. However, as the service sector increasingly contributes to economic expansion, service innovation has become a crucial factor for maintaining competitiveness. The rapid growth of outsourced logistics operations, the integration of information technology, and the influence of globalization and digital transformation combined with evolving customer expectations have significantly intensified industry competition. As a result, logistics firms must strengthen their resource management, innovation capacity, and service quality to enhance operational performance, improve customer satisfaction, and build sustainable long-term relationships with clients.

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Service innovation contributes significantly to value creation by enhancing the overall service experience for customers. This can be achieved through the provision of complementary and support services, including product handling, transportation, information services, warranty systems, and after-sales support. Managerial tools such as service design and service blueprinting enable organizations to better understand customer journeys, identify potential service failures, and improve service efficiency and quality. Effective service design also requires balancing service quality, operational costs, and organizational reputation to ensure that logistics services meet customer expectations while maintaining profitability.

Within the context of rapid e-commerce expansion and intensifying industry competition, Thai logistics entrepreneurs must continuously adapt their business models to deliver services that are fast, convenient, and reliable. Customer satisfaction has become a critical determinant of business growth, organizational survival, and long-term sustainability. Failure to meet customer expectations may result in customers switching to competing service providers. Therefore, strategies such as service guarantees, service differentiation, and digital transformation play an important role in supporting service innovation and sustaining competitive advantage. Ultimately, service innovation serves as a fundamental driver of organizational performance, customer retention, and sustainable economic development within the Thai logistics industry.

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3. Methodology and Research Framework

The empirical foundation of this exploratory case study focuses on identifying new factors influencing service innovation among Thai logistics entrepreneurs and examining the extent to which each service innovation factor impacts business growth; the study employs a quantitative approach using randomly distributed questionnaires, incorporates qualitative contextual tools as an initial parameter for factor identification, utilizes secondary data from bibliographical reviews and prior research for result confirmation, and is based on face-to-face surveys conducted with 44 logistics service entrepreneurs located in the north-east and central regions of Thailand. Descriptive statistical methods, specifically the mean and standard deviation (SD), were employed for data analysis. The conclusions were derived based on the results of the research analysis.

The survey consists of measures capturing key constructs:

- Service Innovation – customer satisfaction guarantee, service blueprint, service guarantee, additional service, pay by installment, and product testing trial.
- Business Growth

Based on the research framework, the independent variables—customer satisfaction guarantee, service blueprint, service guarantee, additional service, pay by installment, and product testing trial—have direct effects on service innovation. In turn, service innovation has a direct influence on business growth.

4. Findings and Discussion

4.1 Service Innovation Dimensions

Among independent variables customer satisfaction guarantee, service blueprint, service guarantee, additional service, pay by installment, and product testing trial have direct effects on service innovation.

The results indicate that logistics service entrepreneurs demonstrate a high level of agreement, with a mean score of 4.10 and a standard deviation of 0.86.

The means and standard deviations (SD) of the following independent variables:

- Customer Satisfaction Guarantee (mean = 4.42, SD = 0.66)
- Service Guarantee (mean = 4.26, SD = 0.76)
- Service Blueprint (mean = 4.20, SD = 0.76)
- Pay By Installment (mean = 3.98, SD = 0.97)
- Additional Service (mean = 3.97, SD = 0.84)
- Product Testing Trial (mean = 3.79, SD = 0.99)

These variables influence service innovation.

Logistics service customers increasingly prioritize efficient core logistics operations while simultaneously expecting providers to deliver meaningful and differentiated service innovations. As a result, logistics service providers must design and implement attractive service innovations based on a clear and accurate understanding of customer expectations and operational needs.

Each independent variable plays a direct role in fostering service innovation. Customer satisfaction guarantees motivate firms to continuously improve service quality and introduce innovative solutions in response to competitive pressures. Service guarantees act as formal commitments that require providers to align operational processes with customer expectations, with their effectiveness depending on customers' understanding, active interaction, and the provider's ability to deliver reliable service outcomes. Furthermore, service blueprints and service design are essential mechanisms for value creation, as they enhance service quality, increase cost efficiency, and improve customer perceptions, ultimately strengthening organizational competitiveness.

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Moreover, financial flexibility through pay-by-installment options assists customers in managing cash flow while simultaneously increasing the attractiveness of logistics services. Additional services, although not part of the core service agreement, play a significant role in supporting logistics operations and enhancing overall customer satisfaction. Product testing trials also contribute to service innovation by improving customer experience, allowing customers to compare alternatives with competing providers, and increasing the probability of successful service or product adoption.

In summary, customer satisfaction guarantees, service blueprints, service guarantees, additional services, pay-by-installment options, and product testing trials each exert a direct and positive influence on service innovation. Collectively, these factors function as critical strategic drivers that enhance competitiveness within the logistics service industry.

4.2 The Integration of Service Innovation to Drive Business Growth

Service innovation fosters business growth through several interconnected dimensions, including customer satisfaction guarantees, service blueprints, service guarantees, additional services, installment payment options, and product testing trials. Logistics service entrepreneurs report that these elements strengthen service innovation by enhancing service quality, minimizing service failures, and ensuring that service processes are more closely aligned with customer expectations. Among these factors, customer satisfaction guarantees appear to exert the strongest influence, highlighting the importance of customer-oriented strategies in service development.

In addition, service blueprints and service guarantees contribute to value creation by systematizing service delivery processes and building customer trust. Meanwhile, supplementary services, installment payment arrangements, and opportunities for product testing provide differentiated value that enhances the overall customer experience. Together, these service innovation practices generate a direct and positive impact on business growth by reinforcing competitive advantage and supporting long-term customer relationships.

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5. Synthesis

This case illustrates that logistics service innovation functions as a strategic mechanism through which entrepreneurs leverage technological and managerial capabilities to enhance business growth and competitive advantage. Innovation is not limited to the adoption of new technologies but involves the systematic integration of technology, service processes, and customer-oriented strategies to create value.

The findings demonstrate that logistics entrepreneurs utilize several service innovation mechanisms including customer satisfaction guarantees, service guarantees, service blueprints, installment payment systems, product testing trials, and additional services to improve service delivery and strengthen market competitiveness. Among these dimensions, customer satisfaction guarantee emerges as the most influential factor, indicating that innovation in service assurance mechanisms plays a critical role in shaping customer trust and loyalty.

From a technological innovation management viewpoint, these practices represent process and service innovations that enhance the efficiency and reliability of logistics operations. For example, service blueprints facilitate the systematic design and monitoring of service processes, while service guarantees and additional services function as innovation-driven strategies to differentiate logistics providers in a highly competitive market. These mechanisms collectively enable firms to align operational capabilities with evolving customer expectations and digital commerce demands.

Furthermore, the case highlights that effective management of technological and service innovations enables logistics entrepreneurs to transform traditional logistics operations into customer-centric, technology-enabled service systems. Such transformation strengthens organizational adaptability, improves service quality, and ultimately contributes to sustainable business growth in the rapidly evolving logistics and e-commerce ecosystem.

Overall, successful logistics entrepreneurs manage innovation not merely through technological adoption but through strategic orchestration of service innovation, operational design, and customer experience, which together drive long-term business performance and competitiveness.

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6. Conclusion

New logistics business models and service innovation play a crucial role in strengthening the competitiveness, business expansion, and long-term sustainability of logistics service entrepreneurs in Thailand. Logistics innovation refers to the development and application of new technologies, operational processes, and creative service concepts that enable firms to manage e-fulfilment depots more efficiently while enhancing customer satisfaction. Innovation strategies that emphasize opportunity exploitation and a deep understanding of customer needs contribute significantly to sustainable business growth.

From the perspective of service innovation, several key factors influence both service innovation and business growth. Among these, customer satisfaction guarantee is identified as the most influential factor, as both logistics entrepreneurs and customers tend to prefer services that ensure satisfactory outcomes. In addition, other service innovation elements including service guarantee, service blueprint, pay-by-installment options, product testing trials, and additional services also play important roles in fostering service innovation.

Moreover, the intensifying competition in the logistics industry compels service providers to continuously improve their service offerings. Service innovation not only has a direct impact on business growth but also produces indirect benefits by strengthening competitive advantage and delivering greater value to customers. Logistics entrepreneurs who transition from conventional service approaches to innovative service practices are therefore better equipped to enhance resource management, develop innovation capabilities, and improve overall competitiveness in the market.

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Case Study Questions

1. How does the implementation of a customer satisfaction guarantee influence service innovation among logistics service entrepreneurs?
2. To what extent does the use of service guarantees enhance service innovation in logistics service businesses?
3. How does the adoption of service blueprinting contribute to the development of service innovation in logistics service operations?
4. How do additional logistics services (e.g., packaging, palletizing, information services) affect service innovation capability?
5. How does service innovation contribute to business growth in logistics service enterprises?

Chapter Summary

This chapter conceptualizes technological innovation management as a systemic process that integrates technological development, innovation diffusion, organizational capabilities, and project-level implementation to support sustainable competitive advantage.

Technological innovation refers to the development and application of new or improved technologies that enhance organizational processes, products, and services. In the digital era, it includes product, process, and digital service innovations supported by technologies such as AI, big data, and cloud computing, enabling firms to improve efficiency, customer experiences, and competitive advantage.

Diffusion of technological innovation is the process through which new technologies spread within a social system over time through communication channels. Adoption occurs through stages from awareness to confirmation and is influenced by factors such as perceived benefits, compatibility, complexity, social influence, and organizational readiness.

Technological innovation management involves multiple organizational roles working together to develop and implement innovations. Leaders set strategic direction and allocate resources, technical experts develop new technologies, and cross-functional teams and external partners collaborate to ensure innovations are technically feasible and commercially viable.

An innovative organization integrates supportive structures, culture, leadership, knowledge management, human resource practices, and external partnerships to promote continuous innovation. These elements enable collaboration, knowledge sharing, employee creativity, and adaptability in dynamic environments.

Successful development projects rely on effective project management, clear objectives, competent leadership, and strong collaboration among stakeholders. Performance measurement, risk management, team learning, and sustainability considerations further contribute to achieving project goals and long-term value creation.

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Chapter Review Questions

Review Question 1:

How do technological innovations such as product, process, and digital service innovations enhance organizational competitiveness and value creation in the digital economy?

Review Question 2:

What are the key elements and stages of the diffusion of technological innovations, and how do they influence the adoption of new technologies within a social system?

Review Question 3:

What roles do organizational leaders, technical experts, and collaborative networks play in managing technological innovation within organizations?

Review Question 4:

What organizational elements support the development of an innovative organization, and how do they collectively contribute to sustaining innovation performance?

Review Question 5:

What key factors contribute to the success of development projects in complex and uncertain environments?

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Chapter Exercises

Exercise 1:

Select a company or organization that has recently implemented a technological innovation (e.g., artificial intelligence, big data analytics, cloud computing, or digital platforms).

1. Identify the type of technological innovation introduced (product, process, or digital service innovation).
2. Explain how the technology improves the organization's value creation, operational efficiency, or customer experience.
3. Discuss how this innovation contributes to the organization's competitive advantage.

Exercise 2:

Choose a recent technological innovation (e.g., AI tools, mobile payment systems, or online learning platforms).

1. Describe how the innovation spreads among users using the Diffusion of Innovation (DOI) process:
    - Knowledge
    - Persuasion
    - Decision
    - Implementation
    - Confirmation
2. Identify which adopter categories (innovators, early adopters, early majority, late majority, laggards) are most likely to adopt the innovation first.
3. Explain how communication channels or social influence affect the adoption process.

Exercise 3:

Consider a firm that is developing a new technological product or digital service.

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1. Identify at least four key roles involved in managing technological innovation (e.g., senior management, engineers, marketing teams, external partners).
2. Explain the responsibilities of each role in supporting the innovation process.
3. Discuss why cross-functional collaboration is important for successful technological innovation management.

Exercise 4:

Analyze an organization that is recognized for its strong innovation capability (e.g., technology firms, startups, or research-based companies).

Evaluate how the organization demonstrates the following six elements of an innovative organization:

1. Organizational structure
2. Organizational culture and climate
3. Knowledge management
4. Human resource management
5. Leadership style
6. Strategic alliances

Explain how these elements collectively support the organization's innovation performance.

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Exercise 5:

Review a development project (e.g., a new product development project, infrastructure project, or technology development project).

1. Identify three key factors that contributed to the success of the project.
2. Explain how project management practices such as performance measurement, team collaboration, or stakeholder management influenced the project outcomes.
3. Discuss how organizations can reduce uncertainty and improve project success in complex environments.

References

Abudureheman, A. (2023). Design of a user comment management system based on text mining: Innovative organization management for E-Commerce. *Journal of Organizational and End User Computing, 35*(1). https://doi.org/10.4018/JOEUC.326611

Al-Razgan, M., Alrowily, A., Al-Matham, R. N., Alghamdi, K. M., Shaabi, M., & Alssum, L. (2021). Using diffusion of innovation theory and sentiment analysis to analyze attitudes toward driving adoption by Saudi women. *Technology in Society, 65*, 101558. https://doi.org/10.1016/j.techsoc.2021.101558

Anvari, R., Berishvili, N., & Mobarhan, R. (2026). The role of emotionally intelligent leadership and team trust in knowledge sharing behavior and project success. *Social Sciences & Humanities Open, 13*, 102578. https://doi.org/10.1016/j.ssaho.2026.102578

Balzano, M., & Marzi, G. (2023). Exploring the pathways of learning from project failure and success in new product development teams. *Technovation, 128*, 102878. https://doi.org/10.1016/j.technovation.2023.102878

Bianchi, M., Di Benedetto, A., Franzò, S., & Frattini, F. (2017). Selecting early adopters to foster the diffusion of innovations in industrial markets: Evidence from a multiple case study. *European Journal of Innovation Management, 20*(4), 620-644. https://doi.org/10.1108/ejim-07-2016-0068

Blais, C., St-Pierre, J., & Bergeron, H. (2023). Performance measurement in new product development projects: findings from successful small and medium enterprises. *International Journal of Project Management, 41*(2), 102451. https://doi.org/10.1016/j.ijproman.2023.102451

Blaskovics, B., Klimkó, G. G., & Maró, Z. M. (2026). Critical success factors in project management: Lessons for sustaining competitiveness.

Library and Learning, University of Phayao

Social Sciences & Humanities Open, 13, 102338. https://doi.org/10.1016/j.ssaho.2025.102338

Castor, J., Bacha, K., & Fuso Nerini, F. (2020). SDGs in action: A novel framework for assessing energy projects against the sustainable development goals. *Energy Research & Social Science, 68*, 101556. https://doi.org/10.1016/j.erss.2020.101556

Chandiona, D. F. (2026). A systematic review of technological innovation in marketing: implications for individuals, organizations, and the broader environment. *Cogent Business & Management, 13*(1), 2621458. https://doi.org/10.1080/23311975.2026.2621458

Chutivongse, N., & Gerdsri, N. (2019). Creating an innovative organization: Analytical approach to develop a strategic roadmap guiding organizational development. *Journal of Modelling in Management, 15*(1), 50-88. https://doi.org/10.1108/jm2-05-2018-0067

Daronco, E. L., Silva, D. S., Seibel, M. K., & Cortimiglia, M. N. (2023). A new framework of firm-level innovation capability: A propensity–ability perspective. European Management Journal, 41(2), 236–250. https://doi.org/10.1016/j.emj.2022.02.002

Gregor, S., & Hevner, A. (2014). The Knowledge Innovation Matrix (KIM): A Clarifying Lens for Innovation. *Informing Science: The International Journal of an Emerging Transdiscipline, 17*, 217-239. https://doi.org/10.28945/2046

Gutiérrez-Leefmans, M., Picazo-Vela, S., & Kareem, O. (2025). Adoption of artificial intelligence in higher education: a diffusion of innovation approach. *The TQM Journal*. https://doi.org/10.1108/tqm-12-2024-0523

Hadi, N. U., Raza, M. A., Orole, F., Abdullah, A., & Khan, M. I. (2026). Exnovation as a strategic enabler: Unlocking technological innovation through ambidexterity and capability reconfiguration. *International Journal of Innovation Studies*. https://doi.org/10.1016/j.ijis.2026.01.001

Library and Learning, University of Phayao

Hevner, A., & Gregor, S. (2022). Envisioning entrepreneurship and digital innovation through a design science research lens: A matrix approach. *Information & Management, 59*(3), 103350. https://doi.org/10.1016/j.im.2020.103350

Jierasup, S., & Leelasantitham, A. (2024). A change from negative to positive of later adoption using the innovation decision process to imply sustainability for HR chatbots of private companies in Thailand. Sustainability, 16(13), 5641. https://doi.org/10.3390/su16135641

Lima, M. (2020). Smarter organizations: insights from a smart city hybrid framework. *International Entrepreneurship and Management Journal, 16*(4), 1281-1300. https://doi.org/10.1007/s11365-020-00690-x

Malykhin, M., Dvornichen, I., Ziakhor, D., Tugay, A., & Dubynka, O. (2025). Assessment of The Development Project Management Efficiency Under Conditions of Uncertainty. *International Journal of Accounting and Economics Studies, 12*(2), 392-401. https://doi.org/10.14419/actqg061

Matos, L. M., Rampasso, I. S., Quelhas, O. L. G., Leal Filho, W., & Anholon, R. (2021). Technological innovation management: understanding difficulties in an emerging country to enhance manufacturers performance. *International Journal of Productivity and Performance Management, 71*(6), 2280-2295. https://doi.org/10.1108/ijppm-02-2021-0074

Opazo-Basáez, M., Vendrell-Herrero, F., & Bustinza, O. F. (2021). Digital service innovation: a paradigm shift in technological innovation. *Journal of Service Management, 33*(1), 97-120. https://doi.org/10.1108/josm-11-2020-0427

Parolin, S. R., Bonfim, L. R. C., Segatto, A. P., & Espindola, T. (2020). Organizational culture for cooperation in technological innovation between research institutes and firms. *Journal of Technology Management and Innovation, 15*(2), 23-40. https://doi.org/10.4067/s0718-27242020000200024

Library and Learning, University of Phayao

Raina, K., Sharma, G. D., Taheri, B., Dev, D., & Chavriya, S. (2026). Artificial intelligence-driven management: Bridging innovation, knowledge creation, and sustainable business practices. *Journal of Innovation & Knowledge, 11*, 100860. https://doi.org/10.1016/j.jik.2025.100860

Reis, J. F., & Junior, L. P. P. (2025). Institutional Theory (IT) and Diffusion of Innovation (DOI): A Theoretical Approach on Artificial Intelligence (AI). *BAR - Brazilian Administration Review, 22*(4), Article e250060. https://doi.org/10.1590/1807-7692bar2025250060

Shinde, B., Sanap, S., Pawar, S., & Wakchaure, V. (2025). Review of critical success factors and frameworks of new product development process. International Journal of Product Development, 29(2), 121–167. https://doi.org/ 10.1504/IJPD.2025.148391

Song, Y., Mi, L., Bian, Z., Tu, W., & He, J. (2025). How does artificial intelligence impact corporate ESG performance? The catching−up effect of digital technological innovation. *Journal of Innovation & Knowledge, 10*(6), 100843. https://doi.org/10.1016/j.jik.2025.100843

Spraggon, M., & Bodolica, V. (2020). On the heterogeneity and equifinality of knowledge transfer in small innovative organizations. *Management Decision, 59*(6), 1421-1441. https://doi.org/10.1108/md-03-2019-0318

Steele, L. M., & Watts, L. L. (2022). Managing technical innovation: A systematic review of 11 leader functions. Technovation, 115, 102539. https://doi.org/ 10.1016/j.technovation.2022.102539

Suvittawat, A. (2020). Logistics service innovation for business growth: A case study of logistics service entrepreneurs. *Polish Journal of Management Studies, 21*(1), 394-407. https://doi.org/10.17512/pjms.2020.21.1.29

Vendrell-Herrero, F., Bustinza, O. F., Opazo-Basaez, M., & Gomes, E. (2023). Treble innovation firms: Antecedents, outcomes, and enhancing factors. *International Journal of Production Economics, 255*, 108682. https://doi.org/10.1016/j.ijpe.2022.108682

Library and Learning, University of Phayao

Wang, Y., Shi, J., Ow, T. T., Yun, J., & Yang, Y. (2025). The Impact of Technological Innovations on Consumer Behavior in E-Commerce: A Systematic Review. *Journal of Organizational and End User Computing, 37*(1). https://doi.org/10.4018/JOEUC.372896

Xu, Y., Ji, J., Qiao, Y., & Huang, J. (2025). How and when does digital transformation promote technological innovation performance? A study of Chinese high-tech firms. *Technovation, 146*, 103294. https://doi.org/10.1016/j.technovation.2025.103294

Zhang, X. (2018). Frugal innovation and the digital divide: Developing an extended model of the diffusion of innovations. *International Journal of Innovation Studies, 2*(2), 53-64. https://doi.org/10.1016/j.ijis.2018.06.001

Zhao, N., Fan, D., Chen, Y., & Wu, C. (2023). IMPACT OF INNOVATION ORGANIZATION NETWORK ON THE SYNERGY OF CROSS-ORGANIZATIONAL TECHNOLOGICAL INNOVATION: EVIDENCE FROM MEGAPROJECT PRACTICES IN CHINA. *Journal of Civil Engineering and Management, 29*(1), 50-66. https://doi.org/10.3846/jcem.2023.18051

Zoubi, M. A. L., Alfaris, Y., Fraihat, B., Otoum, A., Nawasreh, M., & Alfandi, A. (2023). An extension of the diffusion of innovation theory for business intelligence adoption: A maturity perspective on project management. *Uncertain Supply Chain Management, 11*(2), 465-472. https://doi.org/10.5267/j.uscm.2023.3.003

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Chapter 4: Strategic Innovation Management: Building Capabilities for Competitive Advantage

Course Learning Outcomes (CLO):

1. Analyze the concept and strategic role of innovation strategy.
2. Differentiate types and degrees of innovation.
3. Examine key elements of corporate innovation strategy.
4. Assess the role of strategic capabilities in driving innovation.
5. Evaluate the stages of the strategic innovation process.

Contents and Concepts of This Chapter:

4.1 Introduction to Innovation Strategy

4.2 Types of Innovation Strategy

4.3 Elements of Corporate Innovation Strategy

4.4 Strategic Capabilities and Innovation

4.5 The Strategic Innovation Process

Case Study

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4.1 Introduction to Innovation Strategy

This chapter is grounded in the integration of dynamic capability theory, the resource-based view, and innovation systems theory. These perspectives collectively explain how firms develop innovation strategies by aligning internal capabilities, external networks, and institutional conditions under uncertainty.

Innovation strategy refers to a structured and deliberate approach through which organizations generate, implement, and sustain new ideas, products, processes, or business models in alignment with their long-term objectives and competitive environments. It extends beyond creativity or technological advancement by emphasizing strategic decision-making regarding where and how innovation occurs, how resources are allocated, and how associated risks are managed.

From a conceptual perspective, innovation strategy can be understood as an intentional framework that directs and coordinates innovation-related activities through clearly defined goals and actions. Building on the view of innovation as a process encompassing idea generation, invention, and market diffusion, innovation strategy represents a comprehensive set of decisions designed to systematically develop and implement innovations aligned with organizational objectives. Importantly, innovation strategy operates within a multidimensional paradigm consisting of five key orientations: technological, temporal, market, competitive, and cooperative. These dimensions reflect distinct strategic emphases, including technology-driven development, timing advantages (e.g., first-mover strategies), customer-oriented innovation, competitive positioning (e.g., differentiation or cost leadership), and collaborative knowledge integration through external partnerships. Accordingly, innovation strategy should be viewed as a holistic construct that enables firms to align internal capabilities with external environmental conditions to effectively generate, diffuse, and sustain innovation (Wolf et al., 2021).

In addition, innovation strategy can be framed as a dynamic decision-making process under conditions of uncertainty and ambiguity, particularly in relation to the timing and sequencing of innovation adoption. Firms must evaluate whether to adopt existing innovations or delay adoption in

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anticipation of future technological developments. Within this framework, four strategic options emerge: (1) compulsive strategy (early adoption followed by upgrading), (2) buy-and-hold strategy (adoption without upgrading), (3) leapfrogging strategy (bypassing current innovations), and (4) laggard strategy (delayed adoption). Crucially, these strategic choices are shaped by ambiguity defined not only as uncertainty about outcomes but also about the probability distribution of those outcomes. As a result, firms particularly those led by ambiguity-averse managers tend to adopt more cautious and flexible approaches, often delaying irreversible investments until uncertainty is reduced. Thus, innovation strategy is best understood as a contingent, option-based process that integrates expectations of technological change, risk, and managerial perception (Kim, 2023).

Furthermore, innovation strategy constitutes an endogenous determinant of innovation performance, directly influencing the structure and efficiency of the innovation production process. Strategic choices regarding appropriability mechanisms such as the breadth and composition of intellectual property rights (IPR) portfolios and complementarity strategies, particularly the balance between product and process innovation (i.e., ambidexterity), shape how innovation inputs are coordinated and transformed into outputs. More complex strategies, characterized by diversified IPR portfolios and simultaneous pursuit of multiple innovation types, often incur higher coordination and administrative costs, thereby reducing efficiency. In contrast, more focused strategies tend to enhance efficiency by minimizing such costs. Consequently, innovation strategy embodies a fundamental trade-off between strategic complexity and innovation efficiency, particularly in fragmented institutional environments (Koutsouradis et al., 2026).

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In service and hospitality contexts, innovation strategy is typically conceptualized as a configuration of both technological (product and process) and non-technological (organizational and marketing) innovations. Firms may adopt simple strategies focusing on a single innovation type or more complex strategies involving coordinated combinations of multiple innovation practices. Empirical evidence suggests that complex and hybrid strategies generally yield stronger performance outcomes particularly in terms of sales growth due to synergistic effects across innovation dimensions. In the hospitality sector, in particular, performance improvements arise not

from isolated innovations but from integrated configurations combining process, product, organizational, and marketing changes. However, the effectiveness of such strategies varies across sectors, reflecting differences in innovation intensity and structural characteristics (Martin-Rios & Ciobanu, 2019).

The relationship between innovation strategy and intellectual property (IP) further highlights the strategic importance of aligning knowledge creation, protection, and value appropriation. Innovation strategies encompass decisions related to knowledge sourcing (internal versus external), collaboration intensity, and the nature of innovation activities, while IP mechanisms both formal (e.g., patents, trademarks, copyrights) and informal (e.g., secrecy, lead time advantages) serve to protect and appropriate innovation value. These domains are inherently interdependent: innovation strategies shape the selection and effectiveness of IP mechanisms, while IP regimes influence firms' innovation behavior. Recent research integrates these perspectives into a comprehensive framework encompassing innovation strategies, IP protection mechanisms, knowledge processes, collaboration, and value creation, thereby advancing a more coherent understanding of their interaction (Pires & Ferreira, 2025).

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Finally, innovation strategy can be conceptualized as a context-dependent configuration of interrelated strategic choices guided by an underlying strategic logic. Rather than representing universal prescriptions, such strategies are contingent upon environmental conditions, resource endowments, and the nature of the innovation pursued. Sheth and Sinfield (2022) advance this perspective by emphasizing that innovation strategy is not a single decision, but a structured set of interrelated choices that collectively determine where and how a firm competes through innovation. To systematically analyze such strategies, they introduce an analytical framework composed of four core dimensions objective, scope, advantage, and flaws each capturing distinct yet interdependent aspects of strategic decision-making, as illustrated in Figure 4.1.

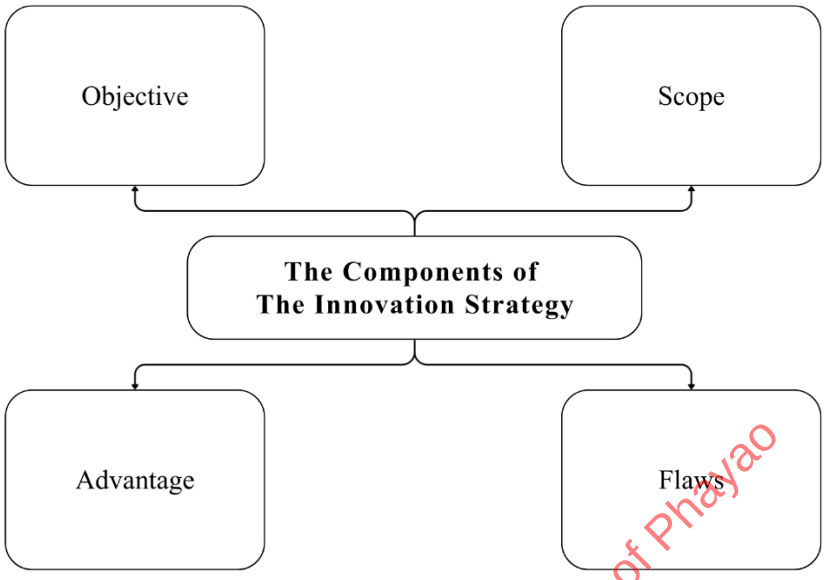

Figure 4.1 The Components of The Innovation Strategy

Source: Adapted from Moreira, A., Navaia, E., & Ribau, C. (2024). Innovation capabilities and their dimensions: A systematic literature review. *International Journal of Innovation Studies*, 8(3), 313–333.

- The objective dimension defines the purpose and intended outcomes of innovation, including the vision and relative performance goals compared to existing alternatives.
- The scope dimension delineates the boundaries of strategic action, encompassing decisions related to markets, customers, pricing, risk, and value capture mechanisms.
- The advantage dimension explains how the chosen strategy generates competitive differentiation, including its effects on customer perception, adoption, and the basis of competition.
- The flaws dimension acknowledges that all strategies involve trade-offs, uncertainty, and potential weaknesses arising from imperfect information and resource constraints.

These dimensions are underpinned by strategic logics such as position, leverage, and opportunity logics which guide decision-making through simplified heuristics in complex and uncertain environments. This framework enables systematic comparison across different innovation

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archetypes and provides a robust analytical foundation for understanding how firms design and implement innovation strategies to achieve sustained competitive advantage (Sheth & Sinfield, 2022).

The four-dimensional framework objective, scope, advantage, and flaws functions as the analytical backbone of this chapter, providing a coherent logic for interpreting how innovation is conceptualized, implemented, and evaluated across multiple levels of analysis. Each dimension captures a distinct yet interrelated aspect of innovation: objective defines the intended purpose and strategic direction of innovation efforts; scope delineates the breadth and domain within which innovation occurs; advantage explains how innovation contributes to competitive positioning and value creation; and flaws highlight the inherent limitations, risks, and trade-offs that accompany innovation decisions.

Within this structure, the types of innovation (e.g., product, process, business model, and organizational innovation) are directly associated with the scope dimension, as they specify the areas and boundaries in which innovation activities take place. Strategic capabilities such as dynamic capabilities, marketing agility, and resource leveraging correspond to the advantage dimension, since they determine how effectively firms transform innovation into sustained competitive advantage. Meanwhile, governance elements including leadership, decision-making structures, and institutional arrangements align with the objective dimension, as they shape the intent, prioritization, and coordination of innovation initiatives. Finally, trade-offs (e.g., exploration vs. exploitation, flexibility vs. efficiency, risk vs. return) are intrinsically linked to the flaws dimension, reflecting the constraints and tensions that organizations must manage when pursuing innovation.

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Taken together, this mapping reinforces the integrative role of the framework, enabling a systematic understanding of how different components of innovation interconnect within a unified conceptual model.

In conclusion, innovation strategy should be understood as a multidimensional, dynamic, and context-dependent construct that integrates strategic choice, organizational capabilities, and environmental conditions. It not only directs how innovation activities are conducted but also determines how effectively firms create, protect, and capture value from innovation. By

balancing complexity, uncertainty, and strategic alignment, innovation strategy plays a critical role in shaping long-term competitive advantage and organizational performance.

This chapter conceptualizes innovation strategy as a multi-level system integrating (1) strategic orientation, (2) innovation typologies and degrees, (3) governance and organizational elements, (4) strategic capabilities, and (5) an iterative innovation process. These components collectively form a coherent architecture through which firms design, implement, and sustain innovation-driven competitive advantage.

4.2 Types of Innovation Strategy

Innovation strategy refers to a structured set of choices through which firms determine the direction, scope, and configuration of their innovation activities. A central dimension of such strategies is the classification of innovation types, which provides a conceptual and operational foundation for understanding how firms create value, adapt to environmental changes, and sustain competitive advantage.

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Rather than conceptualizing innovation types as discrete and mutually exclusive categories, firms should adopt a configurational approach that strategically integrates product, process, and business model innovation to generate synergistic value and reinforce competitive advantage. This integrative logic is particularly critical in complex and dynamic environments, where isolated innovation efforts often fail to deliver sustained impact. For instance, product innovation can enhance customer value propositions, process innovation can improve operational efficiency and scalability, and business model innovation can redefine value capture mechanisms; when orchestrated collectively, these dimensions produce complementarities that amplify overall innovation performance. Extending this logic, a portfolio perspective becomes essential for managing innovation strategically across multiple temporal and strategic horizons. Firms must balance core (exploitative) innovations that optimize existing capabilities with exploratory innovations that pursue novel opportunities, while simultaneously aligning short-term performance objectives with long-term strategic renewal. Moreover, organizations must navigate the inherent tension between efficiency-oriented innovations, which emphasize cost reduction and

incremental improvement, and transformation-oriented innovations, which drive structural change and long-term repositioning. Effectively managing this multidimensional innovation portfolio enables firms to mitigate risk, allocate resources dynamically, and sustain innovation-driven growth over time.

Innovation strategy is inherently multidimensional, encompassing both the types of innovation and the degree of novelty, each contributing differently to firm competitiveness and long-term performance. Drawing on the systematic classification and measurement challenges identified by Stundziene et al. (2024), together with the forward-looking perspective on AI-enabled innovation proposed by Mariani and Dwivedi (2024), innovation strategy can be conceptualized as an integrated construct that combines structural, technological, and managerial transformations within organizations.

From a typological perspective, innovation can be classified into eleven primary types, each representing a distinct locus of change within the firm, as illustrated in Figure 4.2.

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Innovation Types

Product Innovation	Process Innovation	Service Innovation
Technological Innovation	Management Innovation	Business Model Innovation
Supply Chain Innovation	Green Innovation	Open Innovation
Marketing Innovation	Organizational Innovation	

Figure 4.2 Innovation Types

Source: Adapted from Rachinger, M., Vilkas, M., Grybauskas, A., & Lukauskas, M. (2024). The challenge of measuring innovation types: A systematic literature review. *Journal of Innovation & Knowledge*, 9(4), 100620.

First, product innovation refers to the development or introduction of new or significantly improved goods and services that enhance customer value and strengthen market positioning. It is typically measured through outputs such as new product launches, revenue from innovative products, or improvements in product features (Stundziene et al., 2024).

Second, process innovation involves the implementation of new or improved production or delivery methods aimed at increasing efficiency, reducing costs, or enhancing quality. However, it is often measured using binary indicators (e.g., the presence or absence of process changes), which may limit the ability to capture its full complexity (Stundziene et al., 2024).

Third, service innovation encompasses new or improved service offerings, delivery systems, and customer interfaces. Due to its intangible and multidimensional nature, it is more difficult to standardize and measure compared to product innovation (Stundziene et al., 2024).

Fourth, technological innovation refers to advancements in technologies that underpin products, processes, or services. It often overlaps with other innovation types and serves as a foundational driver of broader innovation outcomes (Stundziene et al., 2024).

Fifth, management innovation (also referred to as administrative or organizational innovation) involves the introduction of new managerial practices, policies, or structures that enhance organizational effectiveness (Stundziene et al., 2024).

Sixth, business model innovation entails the reconfiguration of how firms create, deliver, and capture value, often generating transformative impacts that extend beyond individual products or processes (Stundziene et al., 2024).

Seventh, supply chain innovation focuses on improvements in logistics, sourcing, and coordination across the value chain, thereby

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enhancing both resilience and operational efficiency (Stundziene et al., 2024).

Eighth, green innovation (or eco-innovation) emphasizes environmentally sustainable solutions, including reductions in resource consumption, emissions, and ecological impact (Stundziene et al., 2024).

Ninth, open innovation involves the use of external knowledge, collaborations, and networks to accelerate innovation processes, reflecting a shift away from closed, internally focused R&D systems (Stundziene et al., 2024).

These nine categories are consistently identified in the literature as core innovation types. However, their boundaries often overlap, and their measurement remains heterogeneous across studies.

In addition, contemporary literature increasingly recognizes marketing innovation and organizational innovation as distinct yet related categories. Marketing innovation involves the implementation of new marketing methods, including changes in product design, promotion, pricing, or distribution strategies. Organizational innovation, in contrast, focuses on structural and cultural changes that support and facilitate innovation activities. Although these categories are sometimes subsumed under broader management or administrative innovation, their inclusion reflects the expanding scope of innovation beyond purely technological domains (Mariani & Dwivedi, 2024).

Measuring innovation types remains inherently complex due to the diversity of indicators, data sources, and theoretical frameworks. One commonly used framework is the input–process–output–outcome (IPOO) model, which provides a structured approach to analysis. However, this model tends to oversimplify innovation as a linear process and often overlooks intangible elements such as learning, creativity, and collaboration factors that are increasingly critical in contemporary innovation ecosystems. Therefore, innovation strategy should not treat these types as isolated categories but rather as interdependent dimensions embedded within dynamic organizational systems (Stundziene et al., 2024).

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Complementing the typology of innovation types is the degree of novelty, which distinguishes between radical and incremental innovation. Radical innovation involves fundamental and discontinuous changes that create new markets or disrupt existing ones, typically associated with high uncertainty and long-term impact. Incremental innovation, by contrast, refers to gradual improvements or refinements of existing products, processes, or services (Mariani & Dwivedi, 2024).

Generative artificial intelligence (GenAI) is increasingly recognized as a transformative digital technology in innovation management, with the potential to support and reshape innovation activities and processes. Rather than altering established innovation taxonomies, current evidence suggests that GenAI primarily facilitates innovation by enhancing idea generation, accelerating development processes, and enabling new forms of collaboration between humans and intelligent systems. In this regard, GenAI appears particularly effective in supporting incremental innovation such as refining existing products based on data-driven insights while also creating opportunities for more novel and cross-domain recombinations that may contribute to radical innovation. Overall, this underscores the growing influence of digital technologies in shaping both the speed and direction of innovation processes (Mariani & Dwivedi, 2024).

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In summary, innovation strategy can be conceptualized as a multi-layered system in which (1) innovation types define the domain of change, (2) the degree of novelty reflects the intensity of change, and (3) emerging technologies, such as GenAI, act as accelerators that reshape both dimensions. This integrated perspective more accurately captures contemporary innovation dynamics and aligns with current theoretical and empirical developments in the field.

While innovation types define the domains in which firms innovate, the effectiveness of these innovations depends on the underlying corporate structures and governance mechanisms that support strategic implementation.

4.3 Elements of Corporate Innovation Strategy

Corporate innovation strategy can be conceptualized as a set of interrelated elements that collectively shape how firms generate, govern, and appropriate innovation outcomes under varying institutional and market conditions.



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Figure 4.3 Elements of Corporate Innovation Strategy

Source: Adapted from Agazu, B. G., & Kero, C. A. (2024). Innovation strategy and firm competitiveness: A systematic literature review. *Journal of Innovation and Entrepreneurship*, 13, 24.

Figure 4.3 conceptualizes Corporate Innovation Strategy as a multidimensional construct comprising six interrelated organizational elements that collectively enable firms to initiate, govern, and sustain innovation.

These six elements operate as an interdependent governance system in which strategic orientation defines direction, governance structures ensure alignment, executive cognition shapes decision-making, disclosure influences stakeholder perception, financial reporting affects credibility, and resilience ensures adaptability under uncertainty.

At its core, one fundamental element is (1) strategic orientation toward innovation, which reflects managerial decisions regarding the balance between exploratory and exploitative innovation, as well as the level of risk tolerance embedded in strategic choices. Importantly, innovation orientation does not merely respond to the external information environment but also

shapes it. Evidence indicates that firms pursuing exploratory innovation tend to experience lower analyst coverage, higher forecast error, and greater dispersion, reflecting elevated uncertainty and information asymmetry. These information frictions weaken investor responsiveness to analyst forecasts and increase firms' reliance on internal financing. Thus, the interaction between innovation strategy and analyst forecasting activities operates primarily through information opacity, with consequential effects on both innovation outcomes and broader economic performance (Jia, 2017).

Closely related is (2) information disclosure and transparency, wherein firms design disclosure policies not only to comply with regulatory requirements but also to strategically manage investor perceptions. Innovation strategy is intrinsically linked to disclosure behavior, as firms tailor their communication practices to the nature of their innovation activities. In particular, firms engaged in exploratory innovation tend to provide forward-looking disclosures, such as management earnings forecasts, to alleviate information asymmetry, while simultaneously restricting the release of proprietary information to safeguard competitive advantage. This reflects a deliberate trade-off between transparency and knowledge protection (N. Jia, 2019).

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Another critical element is (3) organizational governance and oversight structures, especially the role of boards and executive leadership in directing innovation activities. Board composition, including the presence of faultlines arising from demographic or professional diversity, influences the degree of strategic alignment in innovation decision-making. However, the effects of board faultlines are not uniform; they are contingent upon external governance conditions. Specifically, property rights structures (e.g., state-owned versus non-state-owned enterprises) and the quality of the institutional environment act as moderating factors that shape how board faultlines influence innovation strategy, rather than determining their effects in a deterministic manner (Zhang & Ma, 2022).

Complementing governance is (4) executive cognitive and knowledge-based capability, particularly the CEO's knowledge structure, which affects how firms interpret technological opportunities and allocate innovation resources. The impact of CEO knowledge is nuanced: greater knowledge breadth tends to promote more diverse and proactive innovation

strategies, whereas excessive depth may constrain strategic flexibility. Moreover, these effects are conditional on managerial incentives, including both power and financial compensation, which shape how knowledge is translated into strategic action (Qiu & Yu, 2020).

In addition, (5) financial reporting quality and credibility constitute a pivotal element, as disruptions such as accounting restatements can alter managerial behavior and strategic direction. Rather than inducing conservatism, firms experiencing restatements often shift toward more exploratory innovation while reducing exploitative activities. This reorientation suggests increased managerial risk-taking, potentially driven by the expectation that high-risk, high-reward innovation can facilitate organizational recovery and improve long-term performance (Ning Jia, 2019).

Finally, (6) organizational resilience and adaptive capacity represent a crucial dimension of corporate innovation strategy, particularly in periods of crisis. Firms with sustained investments in innovation especially in research and development (R&D) demonstrate a greater ability to maintain sales revenue during severe disruptions such as the COVID-19 pandemic. This resilience reflects the lagged effects of prior innovation investments, which enable the continued commercialization of new or improved products and processes. More broadly, innovation serves as a strategic resource that enhances firms' ability to reconfigure operations and adapt to rapidly changing environments, thereby supporting performance stability under conditions of uncertainty (Molate et al., 2025).

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Collectively, these elements strategic orientation, disclosure practices, governance structures, executive cognition, financial reporting integrity, and adaptive resilience form an integrated framework through which corporate innovation strategy is formulated and executed. These components operate interdependently, shaping not only innovation outputs but also firms' economic performance and long-term competitive positioning within complex and evolving institutional contexts.

These structural elements alone are insufficient without the development of strategic capabilities that enable firms to mobilize resources and execute innovation strategies effectively.

4.4 Strategic Capabilities and Innovation

Strategic capabilities constitute a critical organizational foundation that enables firms to systematically generate, adapt, and sustain innovation in dynamic and uncertain environments. Rather than representing mere operational competencies, these capabilities function as higher-order, integrative mechanisms that allow firms to sense opportunities, seize them through effective resource reconfiguration, and transform organizational structures and processes accordingly.

Strategic capabilities can be interpreted through the lens of dynamic capabilities, encompassing sensing (opportunity identification), seizing (resource mobilization), and transforming (organizational reconfiguration).

When embedded within digital infrastructures and knowledge-based systems, strategic capabilities play a pivotal role in shaping firms' innovation outcomes. In this context, business intelligence (BI) resources and digital capabilities act as key enabling mechanisms through which strategic capabilities are translated into innovation performance in SMEs. BI systems facilitate the systematic collection, integration, and analysis of both internal and external data, thereby enhancing firms' ability to detect market changes, identify emerging opportunities, and improve decision-making quality. Simultaneously, digital capabilities defined as the ability to mobilize and deploy IT-based resources in combination with other organizational capabilities enable firms to transform data into actionable knowledge and continuously reconfigure resources to support innovation activities. Importantly, these capabilities operate complementarily rather than independently, strengthening the relationship between strategic capabilities and innovation. This synergy enhances SMEs' capacity to absorb information, coordinate activities, and respond effectively to dynamic environmental conditions within the digital economy (Castillo-Vergara et al., 2025).

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Beyond internal resource orchestration, strategic capabilities also extend to firms' positioning and engagement within broader business ecosystems. In this regard, ecosystem exchange refers to collaborative interactions through which organizations share and access knowledge, capabilities, and both tangible and intangible resources, facilitating alignment among multiple actors and enabling value co-creation. These exchanges are

embedded in relational mechanisms that promote coordination, trust-building, and the integration of diverse contributions across the ecosystem. Strategic capabilities, therefore, reflect a firm's ability to configure and deploy a portfolio of competencies including marketing, technological, managerial, and information-based capabilities in ways that ensure both internal coherence and external alignment. From a process-oriented resource-based perspective, firms continuously integrate internally developed resources with externally accessed ones through exchange mechanisms, thereby sustaining competitiveness in dynamic and interdependent environments. This perspective highlights the importance of adaptability, resource integration, and ongoing capability development within open systems characterized by continuous change (Hendrawidjaja et al., 2026).

The transformation of strategic capabilities becomes particularly salient in the context of business model innovation, especially when manufacturing firms transition toward smart solution provision. This transition necessitates a fundamental reconfiguration of both strategic capabilities and underlying organizational processes. Firms shift from a product-centric orientation focused on engineering excellence and efficiency toward integrated product service software capabilities that enable customer-centric value creation. Such transformation involves not only the development of digital and service-oriented competencies but also the renewal of organizational routines, moving from efficiency-driven processes to those emphasizing customer productivity and value-in-use. This reconfiguration is facilitated by dynamic capabilities, which enable firms to realign resources and restructure existing capabilities through activities such as building new digital competencies, leveraging existing assets, accessing external knowledge, and divesting obsolete capabilities. Consequently, innovation emerges not solely from technological advancement but from broader capability transformation that aligns organizational structures, processes, and value creation logics with evolving market demands. Strategic capabilities thus function as a bridging mechanism, enabling firms to transition from existing competencies toward new business models centered on integrated solutions that enhance both customer value and organizational competitiveness (Huikkola et al., 2022).

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In addition, information technology (IT)-enabled capabilities play a crucial role in supporting explorative learning in SMEs by facilitating the acquisition and creation of new knowledge through digital infrastructures and e-business applications. Explorative learning, conceptualized as a dynamic capability, arises from the configuration of IT capabilities (e.g., IT infrastructure and e-business capabilities) and strategic capabilities (e.g., R&D, strategic human resource management, and networking). These capabilities do not exert isolated linear effects; rather, they interact in complex and non-linear ways to shape firms' learning processes and influence performance outcomes such as innovation and productivity. The principle of equifinality suggests that different configurations of IT and strategic capabilities can lead to similar high-performance outcomes, emphasizing that effectiveness depends on how these capabilities are jointly deployed rather than their individual strength. Accordingly, SMEs enhance their competitive performance not merely through IT adoption, but through the effective integration of IT-enabled exploration with complementary strategic capabilities that support knowledge acquisition, sharing, and application (Raymond et al., 2020).

Furthermore, strategic capabilities play a critical role in shaping firms' innovation strategies by enabling the effective integration and allocation of both internal and external resources in alignment with strategic objectives. In emerging economies, firms often rely on externally sourced resources particularly those accessed through political connections to support innovation activities. Political networking capability facilitates access to government-controlled resources, including policy support, financial incentives, and institutional information, which are essential in resource-constrained environments. Strategic capabilities, in turn, enable firms to process, organize, and deploy these resources in ways that align with their innovation orientation. As a result, firms are better positioned to pursue both exploratory innovation, involving the development of new technologies and knowledge domains, and exploitative innovation, focused on refining existing products and processes. This underscores the importance of aligning externally acquired resources with internal capability structures to support diverse innovation strategies (Wang et al., 2022).

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As illustrated in Figure 4.4, strategic capabilities in innovation emerge as an integrative construct shaped by the interplay of internal resources, digital infrastructure, external networks, and dynamic learning capabilities. Internal resources such as human capital, organizational knowledge, and operational assets provide the foundational base upon which firms build their innovation potential, while digital infrastructure enables data-driven decision-making, connectivity, and scalability in innovation processes. Simultaneously, external networks facilitate access to complementary knowledge, partnerships, and market intelligence, enhancing firms' ability to co-create value and respond to environmental changes. These elements are further strengthened by dynamic and learning capabilities, which allow organizations to continuously adapt, reconfigure resources, and institutionalize learning in response to uncertainty. Collectively, these interconnected components form a systemic capability that enables firms to effectively sense opportunities, seize them through innovation, and sustain competitive advantage in rapidly evolving environments.

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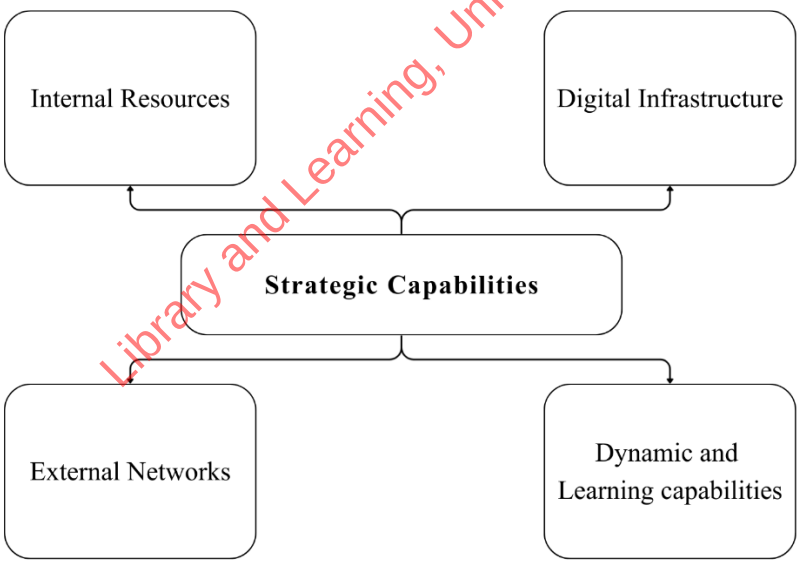

Figure 4.4 Strategic Capabilities

Source: Adapted from Melesse, H. S. (2026). Strategic Capabilities and Competitive Performance of Firms: Development, Current Themes, and

Future Research Agenda. *Journal of the Knowledge Economy*, 17, 2089-2124.

In conclusion, strategic capabilities serve as a central integrative mechanism that connects internal resources, digital infrastructures, external networks, and dynamic capabilities to drive innovation. Their effectiveness lies not only in resource orchestration but also in enabling firms to adapt, integrate, and transform in response to evolving environmental conditions. Through complementary interactions with digital, relational, and learning capabilities, strategic capabilities enhance firms' ability to achieve both exploratory and exploitative innovation, thereby sustaining competitive advantage in increasingly complex and dynamic markets.

Strategic capabilities are operationalized through the strategic innovation process, which translates strategic intent into actionable innovation outcomes.

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4.5 The Strategic Innovation Process

The strategic innovation process refers to a structured yet adaptive sequence of activities through which organizations generate, evaluate, develop, and implement innovations in alignment with long-term strategic objectives. Rather than following a linear progression, contemporary perspectives conceptualize this process as iterative, socio-technical, and increasingly augmented by digital technologies such as artificial intelligence (AI). It integrates strategic intent, organizational capabilities, user involvement, and continuous learning mechanisms to support both incremental improvements and radical innovation outcomes.

The strategic innovation process serves as the execution layer through which innovation strategy is operationalized into tangible outcomes. While strategy provides the directional layer defining long-term intent, positioning, and priorities the process translates this intent into coordinated actions, routines, and decision-making sequences. This execution is made possible by strategic capabilities, which function as the enabling layer by supplying the organization with the necessary skills, resources, and dynamic competencies to act effectively. Importantly, the process is not linear but iterative and

adaptive, continuously aligning strategic direction with evolving internal capabilities and external environmental feedback, thereby ensuring that innovation outcomes remain both strategically coherent and contextually responsive.

The process typically begins with opportunity framing and ideation, during which firms identify potential innovation opportunities based on environmental scanning, market needs, and internal capabilities. However, this stage is not solely generative; it is also inherently constraining. Strategic leaders influence how opportunities are framed, which can unintentionally limit the scope of radical innovation. Managerial framing practices particularly the tendency to interpret innovation activities through existing cognitive schemas may gradually diminish the novelty of initially radical ideas. Discrepancies between expected and actual outcomes are often framed as failures, leading organizations to shift away from uncertain, exploratory initiatives toward more predictable, incremental improvements. Consequently, the challenge is not the absence of radical ideas, but their gradual dilution through iterative decision-making shaped by managerial cognition. This dynamic highlights a paradox in which evaluative processes intended to guide innovation may inadvertently suppress it (Kratochvil, 2025).

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Following ideation, the process advances to concept development and user integration, where users play a central and continuous role. User involvement extends across multiple stages of the innovation process, including opportunity identification, development, testing, and deployment. However, such involvement is often fragmented, with organizations tending to emphasize either early-stage ideation or later-stage validation rather than systematically integrating users throughout the process. In high-technology industries, user contributions provide valuable contextual insights through both direct collaboration and feedback mechanisms. Increasingly, digital technologies facilitate continuous user data collection, enabling firms to refine innovations in real time. The form and intensity of user involvement vary across stages, ranging from qualitative insights in early phases to large-scale behavioral data in later stages (Bosch-Sijtsema & Bosch, 2015).

The subsequent phase involves development, experimentation, and iteration, characterized by prototyping, testing, and continuous refinement.

At this stage, organizational learning mechanisms become critical. Reflective practices function as dynamic, process-embedded capabilities that enable firms to critically examine ongoing activities, identify limitations, and transform challenges into innovation opportunities. Simultaneously, employee involvement facilitates the integration of managerial and operational perspectives, promotes continuous knowledge exchange, and helps resolve tensions among competing innovation priorities. Through such engagement, organizations particularly SMEs can achieve contextual ambidexterity by balancing exploration and exploitation. These mechanisms reinforce the view that innovation is a socially embedded, capability-driven process shaped by ongoing interactions among organizational members, rather than a purely technical or sequential activity (Lui et al, 2025).

As innovations move toward implementation, technology integration and digital augmentation become increasingly important. AI, in particular, has transformed the innovation process by enhancing data analysis, prototyping, and process optimization, especially during the development stage. Although AI is also applied in ideation and commercialization, its impact is most pronounced in improving efficiency and accelerating innovation outcomes during development. Moreover, AI enables firms to better understand customer needs and market trends, thereby improving both innovation and market performance. However, its adoption introduces managerial challenges, including the need to balance automation with human judgment and creativity, as well as to address ethical considerations related to transparency, accountability, and the broader implications of AI use (Roberts & Candi, 2024).

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Building on this, the innovation process can be understood within a human–AI decision spectrum, where decision-making authority is distributed between human actors and AI systems. At one end, humans retain full control over strategic decisions; at the other, AI autonomously generates and evaluates innovation options. In practice, most organizations operate within hybrid configurations, leveraging AI for data-intensive tasks while maintaining human oversight for strategic, contextual, and ethical considerations. This socio-technical arrangement enhances both decision speed and quality by combining computational efficiency with human expertise and judgment. However, effective integration requires organizations

to actively manage interdependencies between human and AI actors. This includes developing capabilities related to coordination, explainability, and governance to ensure effective collaboration within increasingly complex innovation systems (Zhang et al., 2026).

The effectiveness of the strategic innovation process is further shaped by organizational capabilities and innovation culture. Knowledge management capabilities particularly knowledge acquisition and sharing enable firms to access, assimilate, and apply valuable information from both internal and external sources. These capabilities support alignment with technological developments and responsiveness to dynamic market conditions. At the same time, an innovation-oriented culture fosters creativity, experimentation, and openness, while a clearly defined technology strategy ensures that innovation efforts are aligned with long-term objectives. Together, these elements enable firms to leverage knowledge effectively and sustain innovation-driven competitiveness (Sonmez Cakir et al., 2026).

In addition, agility and responsiveness are essential attributes of the strategic innovation process, particularly in dynamic environments. Supply chain agility enables firms to respond effectively to changing customer requirements and market conditions. In contexts such as the electric vehicle industry, agility is reflected in flexibility, responsiveness, and innovation speed, which collectively enhance the alignment between operations and consumer expectations. These capabilities not only improve operational efficiency but also influence consumer purchasing intentions by ensuring that products and services meet evolving demands (Suvittawat, 2024).

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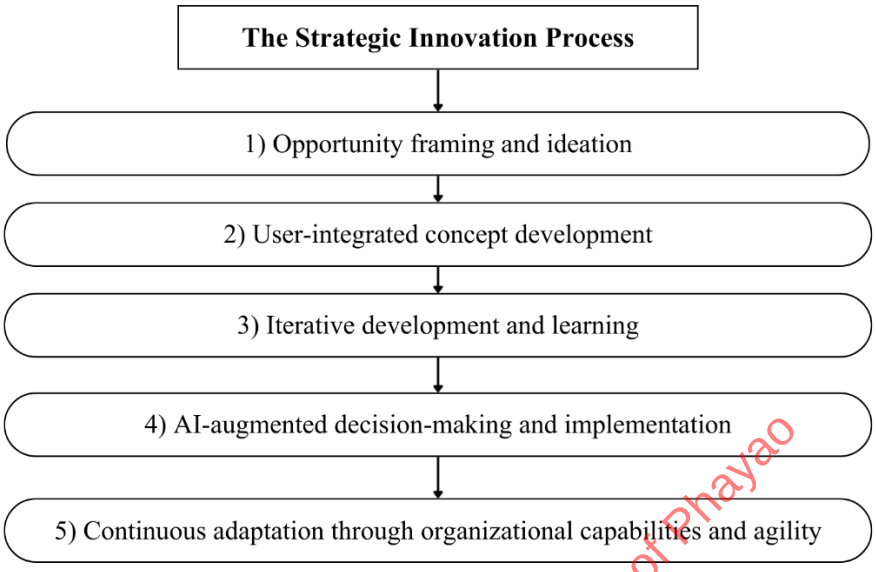

Figure 4.5 The Strategic Innovation Process

Source: Adapted from Bogetoft, P., Kromann, L., Smilgins, A., et al. (2024). Innovation strategies and firm performance. *Journal of Productivity Analysis*, 62, 175–196.

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Figure 4.5 presents The Strategic Innovation Process as a structured, sequential, and iterative framework that organizations use to systematically generate, develop, and implement innovation. Each stage reflects a distinct capability while remaining interconnected within a dynamic learning cycle. The strategic innovation process can be conceptualized as a multi-stage, iterative, and capability-driven system comprising: (1) opportunity framing and ideation, (2) user-integrated concept development, (3) iterative development and learning, (4) AI-augmented decision-making and implementation, and (5) continuous adaptation through organizational capabilities and agility. These stages are not strictly sequential but interconnected through feedback loops that enable ongoing refinement.

In conclusion, the strategic innovation process has evolved from a linear model into a complex, adaptive system that integrates human creativity, user involvement, organizational learning, and digital technologies. While strategic alignment and technological augmentation enhance efficiency and

scalability, they must be balanced with openness and exploration to avoid constraining radical innovation. Organizations that successfully maintain this balance are better positioned to achieve sustainable competitive advantage in dynamic and technology-driven environments.

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Case Study

This case illustrates how innovation strategy is operationalized through the interaction of consumer demand, technological development, and supply chain capabilities within a dynamic market environment.

Factors Influencing Electric Vehicle Purchase Intentions in Thailand: The Impact of Supply Chain Agility, Consumer Attributes, and Electric Vehicle Features

Adapted Reprint from:

Suvittawat, A. (2024). Exploring the Relationship between Supply Chain Agility, Consumer and Electric Vehicle Characteristics, and Purchase Intentions in Thailand: A Structural Equation Modeling Approach. World Electric Vehicle Journal, 15(7), 294. https://doi.org/10.3390/wevj15070294

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1. Introduction

Primary production activities are widely associated with significant environmental externalities, including the depletion of natural resources and the generation of ecological waste, thereby intensifying the need for sustainability-oriented practices across industries. The automotive sector has been particularly responsive to climate change pressures, accelerating the adoption of renewable energy solutions and promoting electric vehicles (EVs) as viable substitutes for conventional internal combustion engine technologies. In the context of Thailand, road transportation remains the dominant mode of mobility and a major contributor to carbon emissions. With approximately 42 million registered vehicles and a continued rise in EV adoption, the transition toward vehicle electrification reflects both an environmental necessity and a transformative shift in the automotive industry structure.

At the global level, the EV market has experienced substantial growth, evidenced by a 65% increase in sales in 2022 and projections reaching approximately 17 million units by 2024. In Thailand, dependence on gasoline characterized by price fluctuations influenced by macroeconomic conditions and geopolitical dynamics creates economic strain and strengthens

the appeal of alternative energy vehicles. Key enabling factors for EV adoption include advancements in battery performance, improved cost efficiency, and supportive public policies such as fiscal incentives and domestic manufacturing initiatives. Additionally, consumer decision-making is shaped by factors such as environmental awareness, perceived risks and benefits, attitudes toward innovation, and levels of technological acceptance.

Despite the rapid expansion of the global EV market, empirical research on EV purchase intentions in Thailand remains relatively underdeveloped, particularly in terms of integrating consumer characteristics, EV attributes, and supply chain agility into a unified analytical framework. This study proposes a conceptual model grounded in behavioral theory and technology acceptance perspectives to investigate the determinants of EV purchase intention among Thai consumers. Specifically, consumer characteristics encompass social, demographic, psychological, and individual dimensions; EV-related attributes include economic factors, technical features, and risk–benefit evaluations; and supply chain agility refers to infrastructure readiness, operational responsiveness, and the effectiveness of pre- and post-sales service systems. The primary objective is to identify the most influential determinants shaping EV purchasing intentions within the Thai context.

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2. National Context: Electric Vehicle Purchase Intentions in Thailand

Electric vehicle (EV) purchase intentions in Thailand can be effectively interpreted through the integration of the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM). According to TPB, behavioral intention is determined by attitudes, subjective norms, and perceived behavioral control, with intention serving as the most immediate antecedent of actual behavior. In the EV context, pro-environmental attitudes and social influence play a significant role in shaping consumers' willingness to adopt EVs. TAM complements this framework by highlighting perceived usefulness and perceived ease of use as key drivers of technology acceptance. When Thai consumers perceive EVs as practical, advantageous, and user-friendly, their likelihood of purchase increases, particularly given that EVs represent both technological and environmentally oriented innovations.

Consumer characteristics further contribute to EV adoption and exhibit a close interrelationship with supply chain agility. Factors such as personality traits, environmental awareness, and subjective norms influence consumers' readiness to adopt EVs. At the same time, supply chain agility

enables firms to respond promptly to dynamic consumer demands through internal integration, digital transformation, and operational flexibility. Similar to other sectors such as food production, evolving consumer preferences necessitate adaptive and responsive value chains. Within the EV industry, agile supply chains facilitate alignment between product availability, charging infrastructure, and targeted marketing strategies across diverse consumer groups in Thailand.

In addition, the inherent characteristics of EVs significantly influence both supply chain agility and consumer purchase intention. EV manufacturing relies heavily on critical raw materials including lithium, nickel, cobalt, and manganese making supply chain resilience, risk mitigation, and sustainability key strategic priorities. Factors such as battery lifespan, safety concerns, seasonal performance variations, and charging accessibility also shape consumer perceptions. In the Thai context, middle-income urban consumers constitute the primary users of charging infrastructure, and their perceptions are largely influenced by technological familiarity and convenience. Furthermore, personal experiences with home charging, individual identity, and usage behavior contribute to shaping attitudes toward EV ownership.

Ultimately, supply chain agility and EV characteristics jointly determine consumer purchase intention. Transparent, efficient, and responsive supply chains often enabled by digital technologies enhance perceived value and consumer trust, analogous to the role of blockchain in improving traceability in other industries. Among the influencing factors, environmental awareness and vehicle pricing emerge as the most critical determinants of purchase intention, while charging infrastructure and government policy exhibit comparatively weaker direct effects. Consequently, promoting environmental consciousness, lowering EV costs, improving technological reliability, and strengthening supply chain responsiveness are essential strategies for accelerating EV adoption in Thailand.

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3. Methodology and Research Framework

The empirical foundation of this case study is based on a quantitative survey administered to 350 randomly selected respondents who are car users, hold a valid driver's license, reside in Thailand, and intend to purchase an electric vehicle. Data were collected through structured questionnaires and analyzed using structural equation modeling (SEM) to test the proposed hypotheses.

The survey includes measures capturing four key constructs: Consumer Characteristics, Electric Vehicle Characteristics, Supply Chain Agility, and Consumer Purchasing Intention.

Reliability and validity assessments indicate strong factor loadings ranging from 0.559 to 0.773. Cronbach's alpha coefficients ranged from 0.93 to 0.96, exceeding the recommended threshold of 0.70 and demonstrating high internal consistency. Furthermore, the model fit indices confirm an excellent overall model fit.

Six hypotheses are proposed to examine the direct effects among the variables, thereby providing a comprehensive understanding of how consumer characteristics, electric vehicle characteristics, and supply chain agility influence consumer purchase intention within the context of Thailand.

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4. Findings and Discussion

4.1 Consumer Characteristics

Among all variables, Consumer Characteristics exhibits the strongest and broadest influence. Consumer Characteristics significantly affects:

- Supply Chain Agility ($\beta = 0.21$)
- Electric Vehicles Characteristics ($\beta = 0.43$)
- Consumer Purchasing Intention ($\beta = 0.19$)

The findings indicate that consumers' environmental awareness, risk perceptions, and value assessments significantly influence both upstream supply chain adaptations and downstream market outcomes in the electric vehicle (EV) context. In particular, stronger environmental concern and expectations for innovation encourage manufacturers to improve supply chain responsiveness and advance technological capabilities. Furthermore, a comprehensive understanding of consumers' perceived financial, environmental, and psychological benefits is crucial for developing EV attributes that align with customer value perceptions. Additionally, the quality of digital platforms and the implementation of customer-centric design play a vital role in strengthening purchase intentions. These insights suggest that firms should systematically integrate consumer perspectives into supply chain configuration, product development, and digital engagement strategies to enhance their competitive position in the rapidly evolving EV market.

4.2 Electric Vehicles Characteristics

Electric Vehicles Characteristics significantly influence:

- Supply Chain Agility (β = 0.30)
- Consumer Purchasing Intention (β = 0.57)

The findings indicate that consumers' evaluations of the functional benefits, perceived value, and technological attributes of electric vehicles particularly aspects such as battery durability and performance efficiency significantly enhance their purchase intentions while also driving improvements in production efficiency and supply chain responsiveness. In line with technology adoption literature, factors such as perceived usefulness, risk perceptions, and practical compatibility are critical determinants of consumer attitudes and behavioral intentions across various contexts, including Internet banking, smart speaker technologies, and COVID-19 tracking applications. Overall, when electric vehicle features are regarded as advantageous, dependable, and congruent with user needs, they not only strengthen consumers' intention to adopt but also promote increased agility within the electric vehicle supply chain ecosystem.

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4.3 Supply Chain Agility

Supply Chain Agility significantly influences Consumer Purchasing Intention (β = 0.25).

The findings suggest that supply chain agility significantly improves firms' capacity to adapt to dynamic market conditions, tailor offerings to shifting customer preferences, and reinforce their competitive advantage. Entrepreneurial capability is instrumental in capitalizing on such agility, enabling SMEs to drive innovation and sustain long-term business performance. Through systematic environmental scanning and the implementation of proactive, future-oriented strategies—such as the adoption of circular economy practices and blockchain technologies—firms can enhance operational efficiency, lower production costs, and improve supply chain transparency and coordination. Collectively, these capabilities contribute to strengthening consumer purchase intentions while supporting sustainable development outcomes.

5. Synthesis

The case study demonstrates that innovation strategy functions as a critical integrative mechanism linking consumer expectations, electric vehicle (EV) attributes, and supply chain agility to enhance purchase intention in Thailand. From an innovation strategy perspective, firms are not merely responding to market demand but actively shaping it through continuous technological advancement, customer-centric design, and agile operational alignment.

Specifically, the findings indicate that innovation is driven by consumer preferences for advanced features such as improved battery longevity, performance efficiency, and usability which compel firms to invest in product and process innovation. This aligns with the notion that innovation strategy must be demand-driven, where firms systematically translate consumer insights into enhanced value propositions.

Moreover, supply chain agility emerges as a strategic enabler of innovation. Agile supply chains facilitate rapid product development, customization, and responsiveness to evolving market conditions, thereby supporting innovation diffusion and reducing time-to-market. In this context, innovation strategy extends beyond product development to include process innovation, digital integration, and collaborative ecosystems across the value chain.

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Importantly, the study highlights that firms adopting forward-looking innovation strategies such as integrating sustainability principles, enhancing transparency, and leveraging emerging technologies can simultaneously improve operational efficiency and strengthen competitive positioning. These strategies not only address functional performance but also align with consumers' environmental awareness and perceived value, which are key drivers of EV adoption.

In synthesis, the case underscores that effective innovation strategy in the EV sector requires:

- Customer-centric innovation (aligning product features with user expectations)
- Agile and responsive supply chains (enabling rapid adaptation and scalability)
- Technological and sustainability integration (enhancing long-term value creation)

Innovation strategy serves as a dynamic capability that transforms market insights into competitive advantage, ultimately reinforcing consumer purchase intentions and accelerating the transition toward electric mobility.

Supply chain agility driven by flexibility, responsiveness, and innovation speed acts as a critical strategic capability that mediates the relationship between consumer and product-related factors and purchasing outcomes, thereby reinforcing its role as an enabling layer for competitive advantage. Within the innovation process (execution layer), these capabilities operationalize market intelligence by translating consumer characteristics (e.g., environmental concern, social influence) and electric vehicle attributes (e.g., battery performance, perceived value) into adaptive production, service, and delivery adjustments, reflecting a continuous feedback-driven and demand-responsive process. Furthermore, the study implicitly captures multiple innovation types, particularly product innovation (enhancement of EV features), process innovation (agile supply chain and manufacturing responsiveness), and elements of business model innovation (customer-centric value delivery and service integration), which collectively interact as a configured innovation portfolio that drives consumer purchasing intention.

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6. Conclusion

Within the Thai context, supply chain agility constitutes a critical determinant of consumers' intentions to purchase electric vehicles (EVs). Purchase intention is positively shaped by three key antecedents: consumer characteristics, EV attributes, and supply chain agility. Consumers with a stronger orientation toward innovation exhibit a higher propensity to adopt EVs. Moreover, the perceived usefulness and convenience of EV features particularly extended driving range and user-friendly design significantly enhance purchase intention. Addressing practical concerns, such as battery durability and range limitations, is therefore essential to strengthening consumer confidence and facilitating adoption.

Furthermore, supply chain agility conceptualized as the capability to respond swiftly to market demand through flexible production, efficient distribution, and product customization plays a reinforcing role by ensuring alignment between EV offerings and consumer expectations. Collectively, these findings suggest that EV manufacturers in Thailand should emphasize continuous innovation, consumer-centric product development, agile supply chain capabilities, and targeted consumer education to accelerate market penetration and strengthen purchase intentions.

Case Study Questions

1. How do consumer characteristics (e.g., environmental concern, social influence, innovation orientation) drive the development of supply chain agility in the EV industry?
2. To what extent do electric vehicle characteristics (e.g., battery performance, perceived value, technological features) shape supply chain agility in EV manufacturing and distribution?
3. How do consumer characteristics influence the perceived and actual development of electric vehicle characteristics?
4. How does supply chain agility (e.g., responsiveness, flexibility, service capability) affect consumers' intention to purchase electric vehicles?
5. What are the direct effects of consumer characteristics and EV characteristics on purchase intention in the Thai EV market?

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Chapter Summary

This chapter conceptualizes innovation strategy as a multi-level, capability-driven system that integrates strategic orientation, innovation typologies, governance mechanisms, and iterative innovation processes to create and sustain competitive advantage.

Innovation strategy refers to a structured, multidimensional, and context-dependent approach through which firms generate, implement, and sustain innovations aligned with long-term objectives and competitive environments. It integrates strategic decision-making on resource allocation, risk management, and innovation direction across dimensions such as technological, market, temporal, competitive, and cooperative orientations. Rather than a static plan, it is a dynamic, option-based process shaped by uncertainty, managerial perception, and trade-offs between complexity and efficiency. Ultimately, innovation strategy aligns internal capabilities with external conditions to create, protect, and capture value, thereby driving sustained competitive advantage.

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Innovation strategy encompasses a multidimensional classification of innovation types and degrees of novelty, reflecting how firms create and transform value. Core innovation types include product, process, service, technological, managerial, business model, supply chain, green, and open innovation, along with marketing and organizational innovation. These types often overlap and should be viewed as interdependent rather than isolated. Additionally, innovation varies in intensity from incremental improvements to radical transformations, with emerging technologies such as generative AI accelerating both processes. Thus, innovation strategy is best understood as an integrated system combining domains of change, levels of novelty, and technological enablers.

Corporate innovation strategy consists of interrelated elements that shape how firms govern and execute innovation under uncertainty. Key components include strategic orientation (exploration vs. exploitation), information disclosure practices, governance structures, executive cognitive capabilities, financial reporting integrity, and organizational resilience. These elements interact to influence decision-making, resource allocation, and risk-

taking behavior while balancing transparency with knowledge protection. Collectively, they form an integrated framework that determines innovation outcomes, firm performance, and long-term competitive positioning within complex institutional environments.

Strategic capabilities are higher-order organizational competencies that enable firms to sense opportunities, reconfigure resources, and sustain innovation in dynamic environments. These capabilities are strengthened through digital tools such as business intelligence and IT systems, as well as through ecosystem collaboration and knowledge integration. They support both exploratory and exploitative innovation by facilitating learning, adaptability, and resource orchestration across internal and external domains. Ultimately, strategic capabilities act as a bridging mechanism that aligns resources, processes, and business models with evolving market demands, thereby enhancing innovation performance and competitive advantage.

The strategic innovation process is an iterative, adaptive, and socio-technical system through which firms generate, develop, and implement innovations aligned with strategic goals. It involves interconnected stages: opportunity framing, user-integrated development, iterative experimentation, AI-augmented implementation, and continuous adaptation. The process is shaped by managerial cognition, user involvement, organizational learning, and digital technologies, particularly AI, which enhances speed and decision quality. However, maintaining a balance between strategic alignment and exploratory openness is critical, as excessive control may suppress radical innovation. Overall, the process reflects a dynamic interplay between human creativity, technological augmentation, and organizational capabilities.

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Chapter Review Questions

Review Question 1:

How does innovation strategy function as a multidimensional and dynamic decision-making framework, and in what ways do its key orientations (technological, temporal, market, competitive, and cooperative) influence a firm's ability to achieve long-term competitive advantage?

Review Question 2:

Critically evaluate how different types of innovation (e.g., product, process, business model, and open innovation) and degrees of novelty (incremental vs. radical) interact to shape organizational performance and strategic positioning.

Review Question 3:

Analyze how the core elements of corporate innovation strategy such as strategic orientation, governance structures, executive cognition, and information disclosure interact to influence innovation outcomes and organizational performance.

Review Question 4:

To what extent do strategic capabilities, including digital capabilities, knowledge integration, and ecosystem collaboration, act as enabling mechanisms for innovation in dynamic environments?

Review Question 5:

Explain how the strategic innovation process has evolved from a linear model to an iterative, socio-technical system, and assess the roles of user involvement, organizational learning, and AI in enhancing innovation effectiveness.

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Chapter Exercises

Exercise 1:

Select a real-world company (e.g., Apple, Tesla, or a Thai SME). Answer the following:

1. Define the company's innovation strategy in terms of:
   - Strategic intent
   - Resource allocation
   - Risk management approach
2. Analyze how the firm reflects the five orientations of innovation strategy:
   - Technological
   - Temporal (timing)
   - Market
   - Competitive
   - Cooperative
3. Evaluate how the company manages uncertainty and ambiguity in innovation decisions (e.g., early adoption vs. delay strategies).
4. Critically discuss whether the firm prioritizes efficiency or strategic complexity, and justify your reasoning.

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Exercise 2:

Choose an organization and:

1. Identify at least five types of innovation implemented by the firm:
   - Product
   - Process
   - Service
   - Business model
   - Marketing / Organizational / etc.
2. For each type:
   - Provide a concrete example
   - Explain its strategic purpose
3. Distinguish between:
   - Incremental innovation vs. Radical innovation in the firm

4. Analyze how digital technologies (e.g., AI or GenAI) support these innovation types.
5. Discuss the interdependencies among different innovation types.

Exercise 3:

Using a case (real or hypothetical firm), evaluate the following six elements: (1) Strategic orientation (exploration vs. exploitation), (2) Information disclosure and transparency, (3) Governance structure (e.g., board, leadership), (4) Executive knowledge and cognition, (5) Financial reporting quality, and (6) Organizational resilience and adaptability.

1. Explain how each element influences innovation decisions
2. Identify potential trade-offs (e.g., transparency vs. knowledge protection)
3. Assess how these elements interact as a system

Exercise 4:

To evaluate how strategic capabilities enable innovation in dynamic environments.

1. Define the following capabilities in your own words:
   - Strategic capabilities
   - Digital capabilities
   - Dynamic capabilities
2. Analyze a firm (preferably SME or Thai context):
   - How it uses business intelligence (BI)
   - How digital capabilities support innovation
3. Examine the role of:
   - Ecosystem collaboration
   - External resource integration
4. Apply the concept of equifinality:
   - Propose two different capability configurations that could lead to similar innovation outcomes
5. Discuss how capabilities support:
   - Exploratory innovation
   - Exploitative innovation

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Exercise 5:

To understand innovation as an iterative, socio-technical, and AI-augmented process.

1. Map the five stages of the strategic innovation process:
   - Opportunity framing & ideation
   - Concept development & user integration
   - Development & iteration
   - Implementation (AI integration)
   - Continuous adaptation
2. Select a case and:
   - Describe how each stage is implemented
   - Identify feedback loops between stages
3. Analyze the role of:
   - User involvement across stages
   - Employee participation and reflective practices
4. Evaluate the impact of:
   - AI in decision-making
   - Human–AI collaboration
5. Critical Analysis:
   - Explain how managerial framing may suppress radical innovation
   - Propose strategies to avoid this problem

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References

Agazu, B. G., & Kero, C. A. (2024). Innovation strategy and firm competitiveness: A systematic literature review. *Journal of Innovation and Entrepreneurship*, 13, 24. https://doi.org/10.1186/s13731-024-00381-9

Bogetoft, P., Kroman, L., Smilgins, A., et al. (2024). Innovation strategies and firm performance. *Journal of Productivity Analysis*, 62, 175–196. https://doi.org/10.1007/s11123-024-00727-1

Bosch-Sijtsema, P., & Bosch, J. (2015). User Involvement throughout the Innovation Process in High-Tech Industries. *Journal of Product Innovation Management, 32*(5), 793-807. https://doi.org/10.1111/jpim.12233

Castillo-Vergara, M., Geldes, C., Mora, R., & Leiva, J. C. (2025). The role of business intelligence and digital capabilities in driving SME innovation in Latin America. *Revista de Gestão, 32*(4), 361-386. https://doi.org/10.1108/rege-01-2025-0018

Hendrawidjaja, J. B., Soetjipto, B. W., Kusumastuti, R. D., & Jayanagara, O. (2026). Ecosystem Exchange, Strategic Capabilities, and Firm Performance with Agility and Innovation Mediators. *APTISI Transactions on Technopreneurship, 8*(1), 226-238. https://doi.org/10.34306/att.v8i1.688

Huikkola, T., Kohtamäki, M., & Ylimäki, J. (2022). Becoming a smart solution provider: Reconfiguring a product manufacturer's strategic capabilities and processes to facilitate business model innovation. *Technovation, 118*, 102498. https://doi.org/10.1016/j.technovation.2022.102498

Jia, N. (2017). Corporate Innovation Strategy, Analyst Forecasting Activities and the Economic Consequences. *Journal of Business Finance & Accounting, 44*(5-6), 812-853. https://doi.org/10.1111/jbfa.12242

Library and Learning, University of Phayao

Jia, N. (2019). Corporate innovation strategy and disclosure policy. *Review of Quantitative Finance and Accounting, 52*(1), 253-288. https://doi.org/10.1007/s11156-018-0709-6

Jia, N. (2019). The impact of accounting restatements on corporate innovation strategy. *Journal of Accounting and Public Policy, 38*(3), 219-237. https://doi.org/10.1016/j.jaccpubpol.2019.05.004

Kim, H.-S. (2023). Effects of ambiguity on innovation strategies. *Financial Innovation, 9*(1), 68. https://doi.org/10.1186/s40854-023-00468-4

Koutsouradis, G., Gkypali, A., & Tsekouras, K. (2026). Innovation efficiency and complexity of innovation strategy: A trade-off relationship. *Omega, 142*, 103533. https://doi.org/10.1016/j.omega.2026.103533

Kratochvil, R. (2025). The process of framing innovation activities: How strategic leaders erode their ideas for radical innovations. *Research Policy, 54*(1), 105107. https://doi.org/10.1016/j.respol.2024.105107

Lui, S., Ozdemir, S. Z., Jackson, C. J., Shinkle, G. A., & Walker, B. R. (2025). Managing the innovation process of small and medium-sized enterprises: The important roles of reflecting and employee involvement. *Australian Journal of Management, 50*(3), 917-938. https://doi.org/10.1177/03128962241270771

Mariani, M., & Dwivedi, Y. K. (2024). Generative artificial intelligence in innovation management: A preview of future research developments. *Journal of Business Research, 175*, 114542. https://doi.org/10.1016/j.jbusres.2024.114542

Martin-Rios, C., & Ciobanu, T. (2019). Hospitality innovation strategies: An analysis of success factors and challenges. *Tourism Management, 70*, 218-229. https://doi.org/10.1016/j.tourman.2018.08.018

Melesse, H. S. (2026). Strategic Capabilities and Competitive Performance of Firms: Development, Current Themes, and Future Research

Library and Learning, University of Phayao

Agenda. Journal of the Knowledge Economy, 17, 2089-2124. https://doi.org/10.1007/s13132-025-02708-7

Molate, M. C. C., Ngwakwe, C. C., & Motubatse, K. N. (2025). CORPORATE INNOVATION STRATEGY AND SALES REVENUE OF MULTINATIONAL COMPANIES IN TIMES OF CRISIS: A CASE OF THE COVID-19 PANDEMIC. *Corporate and Business Strategy Review, 6*(1 Special Issue), 370-377. https://doi.org/10.22495/cbsrv6i1siart13

Moreira, A., Navaia, E., & Ribau, C. (2024). Innovation capabilities and their dimensions: A systematic literature review. *International Journal of Innovation Studies*, 8(3), 313–333. https://doi.org/10.1016/j.ijis.2024.07.001

Pires, R. A. R., & Ferreira, J. J. (2025). Bridging innovation strategies and intellectual property: A systematic review-based conceptual framework and a roadmap for future research. *Technovation, 144*, 103243. https://doi.org/10.1016/j.technovation.2025.103243

Qiu, Q., & Yu, D. (2020). The impacts of CEO's knowledge structure on corporate innovation strategy. *Kybernetes, 50*(9), 2597-2618. https://doi.org/10.1108/k-03-2020-0131

Rachinger, M., Vilkas, M., Grybauskas, A., & Lukauskas, M. (2024). The challenge of measuring innovation types: A systematic literature review. *Journal of Innovation & Knowledge*, 9(4), 100620. https://doi.org/ 10.1016/j.jik.2024.100620

Raymond, L., Bergeron, F., Croteau, A.-M., Ortiz de Guinea, A., & Uwizeyemungu, S. (2020). Information technology-enabled explorative learning and competitive performance in industrial service SMEs: a configurational analysis. *Journal of Knowledge Management, 24*(7), 1625-1651. https://doi.org/10.1108/jkm-12-2019-0741

Library and Learning, University of Phayao

Roberts, D. L., & Candi, M. (2024). Artificial intelligence and innovation management: Charting the evolving landscape. *Technovation, 136*, 103081. https://doi.org/10.1016/j.technovation.2024.103081

Sheth, A., & Sinfield, J. V. (2022). An analytical framework to compare innovation strategies and identify simple rules. *Technovation, 115*, 102534. https://doi.org/10.1016/j.technovation.2022.102534

Sonmez Cakir, F., Jahanshahi, A. A., Adiguzel, Z., & Kalaycioglu, O. (2026). Knowledge capabilities and AI firm performance: the mediating roles of innovation culture and technology strategy. *Business Process Management Journal*, 1-34. https://doi.org/10.1108/BPMJ-02-2025-0187

Stundziene, A., Pilinkiene, V., Vilkas, M., Grybauskas, A., & Lukauskas, M. (2024). The challenge of measuring innovation types: A systematic literature review. *Journal of Innovation & Knowledge, 9*(4), 100620. https://doi.org/10.1016/j.jik.2024.100620

Suvittawat, A. (2024). Exploring the Relationship between Supply Chain Agility, Consumer and Electric Vehicle Characteristics, and Purchase Intentions in Thailand: A Structural Equation Modeling Approach. *World Electric Vehicle Journal, 15*(7), 294. https://doi.org/10.3390/wevj15070294

Wang, G., Wang, Y., Ju, X., & Rui, X. (2022). Effects of political networking capability and strategic capability on exploratory and exploitative innovation: evidence from traditional manufacturing firms in China. *Journal of Manufacturing Technology Management, 33*(3), 618-642. https://doi.org/10.1108/jmtm-07-2021-0237

Wolf, V., Dobrucka, R., Przekop, R., & Haubold, S. (2021). Innovation strategies in the context of the paradigm of the five dimensions of innovation strategy. *Logforum, 17*(2), 205-211. https://doi.org/10.17270/J.LOG.2021.587

Zhang, Y., & Ma, L. (2022). The Board Faultlines and Corporate Innovation Strategies Under the Influence of Property Rights Background and

Library and Learning, University of Phayao

Institutional Environment. *Frontiers in Psychology, 13*, Article 857886. https://doi.org/10.3389/fpsyg.2022.857886

Zhang, Y., Wang, X., Tarba, S., & Neely, A. (2026). Digital transformation through innovation: The human-AI decision spectrum. *Technovation, 153*, 103524. https://doi.org/10.1016/j.technovation.2026.103524

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Chapter 5: Strategic Sources of Innovation in Dynamic and Digital Ecosystems

Course Learning Outcomes (CLO):

1. Analyze internal and external innovation sources in digital ecosystems.
2. Classify and evaluate internal, external, and combined innovation sources.
3. Apply sentiment analysis to interpret stakeholder perceptions in innovation.
4. Examine multi-level origins of innovation (individual, organizational, ecosystem).
5. Evaluate innovation trends as sources shaping future opportunities.

Contents and Concepts of This Chapter:

5.1 Introduction to Innovation Sources

5.2 Types of Innovation Sources

5.3 Innovation Sentiment Analysis

5.4 Where Do Innovations Come From?

5.5 Innovation Trends as Sources

Case Study

Chapter Summary

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5.1 Introduction to Innovation Sources

This chapter proposes a novel integrative framework that conceptualizes innovation sources as a multilevel, capability-driven system linking knowledge flows, stakeholder sentiment, and strategic trends.

Innovation sources refer to the origins or drivers from which new ideas, technologies, products, processes, and business models emerge. These sources can be broadly categorized into internal (within the firm) and external (outside the firm), forming a dynamic and interconnected ecosystem that sustains continuous innovation and competitive advantage.

In contemporary contexts, innovation sources are increasingly embedded within digital transformation, which functions not merely as a technological upgrade but as a strategic and systemic driver of innovation. Digital transformation entails an organization-wide reconfiguration of business models, processes, structures, and capabilities through the integration of digital technologies. This transformation enhances stakeholder connectivity, expands information flows, and accelerates data-driven decision-making. Collectively, these mechanisms foster innovation by enabling knowledge recombination, collaborative value creation, and adaptive responses to rapidly changing market conditions. In manufacturing family firms, digital transformation serves as a critical internal source of innovation by reshaping organizational logic and facilitating the development of new products, processes, and business models. From a dynamic capabilities perspective, it enables firms to sense opportunities, seize them through resource reconfiguration, and transform operations to sustain competitive advantage. However, its effectiveness depends on organizational characteristics such as generational leadership and long-term orientation as well as institutional contexts, although its overall impact remains consistently positive across both developed and emerging economies (Alayo et al., 2026).

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Beyond traditional research and development (R&D), innovation sources increasingly encompass a broader ecosystem of digitally enabled and non-conventional inputs, particularly in SMEs. Innovation emerges from the integration of digital strategies with diverse knowledge sources, including digital communities, user-driven innovation, open innovation networks, and collaborative environments such as coworking spaces and makerspaces.

These sources facilitate knowledge exchange, co-creation, and rapid experimentation, which are especially critical under the resource constraints faced by SMEs. Importantly, innovation is not solely technology-driven but is shaped by complex, interdependent relationships among organizational factors, tools, methodologies, and stakeholders. These elements interact dynamically to influence innovation outcomes. To fully benefit from these sources, SMEs must develop absorptive capacity to recognize, assimilate, and apply external knowledge, while leveraging digital transformation as a strategic enabler. Consequently, innovation sources are increasingly conceptualized as multidimensional, network-based, and digitally mediated, requiring structured decision-making approaches to identify causal relationships and prioritize high-impact factors that enhance sustainable competitive advantage (Farinha et al., 2025).

External innovation sources consist of knowledge and information inputs acquired from actors such as customers, suppliers, universities, research institutions, and strategic partners. These sources play a critical role in expanding a firm's knowledge base and supporting learning processes, including learning-by-doing, knowledge sharing, and experimentation, which ultimately enhance new product performance. While external sources positively influence innovation activities and indirectly affect product innovation outcomes, their relative importance varies across industries. Low-technology firms tend to rely more heavily on external sources due to limited internal R&D capacity, whereas high-technology firms depend more on internally generated knowledge. Furthermore, the effectiveness of external innovation sources is significantly enhanced by knowledge management practices, which facilitate the acquisition, integration, and application of knowledge within the organization (Law et al., 2021).

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Internal innovation sources, particularly in peripheral regions, are deeply embedded in organizational culture and strategic orientation rather than driven solely by technological inputs or external knowledge acquisition. Innovation emerges from internal organizational conditions in which cultural elements such as shared values, norms, communication practices, teamwork, and employee involvement serve as key enablers. Three interrelated dimensions management strategy, organizational strategy, and innovation strategy function as structured mechanisms for mobilizing knowledge,

coordinating activities, and supporting the implementation of new ideas. These cultural configurations create environments conducive to idea generation, knowledge sharing, and the development of innovative practices. Notably, managerial skills, including personal, interpersonal, and group competencies, exhibit a complex relationship with innovation performance. In some contexts, these skills may not enhance and may even hinder innovation outcomes due to misalignment with innovation-specific capabilities or the persistence of rigid managerial routines. Therefore, innovation is more accurately understood as a culturally embedded and systemically conditioned process, in which organizational values and strategic practices exert a more decisive influence than individual managerial competencies, particularly in resource-constrained and peripheral innovation systems (Pedraza-Rodríguez et al., 2023).

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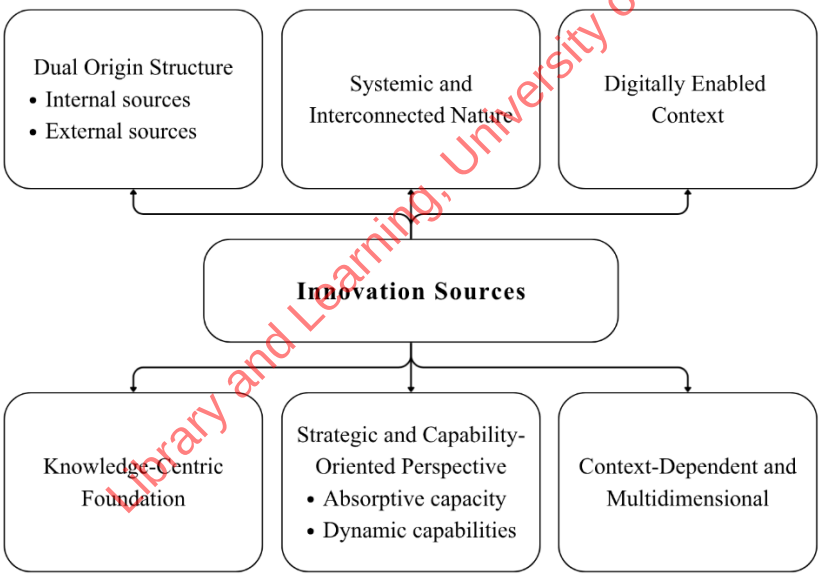

Figure 5.1 Innovation Sources

Source: Adapted from Pinto, H., Guerreiro, J. A., & Fernández-Esquinas, M. (2023). Sources of knowledge in the firm: A review on influential, internal and contextual factors in innovation dynamics. *SN Business & Economics*, 3, 57.

As illustrated in Figure 5.1, innovation sources are conceptualized as a multifaceted and integrative construct characterized by a dual-origin

structure, encompassing both internal sources (e.g., organizational knowledge, R&D, employee capabilities) and external sources (e.g., customers, partners, competitors, and institutions). These sources operate within a systemic and interconnected framework, where knowledge flows and interactions across organizational boundaries collectively drive innovation outcomes. In contemporary settings, this process is increasingly embedded in a digitally enabled context, in which digital technologies facilitate real-time information exchange, collaboration, and scalability of innovation activities. Fundamentally, innovation sources are grounded in a knowledge-centric foundation, emphasizing the critical role of knowledge creation, acquisition, and utilization. From a strategic perspective, firms leverage absorptive capacity and dynamic capabilities to identify, assimilate, and reconfigure resources for sustained innovation. Moreover, innovation sources are inherently context-dependent and multidimensional, varying across industries, environments, and organizational conditions, thereby requiring adaptive and integrative approaches to effectively harness their potential.

The conceptual positioning of this study integrates innovation sources, sentiment analysis, multi-level origins, and innovation trends into a unified analytical framework that explains how innovation emerges, evolves, and diffuses across contexts. Innovation sources constitute the foundational inputs of the model, encompassing internal capabilities, market-driven insights, and external knowledge networks, which collectively shape the generation of new ideas. These sources are dynamically interpreted through sentiment analysis, which captures stakeholders' perceptions, emotions, and evaluative feedback, thereby influencing both the direction and intensity of innovation activities. Building on this, the model incorporates a multi-level perspective, recognizing that innovation originates and interacts across individual (e.g., entrepreneurial cognition), organizational (e.g., strategic orientation and resource configurations), and ecosystem levels (e.g., institutional and technological environments). These interconnected layers create a recursive system in which feedback loops continuously refine innovation processes. Finally, innovation trends represent the forward-looking dimension of the model, reflecting how accumulated insights from sources, sentiments, and multi-level interactions translate into emerging patterns such as digital transformation, sustainability-driven innovation, and

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customer-centric adaptation. Together, these elements form a coherent, integrative model that not only explains the structural and behavioral foundations of innovation but also provides a predictive lens for understanding its future trajectories.

In conclusion, innovation sources should be understood as an integrated and evolving system comprising both internal and external drivers that interact within digitally enabled environments. Rather than operating in isolation, these sources collectively shape firms' innovation capacity through continuous knowledge exchange, organizational adaptation, and strategic alignment. As digital transformation intensifies and innovation ecosystems become more interconnected, firms must develop the capabilities to effectively integrate diverse innovation sources, enhance absorptive capacity, and align organizational culture with strategic objectives. Such an integrative approach is essential for sustaining innovation and achieving long-term competitive advantage in increasingly complex and dynamic environments.

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5.2 Types of Innovation Sources

Types of innovation sources refer to the origins of ideas, knowledge, or inspiration that drive innovation within firms. The literature consistently classifies these sources into internal and external categories, with further sub-dimensions reflecting the diversity of knowledge inputs, as illustrated in Figure 5.2.

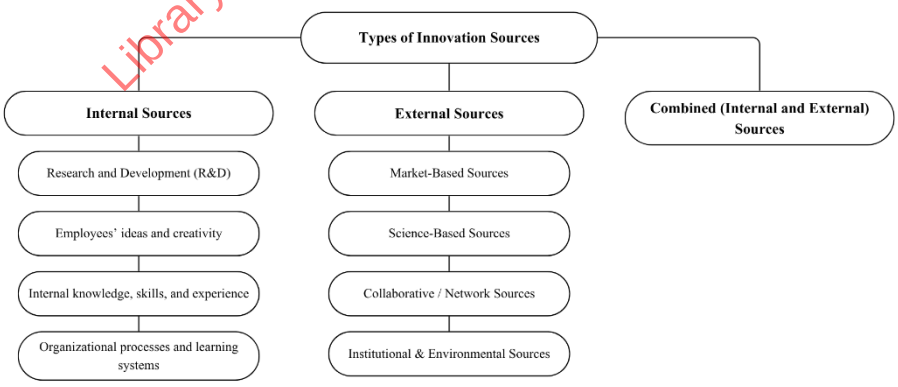

Figure 5.2 Types of Innovation Sources

Source: Adapted from Stundziene, A., et al. (2024). The challenge of measuring innovation types: A systematic literature review. *Journal of Innovation & Knowledge*, 9(4), 120600

1. Internal Sources of Innovation

Internal sources originate within the organization and constitute the firm's foundational knowledge base.

Key internal sources include:

- Research and Development (R&D)
- Employees' ideas and creativity
- Internal knowledge, skills, and experience
- Organizational processes and learning systems

Internal knowledge and R&D should not be viewed solely as direct drivers of innovation performance; rather, they function as fundamental capabilities that enable firms to generate, evaluate, and exploit innovation opportunities. Embedded in employees' competencies, organizational routines, and in-house R&D activities, internal knowledge plays a central role in shaping innovation processes and outcomes. Moreover, investments in R&D and personnel development enhance a firm's absorptive capacity, allowing it to identify, assimilate, and apply external knowledge from various partners, including universities, suppliers, and customers. Thus, innovation performance emerges from the interaction between strong internal knowledge bases and the effective utilization of external knowledge, with firms possessing more developed internal capabilities achieving superior outcomes (Ozols et al., 2025).

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Internal information also provides a critical foundation for product innovation, particularly in new product development. Firm-specific resources such as accumulated technological capabilities, experiential learning, and internal problem-solving mechanisms facilitate the generation and application of proprietary knowledge. These internal knowledge bases enable firms to transform insights into tangible innovations, highlighting the importance of internally developed competencies in supporting product innovation processes (Suzuki, 2023).

Furthermore, strong internal capabilities especially internal R&D enhance firms' ability to leverage external knowledge by strengthening absorptive capacity. Internal R&D supports the identification, evaluation, assimilation, and integration of external knowledge into existing knowledge systems. It also facilitates communication with external partners and

improves the adaptation of externally sourced knowledge to firm-specific contexts, thereby increasing the effectiveness of external knowledge utilization (Chen et al., 2016).

2. External Sources of Innovation

External sources originate outside the organization and are central to open innovation practices. These sources can be categorized into several groups:

a) Market-Based Sources

- Customers (feedback, needs)
- Suppliers (technology, materials)
- Competitors (benchmarking, imitation)

External information from market actors plays differentiated roles across innovation types. Customer-related knowledge is a key driver of product innovation, enhancing the development of new or improved products. In contrast, supplier-related knowledge is particularly influential in process innovation, contributing to improvements in production methods and operational efficiency (Gómez et al., 2016).

Supplier relationships further support innovation by fostering supply management innovativeness and strengthening buyer–supplier partnerships. These relationships facilitate the integration of external knowledge and resources into firms' innovation processes (Liu et al., 2024).

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b) Science-Based Sources

- Universities
- Research institutes
- Scientific publications

Science-based knowledge derived from universities and research institutions contributes to innovation performance; however, its effectiveness

depends on firm-specific conditions, including the firm's capacity to absorb and utilize such knowledge (Duong et al., 2022).

Collaborations with science-based actors are particularly important for knowledge-intensive and research-driven innovation activities. Such partnerships, especially when combined with industry collaboration, enhance research capabilities and support more advanced forms of innovation, particularly in technology-oriented firms (De Beule & Van Beveren, 2019).

c) Collaborative / Network Sources

- Strategic partners
- Alliances and joint ventures
- Supply chains
- Consultants and innovation intermediaries

Collaborative knowledge obtained from supply-chain partners including customers, suppliers, and competitors serves as an important channel for accessing external ideas and information within operational contexts (Phung Minh Thu et al., 2018).

More broadly, firms engage with diverse external actors such as suppliers, customers, competitors, and research institutions forming knowledge networks that enhance their capacity to generate and apply knowledge for innovation activities (Pinto et al., 2023).

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d) Institutional & Environmental Sources

- Government policies
- Industry standards
- Conferences, fairs, and exhibitions
- Regional innovation ecosystems

Innovation does not occur in isolation but is embedded within a broader institutional and environmental context. External conditions including regulatory frameworks, industry structures, and institutional support shape firms' ability to adopt and implement innovations. Consequently, observed innovation outcomes reflect both firm-level efforts

and the effectiveness of the surrounding innovation system, highlighting the importance of supportive policies and coordinated institutional mechanisms (Chang et al., 2016).

3. Combined (Internal and External) Sources

Contemporary innovation increasingly results from the integration of internal and external sources rather than reliance on a single type. Internal R&D enables firms to absorb and utilize external knowledge effectively, while external sources provide complementary insights that extend internal capabilities. Both internal and external knowledge sources contribute positively to innovation outcomes, particularly process innovation, although their effects vary depending on the type of source and innovation context (Moya-Fernández & Seclen-Luna, 2024). Importantly, the effectiveness of external knowledge depends on the strength of internal capabilities such as R&D, employee competencies, and organizational knowledge which facilitate the absorption and integration of external inputs into innovation processes (Ozols et al., 2025).

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Despite the advantages of open innovation and leveraging external knowledge sources, several critical limitations must be acknowledged. Heavy reliance on external innovation can erode internal capability development, weakening firms' absorptive capacity and long-term innovation self-sufficiency while increasing strategic dependency on partners. Additionally, over-reliance on sentiment data often derived from digital platforms may introduce biases due to non-representative samples, algorithmic filtering, and short-term noise, potentially distorting strategic decision-making. Digital transformation further amplifies these concerns, as firms may prioritize data-driven signals over tacit knowledge and contextual judgment, leading to homogenized innovation trajectories and reduced differentiation. Collectively, these risks highlight the need for a balanced approach that integrates external insights with robust internal capabilities and critical evaluation mechanisms.

In conclusion, innovation arises from a dynamic interplay between internal capabilities and external knowledge sources. While internal resources provide the foundational capacity for innovation, external sources expand the scope of knowledge and opportunities available to firms. The most effective innovation strategies, therefore, are those that integrate and leverage both internal and external sources in a complementary manner, enabling firms to enhance their innovation performance in increasingly complex and competitive environments.

While traditional innovation sources focus on knowledge inputs, emerging approaches such as sentiment analysis extend this perspective by incorporating socio-emotional signals as intangible yet influential sources of innovation.

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5.3 Innovation Sentiment Analysis

Innovation sentiment analysis refers to the systematic extraction and interpretation of affective signals such as opinions, emotions, and attitudes from textual data (e.g., social media, reports, investor communications, and organizational discourse) to understand how stakeholders perceive, influence, and respond to innovation processes.

Within innovation management, sentiment analysis can be conceptualized as a complementary analytical approach that enriches traditional diffusion-based assessments by capturing expressed attitudes in digital communication environments. Integrating diffusion of innovation theory with computational text analytics, social media platforms particularly Twitter function as critical channels through which opinions, beliefs, and emotional responses toward innovations are articulated and disseminated. These sentiments, typically classified as positive, negative, or neutral, have been empirically linked to stages of the innovation–decision process, particularly persuasion and decision, thereby influencing how individuals evaluate and respond to new ideas. Importantly, communication dynamics within social systems facilitated by homophily, hashtag networks, and real-time discourse play a central role in shaping adoption behaviors. Thus,

innovation diffusion is not solely driven by technological attributes but is significantly mediated by socially constructed perceptions, collective attitudes, and communicative processes that legitimize innovations within society (Al-Razgan et al., 2021).

At the organizational level, sentiment analysis serves as a data-driven mechanism for identifying and defining innovation-related problems through the systematic analysis of large-scale user-generated content. By extracting subjective information such as customer opinions, emotions, and feedback firms can generate actionable insights into product performance, service deficiencies, and emerging market needs. This process typically involves structured analytical procedures, including data preprocessing, keyword extraction, sentiment classification, and clustering, which enable the identification of patterns in customer feedback and their categorization into meaningful problem domains. The application of frameworks such as the 5W model (What, Who, When, Where, Why) further enhances the systematic characterization and formalization of innovation problems. Consequently, sentiment analysis facilitates real-time monitoring of stakeholder perceptions and strengthens opportunity recognition by uncovering latent dissatisfaction and unmet needs that may not be captured through conventional market research methods. Moreover, its integration with artificial intelligence and autonomic data analysis cycles enhances decision-making by enabling adaptive, scalable, and self-regulating identification of organizational challenges (Gutiérrez et al., 2025).

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At the project level, sentiment analysis can be employed to assess digital competencies by analyzing both scholarly discourse and project-related communication data. Rather than directly measuring constructs such as leadership tone or emotional intelligence, this approach identifies underlying capability patterns such as technological, innovation, and cognitive competencies and reveals prevailing attitudes toward digitalization in project environments. Sentiments toward digital project leadership are often neutral or negative, suggesting ambiguity, capability gaps, or resistance in practice. These patterns underscore the importance of leaders' abilities to interpret and respond to sentiment signals as part of their dynamic capabilities, particularly in sensing, seizing, and reconfiguring digital opportunities within projects (Marnewick, 2025).

From a financial and strategic perspective, investor sentiment plays a critical role in shaping firms' innovation investment decisions. Empirical evidence demonstrates a positive and causal relationship between investor sentiment and corporate innovation, whereby optimistic sentiment enhances innovation outputs and R&D intensity. This relationship operates primarily through the relaxation of financing constraints and the expansion of external financing capacity, enabling firms especially those facing financial frictions to increase innovation investment. In addition, market sentiment can function as an alternative financing mechanism, particularly in emerging markets, where firms leverage favorable equity valuations to support R&D activities. Conversely, pessimistic sentiment may restrict access to capital and reduce innovation incentives, highlighting the sensitivity of innovation investment to capital market conditions (Kim et al., 2026; Lin, 2023).

The intersection between innovation and emotional commodification is increasingly evident in the emergence of digital well-being technologies, particularly happiness applications. In this context, sentiment analysis is primarily utilized as a methodological tool to capture users' emotional responses and cognitive evaluations through large-scale analysis of app reviews, rather than as a direct commercialization mechanism. These applications operate within a broader "happiness industry," where well-being is framed as an individual, measurable, and improvable outcome, often delivered through accessible and gamified digital solutions. Although users frequently report positive emotional experiences such as increased joy and perceived mental health benefits critical concerns remain regarding the underlying assumptions of these innovations. These include the individualization of well-being, limited empirical validation of effectiveness, and ethical issues related to design, data usage, and psychological influence. Accordingly, emotion-driven innovation reflects not only enhanced user experience but also a broader socio-economic shift toward the normalization and potential commodification of happiness (Mojica et al., 2024).

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As illustrated in Figure 5.3, innovation sentiment analysis extends beyond simple opinion mining by enabling organizations to identify emerging problems and unmet needs, monitor stakeholder perceptions in real time, and support strategic and innovation-related decision-making. Thus, it can be defined as a multidimensional analytical mechanism that captures the socio-

emotional dimension of innovation, linking data-driven sentiment insights with innovation processes, adoption behavior, and strategic outcomes.

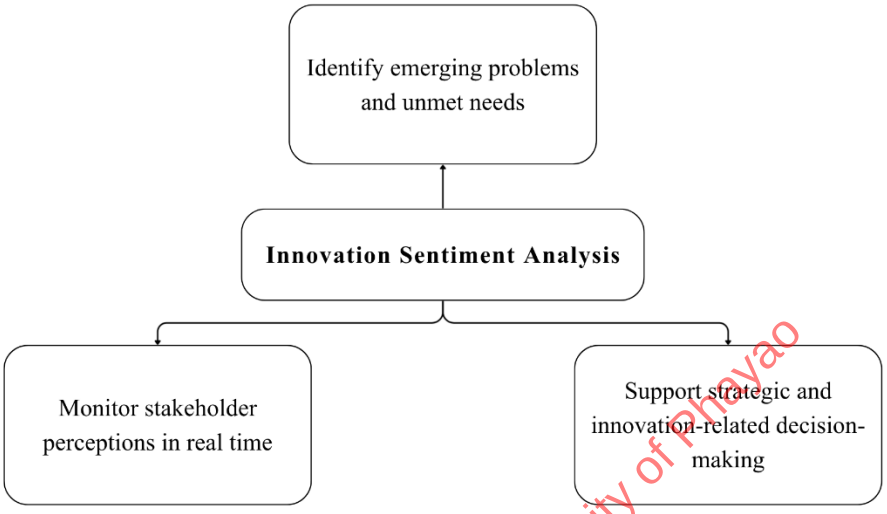

Figure 5.3 Innovation Sentiment Analysis

Source: Adapted from Al-Razgan, M., et al. (2021). Using diffusion of innovation theory and sentiment analysis to analyze attitudes toward driving adoption by Saudi women. *Technology in Society*, 65, 101558.

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In conclusion, innovation sentiment analysis extends beyond a purely analytical tool by functioning as a multidimensional mechanism that links stakeholder perceptions with innovation processes across individual, organizational, project, and financial levels. It enhances opportunity recognition, supports problem identification, informs strategic investment decisions, and reveals the socio-emotional dynamics underlying innovation adoption. As such, sentiment analysis contributes to a more holistic understanding of innovation ecosystems, where technological advancement is inseparable from the social, cognitive, and emotional contexts in which it is embedded.

5.4 Where Do Innovations Come From?

Innovation does not originate from a single source; rather, it emerges from a complex, multi-level interplay among individual cognition, organizational processes, and broader knowledge ecosystems.

At the micro level, creativity constitutes a foundational driver of innovation by enabling the generation of novel and useful ideas that can be transformed into products, services, or processes. However, creativity should not be conceptualized as an isolated individual attribute; instead, it is a multidimensional organizational condition embedded within broader configurations of factors. Specifically, elements such as creative climate and creative intensity interact with complementary inputs including innovation networks and organizational resources to shape innovation outcomes. From this configurational perspective, superior innovation performance does not result from creativity alone but from specific combinations of interdependent conditions. Accordingly, creativity functions as a necessary but insufficient condition, with its effectiveness contingent upon alignment with structural and strategic factors within the firm (del-Corte-Lora et al., 2023).

Leadership plays a pivotal role in enabling collective creativity and innovation, particularly in knowledge-intensive environments such as research and development (R&D). Rather than merely amplifying creativity, leadership operates as a mechanism of social influence that shapes employees' attitudes, behaviors, and interactions while structuring the conditions under which creative processes unfold. In this regard, leaders facilitate innovation by fostering supportive environments, promoting collaboration, and sustaining engagement in idea generation and implementation. Moreover, leadership behaviors such as encouraging participation, allocating resources, and guiding team dynamics enhance individual creativity, which subsequently translates into team-level innovation outcomes. Thus, leadership functions as an integrative and coordinating force that connects individual creativity with broader organizational innovation processes (Huang et al., 2022).

At the organizational level, innovation arises from structured routines that underpin firms' dynamic capabilities, enabling the continuous development, integration, and reconfiguration of knowledge. From a dynamic

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capabilities perspective, these routines serve as mechanisms through which firms adapt to environmental change and recombine resources. In the context of user-centered design (UCD), such routines can be categorized into three interrelated types: (1) knowledge-gaining routines (e.g., benchmarking, customer interaction, and feedback analysis), (2) organization-mobilizing routines (e.g., cross-functional collaboration and stakeholder engagement), and (3) organization-alignment routines (e.g., agile processes and continuous innovation initiatives). Collectively, these routines support iterative learning, sustained user interaction, and knowledge exchange, which are critical for identifying both explicit and latent user needs. Importantly, they enable firms to sense opportunities, seize them through coordinated action, and continuously reconfigure resources, thereby positioning innovation as an ongoing, capability-driven process embedded in organizational practice rather than a discrete event (Dasgupta & Vallabh, 2026).

Beyond the firm, innovation is embedded in distributed systems of knowledge production and transfer that extend across organizational boundaries. While internal activities such as R&D, experiential learning, and problem-solving remain important, a substantial portion of innovation originates from external actors, including customers, suppliers, universities, and research institutions. These diverse sources reflect different loci of knowledge particularly needs knowledge and solutions knowledge which are unevenly distributed and often characterized by "stickiness," making transfer complex and context-dependent. Consequently, firms increasingly operate within networked environments where innovation emerges through interaction, collaboration, and the recombination of heterogeneous knowledge bases. Each source of innovation carries distinct implications for how knowledge is generated, transferred, and applied, ranging from minimal transfer in purely internal innovation to intensive reciprocal exchange in collaborative arrangements. This highlights the strategic importance of effectively managing both internal and external knowledge flows to enhance innovation outcomes (Philipson, 2020).

At the systemic level, innovation arises from interactions among actors within broader innovation ecosystems, where universities, industries, governments, and users collectively engage in knowledge co-creation. These ecosystems function as dynamic environments in which ideas circulate,

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evolve, and are selectively retained based on their perceived value and applicability. The convergence of individual creativity, leadership-driven collaboration, routinized organizational processes, and external knowledge linkages underscores that innovation is inherently distributed and socially constructed.

Innovations emerge from a combination of customer-driven insights, service improvements, and environmental or contextual factors within the market setting. In the context of night markets, innovation is not portrayed as originating from a single source but rather from the interaction between understanding customer preferences, enhancing service quality, and improving facilities to meet evolving customer expectations. Entrepreneurs generate innovative ideas by observing customer behavior, adapting product offerings, integrating technology, and refining service processes to create better customer experiences. Thus, innovation arises as a practical, experience-based process shaped by market dynamics and customer needs rather than purely from formal R&D activities (Suvittawat, 2024).

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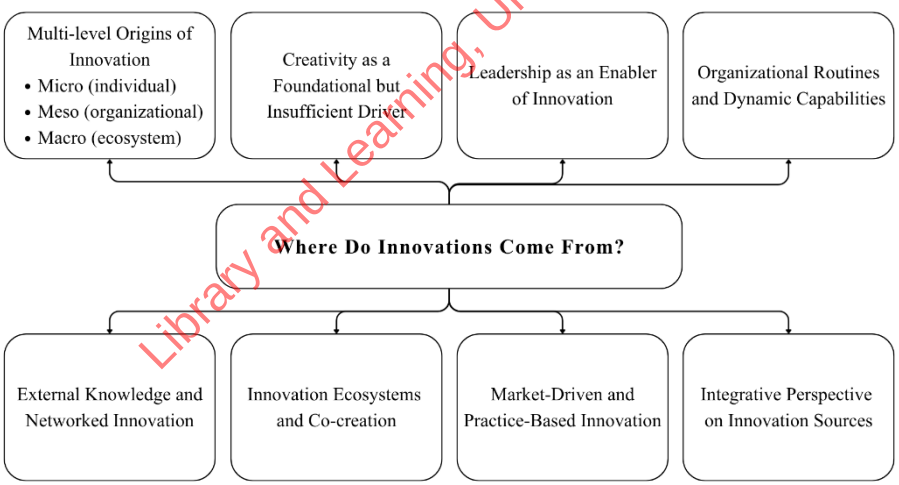

Figure 5.4 Where Do Innovations Come From?

Source: Adapted from Homfeldt, F., Rese, A., & Simon, F. (2019). Suppliers versus start-ups: Where do better innovation ideas come from? *Research Policy*, 48(7), 1738-1757.

As illustrated in Figure 5.4, innovation emerges from a multi-level, systemic interaction rather than a single source. At the micro level, individual creativity provides the foundational generation of novel and useful ideas; however, creativity alone is insufficient without enabling conditions. At the meso level, leadership acts as a critical enabler by shaping vision, fostering a supportive culture, and mobilizing resources, while organizational routines and dynamic capabilities translate ideas into scalable and repeatable innovations. At the macro level, innovation is further enriched through external knowledge flows, networked collaboration, and participation in broader innovation ecosystems that facilitate co-creation and knowledge recombination. Importantly, these elements are continuously refined through market-driven and practice-based feedback loops, ensuring relevance and adaptability. Thus, innovation should be understood as an integrative, ecosystem-embedded process shaped by the interaction of internal competencies and external environmental forces.

Therefore, understanding the origins of innovation requires moving beyond linear models toward an integrative perspective that acknowledges the interdependence of individual, organizational, and institutional sources. Such a perspective provides a more accurate representation of contemporary innovation dynamics and offers important strategic implications for organizations seeking to strengthen their innovation capacity in increasingly complex and uncertain environments.

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5.5 Innovation Trends as Sources

Innovation trends constitute a critical and increasingly strategic source of innovation, particularly in environments characterized by rapid technological advancement, evolving consumer expectations, and intensified global competition. Rather than emerging randomly, innovation is often guided by identifiable patterns of change referred to as innovation trends that reflect broader transformations in technologies, markets, institutions, and societal values. These trends function as directional signals that enable organizations to anticipate future developments, align innovation strategies, and proactively identify opportunities for value creation.

From a sectoral perspective, innovation trends can be understood as externally embedded sources of innovation that emerge from the dynamic interaction among technological progress, stakeholder expectations, and sustainability imperatives. For example, in forestry and forest-based industries, innovation trends increasingly emphasize process efficiency through advanced wood-processing technologies and the utilization of residual materials, reflecting a transition toward circular economy principles and resource optimization. Simultaneously, there is a growing expansion of service-oriented innovations particularly in forest recreation and ecosystem services indicating a shift from production-centric models toward diversified, value-added activities. The integration of digital technologies, such as forest management software, geospatial mapping, and stakeholder engagement platforms, further illustrates how digitalization is reshaping traditional sectoral practices. Importantly, these trends are influenced by heterogeneous stakeholder perspectives, including experts, firms, and the public, each prioritizing different dimensions of innovation. This plurality highlights that innovation trends are not purely technological trajectories but are also socially constructed phenomena that shape and redefine innovation opportunities (Loučanová et al., 2020).

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At a broader level, bibliometric evidence demonstrates that innovation trends serve as indicators of evolving knowledge production and technological trajectories within the global economy. Recent analyses reveal a sustained increase in innovation-related research, with dominant themes including digital transformation, open innovation, entrepreneurial ecosystems, and sustainability-oriented innovation. These trends reflect structural shifts toward knowledge-intensive and technology-driven economic systems, where firms increasingly rely on advanced technologies such as artificial intelligence, big data analytics, and blockchain to enhance competitiveness and adaptability. Moreover, the convergence of digital and physical systems, exemplified by the integration of IoT and smart manufacturing, reinforces the role of innovation trends as forward-looking mechanisms that inform strategic decision-making and resource allocation. The growing alignment between innovation and sustainability agendas further signals a transition toward more inclusive and environmentally responsible innovation paradigms (Ngo, 2025).

In the context of digital entrepreneurship, innovation trends represent critical sources of opportunity creation shaped by the rapid diffusion of digital technologies. Emerging trajectories such as platform-based business models, digital ecosystems, and data-driven innovation are transforming how entrepreneurial opportunities are identified, developed, and scaled. These trends facilitate greater collaboration among startups, incumbent firms, academic institutions, and governments, thereby lowering entry barriers and democratizing access to innovation processes. At the same time, innovation is increasingly driven by the recombination of digital technologies with entrepreneurial capabilities, enabling rapid experimentation, scalability, and global market reach. However, these developments are accompanied by new challenges, including data privacy concerns, cybersecurity risks, and the persistence of the digital divide, which simultaneously shape the direction and constraints of innovation processes (Sánchez-García et al., 2025).

Furthermore, innovation trends are closely intertwined with financial systems, policy frameworks, and macroeconomic dynamics. Empirical evidence suggests that shifts in innovation trajectories are significantly influenced by financial instruments such as taxation policies, monetary measures, investment mechanisms, and R&D funding structures. These factors determine not only the intensity but also the direction of innovation activities across sectors. In addition, macro-level disruptions such as financial crises or global technological transitions play a pivotal role in reshaping innovation priorities and research agendas. For instance, periods of economic instability tend to redirect attention toward regulatory and financial mechanisms, whereas recovery phases often stimulate renewed investment in innovation. This co-evolution between innovation trends and economic conditions underscores that innovation is not solely technology-driven but is embedded within broader institutional and economic systems (Strielkowski et al., 2022).

Finally, recent knowledge-mapping and bibliometric studies highlight a paradigmatic shift in innovation trends from firm-centric models toward ecosystem-based and value co-creation approaches. Contemporary innovation is increasingly embedded in networked, multi-actor systems characterized by collaboration, platform competition, and digital servitization. Technologies such as artificial intelligence, big data, and digital platforms function as

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enabling infrastructures that facilitate value creation across interconnected ecosystems. Moreover, innovation trends evolve through identifiable phases—from early conceptual development to ecosystem integration and, ultimately, digitally enabled and sustainability-oriented transformation. This evolution underscores the dynamic nature of innovation trends as continuously developing sources that shape both theoretical and practical advancements in innovation management (Zhou et al., 2025).

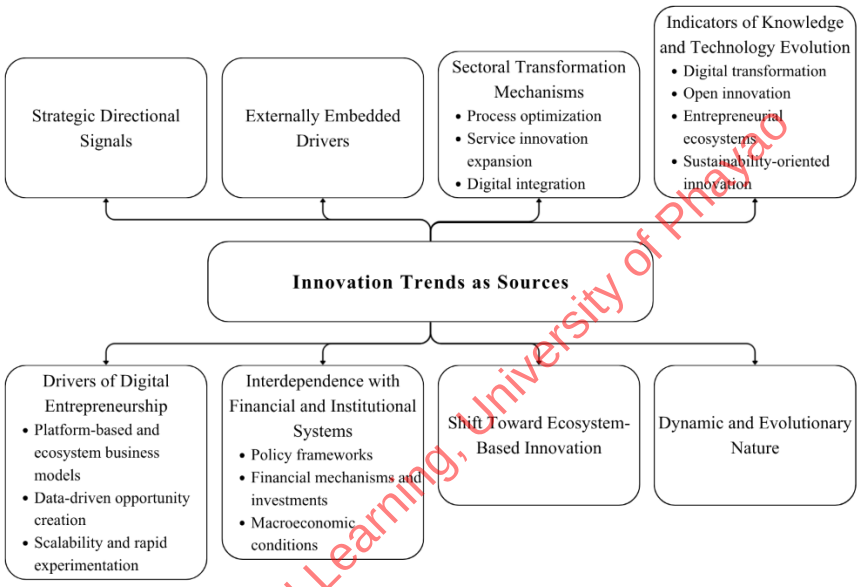

Figure 5.5 Innovation Trends as Sources

Source: Adapted from Appiah, P., & Grimm, H. (2026). Landscape of social innovation research in the global south: trends and implications for future research. *Journal of Entrepreneurship and Public Policy*, 15(1), 15-37.

As illustrated in Figure 5.5, innovation trends as sources, innovation trends operate as forward-looking, multi-dimensional sources of innovation that both reflect and actively shape technological, economic, and societal transformations. Rather than being passive patterns of change, they function as strategic signals and embedded drivers that guide organizational decision-making, influence sectoral transformation mechanisms, and indicate the evolution of knowledge and technology systems. By integrating elements such as digital transformation, open innovation, and ecosystem-based collaboration, these trends enable organizations to anticipate shifts, identify

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emerging opportunities, and reconfigure resources accordingly. Consequently, innovation trends are critical for developing adaptive, competitive, and sustainable innovation strategies within increasingly complex and interconnected ecosystems.

In conclusion, innovation trends function as a dynamic, externally embedded, and multi-dimensional source of innovation that reflects the convergence of technological advancements, market transformations, institutional dynamics, and societal priorities. By serving as forward-looking signals, these trends enable organizations and policymakers to anticipate change, allocate resources strategically, and develop adaptive capabilities in increasingly complex and digitalized environments. At the same time, innovation trends are not merely descriptive patterns but active structuring forces that shape how innovation is generated, governed, and sustained within evolving innovation ecosystems.

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Case Study

Key Drivers Shaping Customer Experience in Thailand's Night Market Context

Adapted Reprint from:

Suvittawat, A. (2024). Exploring Customer Experience Drivers in Night Markets: Examining the Roles of Product Preference, Service Quality, and Facility Accessibility. Tourism and Hospitality, 5(4), 1477-1492. https://doi.org/10.3390/tourhosp5040082

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1. Introduction

Night markets constitute an important mechanism for stimulating local economic development by facilitating commodity exchange, fostering entrepreneurial activities, and supporting small-scale production. Simultaneously, they function as social and cultural spaces as well as key tourist attractions. These markets offer affordable goods, diverse cultural encounters, and a relaxed nocturnal atmosphere that encourages consumer engagement. Their distinctive characteristics are shaped by factors such as geographical context, consumer preferences, and market ambiance, with the cooler nighttime environment serving as a critical differentiator from daytime markets and significantly influencing consumer behavior.

Beyond the provision of a wide variety of products, night markets emphasize creativity and product differentiation, as vendors must continuously innovate to maintain competitiveness. Offerings typically include food and beverages, apparel, handicrafts, vintage items, and other specialty goods, often presented through unconventional retail formats such as ground-based displays or modified vehicles. Notably, teenagers constitute a primary consumer segment, perceiving night markets not only as retail venues but also as social gathering spaces. Consequently, night markets have evolved into multifunctional environments that integrate commercial, cultural, and recreational dimensions to address increasingly heterogeneous consumer demands.

The night market model demonstrates high transferability to other emerging economies due to its reliance on low entry barriers, informal networks, and adaptive, customer-centric micro-innovation. However, its scalability to developed economies is constrained by stricter regulatory frameworks, higher labor and rental costs, and formalized retail structures, which limit the flexibility and spontaneity that underpin its success. While elements such as experiential consumption and localized service innovation can be adapted in developed contexts, the full ecosystem characterized by dense vendor clustering, price accessibility, and hybrid social-commercial interactions remains context-dependent and less directly replicable without structural modification.

This case study utilizes survey data and structural equation modeling (SEM) to investigate the influence of product preference (PP), service quality (SQ), and facilities (FA) on customer experience (CE) within night market contexts. These constructs collectively enable a comprehensive analysis of customer behavior, satisfaction, and engagement, thereby providing practical insights for enhancing overall customer experience in such dynamic market settings.

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2. National Context: Drivers of Customer Experience in Thailand's Night Markets

Thailand's night markets constitute a distinctive retail and socio-cultural setting that integrates commercial activity, cultural expression, and leisure within local communities. These markets operate not merely as venues for purchasing affordable and diverse goods, but also as dynamic social spaces and tourist attractions that embody local identity and lifestyle. Their nighttime operation, informal atmosphere, and wide-ranging offerings including food and beverages, apparel, handicrafts, and creative products establish a unique consumption context that differentiates them from conventional retail formats.

Customer experience in Thailand's night markets is shaped by a set of interrelated drivers grounded in consumption value and service encounters. Product-related attributes such as variety, distinctiveness, pricing, and perceived value play a pivotal role in attracting consumers and maintaining their engagement. Importantly, products in night markets are evaluated not only based on functional utility but also on symbolic and experiential dimensions, including novelty, creativity, and congruence with consumers'

self-expression. These factors foster emotional involvement and enjoyment, which are essential components of the overall market experience.

In addition to product attributes, the experiential quality of night markets is reinforced by service interactions and the physical environment. Vendor behaviors characterized by friendliness, responsiveness, and trustworthiness enhance customers' sense of comfort and confidence during transactions. Simultaneously, environmental factors such as accessibility, parking availability, cleanliness, lighting, and overall ambience facilitate convenience and encourage extended visitation. Collectively, product attributes, service encounters, and physical facilities interact synergistically to create a comprehensive customer experience that drives satisfaction, repeat patronage, and the sustained popularity of night markets within Thailand's urban and local economies.

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3. Methodology and Research Framework

The empirical foundation of this case study is a quantitative survey administered to 201 respondents, complemented by structural equation modeling (SEM) for hypothesis testing. The survey includes measures capturing four key constructs:

Product Preference (PP) – price discount, value-added, brand preference, and product packaging.

Service Quality (SQ) – image, responsiveness, reliability, and technology excellence.

Facilities (FA) – parking area, location, toilets, and ambience.

Customer Experience (CE) – sale utilization, customer regain, customer personalization, and customer retention.

Reliability and validity assessments reveal strong factor loadings ranging from 0.707 to 0.925 and Cronbach's alpha coefficients exceeding 0.80, indicating high internal consistency. The model fit indices (RMSEA = 0.000, GFI = 0.951, CFI = 1.000) further confirm an excellent model fit.

Eight hypotheses examine the direct and mediating effects among the variables, providing a comprehensive understanding of how product preference, service quality, facilities, and customer experience interact within Thailand's night market context.

4. Findings and Discussion

4.1 Product Preference (PP): price discount, value-added, brand preference, and product packaging

Among all variables, Product Preference (PP) exhibits the strongest and broadest influence. Product Preference (PP) significantly affects:

- Customer Experience (CE) (β = 0.465)
- Service Quality (SQ) (β = 0.209)
- Facilities (FA) (β = 0.585)

The findings underscore the pivotal role of product preference in shaping customer outcomes within Thailand's night markets. Product preference exerts a strong positive influence on customer experience, indicating that factors such as price promotions, perceived value, brand affinity, and product presentation significantly enhance customers' emotional responses, satisfaction levels, and overall shopping experiences. Moreover, product preference is found to positively affect perceptions of service quality, suggesting that when products are perceived as appealing and well-aligned with customer needs, evaluations of service attributes such as responsiveness, reliability, and technological support also improve. In addition, product preference has a positive impact on facility perceptions, implying that favorable product evaluations extend to customers' assessments of supporting infrastructure, including parking availability, accessibility, sanitation facilities, and ambient conditions. Collectively, these findings highlight that product preference operates as a fundamental driver that not only directly enhances customer experience but also indirectly shapes perceptions of service quality and facilities within the night market context.

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4.2 Service Quality (SQ): image, responsiveness, reliability, and technology excellence

Service Quality (SQ) significantly influences Customer Experience (CE) (β = 0.180)

The findings indicate that service quality exerts a positive and statistically significant effect on customer experience within night market settings. This suggests that superior service performance particularly in terms of effective service delivery and constructive interactions between vendors and customers plays a critical role in enhancing overall customer experiences, as well as in fostering satisfaction and loyalty. In service-intensive environments such as night markets, elements including responsiveness,

reliability, and the quality of interpersonal exchanges are pivotal in shaping favorable experiential evaluations. Accordingly, service quality should not be regarded solely as an operational function; rather, it represents a strategic lever for enhancing customer experience, encouraging repeat patronage, and supporting sustained business growth in the context of night markets.

4.3 Facilities (FA): parking area, location, toilets, and ambience

Facilities (FA) significantly influence:

- Service Quality (SQ) ($\beta = 0.581$)
- Customer Experience (CE) ($\beta = 0.261$)

The findings indicate that facilities constitute a fundamental determinant in shaping both perceived service quality and overall customer experience within night markets. Adequately maintained and easily accessible physical infrastructures such as sufficient parking spaces, hygienic restrooms, well-organized layouts, and an appealing ambient environment substantially enhance service quality by facilitating convenience, comfort, and efficient operations for both vendors and customers. Moreover, facilities demonstrate a direct and positive effect on customer experience, highlighting the critical role of tangible environmental attributes in influencing customers' cognitive evaluations and emotional responses. Beyond supporting effective service delivery, facilities act as salient experiential stimuli that contribute to customer satisfaction, enjoyment, and perceived value. These findings emphasize the strategic significance of facility management in fostering positive and memorable night market experiences.

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4.4 The Mediating Roles of Service Quality (SQ) and Facilities (FA) in the Relationship between Product Preference (PP) and Customer Experience (CE)

The findings highlight the mediating roles of service quality and facilities in the relationship between product preference and customer experience within night market contexts. The results demonstrate that service quality functions as a full mediator, indicating that the influence of product preference on customer experience operates primarily through enhanced service performance particularly in terms of responsiveness, reliability, and the quality of interactions between vendors and customers rather than through a direct effect alone. Conversely, facilities act as a partial mediator, suggesting that product preference retains a direct effect on customer experience while being simultaneously reinforced by the presence of well-maintained and accessible physical infrastructures, such as parking

availability, sanitation facilities, convenient location, and overall ambience. Taken together, these findings emphasize that customer experience in night markets is not solely determined by product attractiveness; rather, it is co-created through the interplay of service quality and the physical environment, with service quality exerting a more substantial mediating influence than facilities.

4.5 Customer Experience (CE): sale utilization, customer regain, customer personalization, and customer retention.

Customer Experience (CE) is directly shaped by:

- Product Preference (PP)
- Service Quality (SQ)
- Facilities (FA)

Customer experience (CE) in night markets is significantly influenced by product preference (PP), facilities (FA), and service quality (SQ), underscoring their synergistic and mutually reinforcing effects. Product preference demonstrates a strong positive impact on customer experience, as alignment between products and customer preferences particularly in terms of price promotions, perceived value, branding, and packaging enhances experiential value, satisfaction, and repurchase intentions. Facilities, including adequate parking, accessible locations, clean restrooms, and a pleasant ambience, play a crucial role in shaping customer experience by providing comfort, convenience, and a conducive physical environment that supports consumption activities. Moreover, service quality exerts a positive and statistically significant influence on customer experience, indicating that dimensions such as responsiveness, reliability, technological competence, and a favorable service image contribute to positive interactions and emotional engagement among customers. Collectively, these findings suggest that customer experience in night markets is a multidimensional construct arising from the integrated effects of appealing product offerings, well-developed facilities, and high-quality service delivery.

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5. Synthesis

The case study illustrates that customer experience in night markets is not driven by a single factor, but emerges from the integration of multiple innovation sources, both internal and external to the service system. From an Innovation Sources perspective, the findings highlight how value creation is

shaped through the recombination of market knowledge, operational capabilities, and environmental resources.

First, customer-driven innovation (demand-side source) plays a central role. Product preference reflecting customers' tastes, perceived value, and expectations acts as a primary input for innovation. Vendors who adapt pricing strategies, packaging, and product variety based on customer insights effectively co-create value, demonstrating that innovation originates from continuous sensing of customer needs.

Second, service-based innovation (organizational/internal source) emerges through service quality improvements. The study shows that responsiveness, reliability, and interaction quality mediate the relationship between product offerings and customer experience. This indicates that innovation is embedded in service processes and frontline interactions, where vendors refine delivery mechanisms to enhance experiential outcomes.

Third, infrastructure and environmental innovation (system-level source) is reflected in facilities such as parking, layout, cleanliness, and ambience. These tangible elements function as enabling platforms that enhance both service efficiency and customer comfort. Facilities not only directly influence customer experience but also strengthen service quality, illustrating how environmental design contributes to experiential innovation.

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Finally, the study demonstrates complementarity among innovation sources. Product preference (market knowledge), service quality (process capability), and facilities (physical infrastructure) interact synergistically rather than independently. This aligns with an integrative innovation view, where competitive advantage is achieved through the alignment of multiple innovation inputs rather than isolated improvements.

In summary, the case confirms that innovation in night markets is multi-sourced and systemic, involving:

- Customer insights as a trigger for innovation
- Service processes as mechanisms for value delivery
- Facilities as enabling infrastructures
- Interactions among these elements as drivers of superior customer experience

This synthesis extends the Innovation Sources perspective by showing that in informal, service-dominant contexts like night markets, innovation is

less about technological breakthroughs and more about adaptive, experience-oriented, and context-specific integration of diverse resource inputs.

This case provides theory-building evidence by empirically integrating multiple theoretical lenses into a coherent explanatory mechanism of customer experience formation. First, the identified drivers product preference, service quality, and facility accessibility can be conceptualized as innovation sources, where customer insights (demand-side signals) and operational configurations (supply-side capabilities) jointly shape value creation. Second, the significant structural relationships and mediation effects validate service innovation theory, demonstrating how service quality and facilities function as dynamic mechanisms translating preferences into experiential outcomes. Third, the findings align with the experience economy, as value is co-created through sensory, emotional, and contextual interactions within the night market environment. Collectively, the case advances theory by showing that customer experience emerges from a multi-layered innovation system, where preference-driven inputs are transformed through service and environmental design into experiential and economic value, thereby extending existing frameworks toward a more integrated, empirically grounded model.

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6. Conclusion

This case study employs customer service theory to investigate the roles of product preference, service quality, and facilities in shaping customer experience within night markets, with the overarching objective of enhancing customer satisfaction and loyalty. The findings offer both theoretical and practical contributions by demonstrating that customer experience is influenced by multiple context-dependent factors. Specifically, product preference exerts a significant impact on purchasing behavior and emotional satisfaction, whereas the relative importance of service quality dimensions varies across different types of businesses, highlighting the necessity for context-specific service strategies. Furthermore, facilities, in conjunction with service quality, play a pivotal role in enriching the overall customer experience.

From a practical perspective, the study provides actionable implications for night market vendors. Entrepreneurs are encouraged to differentiate their offerings through product innovation, value enhancement, competitive pricing, and appealing packaging. Service quality can be

strengthened by fostering trust, responsiveness, and professionalism, supported by the adoption of technologies such as digital payment systems. In addition, the provision of well-maintained facilities including accessible parking, clean restrooms, adequate lighting, and clear signage is essential to ensure customer comfort and convenience. Moreover, the integration of effective offline and online marketing strategies, data-driven insights into customer preferences, and sustainable business practices can collectively enhance the market's image, deepen customer engagement, and promote repeat patronage.

Case Study Questions

1. How do changes in product preference influence customer experience in this context?
2. To what extent does product preference shape customers' perception of service quality?
3. Does an increase in product preference lead to improved perceptions or demand for facilities?
4. How do improved facilities affect perceived service quality among customers?
5. How do service quality and facilities mediate the relationship between product preference and customer experience?

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Chapter Summary

This chapter advances innovation management literature by reconceptualizing innovation sources as a multilevel, systemic, and sentiment-informed construct.

Innovation sources refer to the origins of ideas, knowledge, and capabilities that generate new products, processes, and business models, encompassing both internal and external drivers within a dynamic, interconnected system. In modern contexts, these sources are increasingly shaped by digital transformation, which enhances connectivity, data-driven decision-making, and knowledge recombination. Innovation is no longer limited to R&D but emerges from diverse ecosystems such as digital communities, open innovation networks, and collaborative environments requiring firms to develop absorptive capacity and strategically integrate multiple knowledge inputs to sustain competitive advantage.

Innovation sources are broadly classified into internal and external categories, with innovation outcomes often resulting from their interaction. Internal sources include R&D, employee creativity, organizational knowledge, and learning systems, which form the firm's core capabilities and absorptive capacity. External sources consist of market-based actors (customers, suppliers, competitors), science-based institutions (universities, research institutes), collaborative networks (partners, alliances), and institutional environments (policies, ecosystems). The most effective innovation arises from combining these sources, where strong internal capabilities enable firms to absorb and leverage diverse external knowledge.

Innovation sentiment analysis involves extracting and interpreting opinions, emotions, and attitudes from textual data to understand stakeholder perceptions of innovation. It complements traditional innovation analysis by capturing social and emotional dynamics that influence adoption, decision-making, and diffusion processes. At organizational and strategic levels, it enables firms to identify problems, detect unmet needs, and support innovation investment decisions, while also reflecting broader socio-emotional and financial influences. Overall, it functions as a multidimensional

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tool linking stakeholder perceptions with innovation processes across individual, organizational, and market contexts.

Innovation emerges from a multi-level interaction of factors rather than a single source, involving individual creativity, leadership, organizational routines, and external knowledge ecosystems. Creativity provides the foundation, but its effectiveness depends on supportive structures such as leadership, collaboration, and dynamic capabilities that enable knowledge integration and resource reconfiguration. At the same time, innovation is shaped by networks of external actors and market interactions, where knowledge exchange and customer-driven insights play key roles. Thus, innovation is a distributed, socially constructed process arising from the alignment of individual, organizational, and systemic elements.

Innovation trends act as forward-looking sources of innovation by signaling patterns of technological, market, and societal change that guide strategic decision-making. These trends such as digital transformation, sustainability, and ecosystem-based innovation reflect broader shifts in knowledge production and economic structures. They enable firms to anticipate opportunities, allocate resources effectively, and adapt to evolving environments, while also being shaped by stakeholder perspectives, institutional conditions, and macroeconomic dynamics. Consequently, innovation trends are not only indicators of change but active forces that influence how innovation is generated and sustained within complex ecosystems.

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Chapter Review Questions

Review Question 1:

How do internal and external innovation sources interact within digitally enabled environments to enhance a firm's innovation capacity?

Review Question 2:

Compare internal and external sources of innovation and explain how their integration contributes to superior innovation outcomes.

Review Question 3:

How does sentiment analysis support innovation by linking stakeholder perceptions to decision-making and opportunity recognition?

Review Question 4:

Why should innovation be understood as a multi-level process involving individual, organizational, and ecosystem factors rather than a single source?

Review Question 5:

In what ways do innovation trends function as forward-looking signals that shape strategic decision-making and opportunity identification?

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Chapter Exercises

Exercise 1:

Develop a conceptual diagram (framework) illustrating how innovation sources function as an integrated system within a firm. Your diagram should:

- Distinguish between internal and external sources
- Incorporate digital transformation as an enabling mechanism
- Show how knowledge flows and interactions lead to innovation outcomes

Exercise 2:

Select a real firm (e.g., SME or startup) and:

1. Identify at least 3 internal sources and 3 external sources of innovation
2. Classify external sources into:
    - Market-based
    - Science-based
    - Collaborative/network
    - Institutional/environmental
3. Analyze how the firm integrates these sources to support innovation

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Exercise 3:

Collect at least 20 user-generated comments (e.g., social media, product reviews) related to a specific innovation (e.g., mobile app, digital service).

Steps:

- Classify each comment as positive, negative, or neutral
- Identify key themes or issues (e.g., usability, trust, performance)
- Apply the 5W framework (What, Who, When, Where, Why) to interpret insights

Exercise 4:

Explain how innovation emerges across the following levels:

- Individual (creativity)
- Organizational (routines, leadership, capabilities)
- Ecosystem (external actors and networks)

Exercise 5:

Identify one major innovation trend (e.g., AI, sustainability, digital platforms, circular economy).

Steps:

1. Describe the trend and its key characteristics
2. Explain how it acts as a source of innovation opportunities
3. Analyze its impact on:
    - Business models
    - Competitive advantage
    - Industry transformation

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References

Al-Razgan, M., Alrowily, A., Al-Matham, R. N., Alghamdi, K. M., Shaabi, M., & Alssum, L. (2021). Using diffusion of innovation theory and sentiment analysis to analyze attitudes toward driving adoption by Saudi women. *Technology in Society, 65*, 101558. https://doi.org/10.1016/j.techsoc.2021.101558

Alayo, M., Keen, C., Sanchez-Famoso, V., Theodoraki, C., & Wong, S. A. (2026). Digital transformation as a source of innovation in manufacturing family firms: Analysis of developed and emerging economies. *Journal of Family Business Strategy, 17*(1), 100696. https://doi.org/10.1016/j.jfbs.2025.100696

Appiah, P., & Grimm, H. (2026). Landscape of social innovation research in the global south: trends and implications for future research. *Journal of Entrepreneurship and Public Policy*, 15(1), 15-37. https:doi.org/10.1108/JEPP-07-2024-0111

Chang, Y. F., Rasiah, R., & Chan, W. M. (2016). Understanding innovations in Malaysia's construction industry: a study of four large national firms. *Asian Journal of Technology Innovation, 24*(3), 275-292. https://doi.org/10.1080/19761597.2016.1248631

Chen, Y., Vanhaverbeke, W., & Du, J. (2016). The interaction between internal R&D and different types of external knowledge sourcing: an empirical study of Chinese innovative firms. *R&D Management, 46*(S3), 1006-1023. https://doi.org/10.1111/radm.12162

Dasgupta, M., & Vallabh, P. (2026). How do organisational routines support user-centred design (UCD) innovations?: Dynamic capabilities perspective. *IIMB Management Review*, 100641. https://doi.org/10.1016/j.iimb.2025.100641

De Beule, F., & Van Beveren, I. (2019). Sources of open innovation in foreign subsidiaries: An enriched typology. *International Business Review, 28*(1), 135-147. https://doi.org/10.1016/j.ibusrev.2018.08.005

Library and Learning, University of Phayao

del-Corte-Lora, V., Martínez-Fernández, T., Vallet-Bellmunt, T., & Roig-Tierno, N. (2023). A configurational approach to innovation performance: The role of creativity. *International Journal of Innovation Studies, 7*(3), 171-186. https://doi.org/10.1016/j.ijis.2023.03.001

Duong, P.-A. N., Voordeckers, W., Huybrechts, J., & Lambrechts, F. (2022). On external knowledge sources and innovation performance: Family versus non-family firms. *Technovation, 114*, 102448. https://doi.org/10.1016/j.technovation.2021.102448

Farinha, I. M., Ferreira, F. A. F., Ferreira, N. C. M. Q. F., Garces, E., & Daim, T. (2025). Digital strategies and non-conventional sources of innovation: Analysis of causal relationships using interpretive structural modeling. *Technology in Society, 82*, 102940. https://doi.org/10.1016/j.techsoc.2025.102940

Gómez, J., Salazar, I., & Vargas, P. (2016). Sources of Information as Determinants of Product and Process Innovation. *PLoS ONE, 11*. https://doi.org/10.1371/journal.pone.0152743

Gutiérrez, A., Aguilar, J., Ortega, A., & Montoya, E. (2025). Sentiment analysis on social networks for defining innovation problems in organizations. *Technology in Society, 81*, 102804. https://doi.org/10.1016/j.techsoc.2024.102804

Homfeldt, F., Rese, A., & Simon, F. (2019). Suppliers versus start-ups: Where do better innovation ideas come from? *Research Policy*, 48(7), 1738-1757. https://doi.org/ 10.1016/j.respol.2019.04.002

Huang, Z., Sindakis, S., Aggarwal, S., & Thomas, L. (2022). The role of leadership in collective creativity and innovation: Examining academic research and development environments. *Frontiers in Psychology, Volume 13 - 2022*. https://doi.org/10.3389/fpsyg.2022.1060412

Library and Learning, University of Phayao

Kim, K., Batten, J. A., & Ryu, D. (2026). Does sentiment influence corporate innovation investment? *Emerging Markets Review, 72*, 101431. https://doi.org/10.1016/j.ememar.2025.101431

Law, K. M. Y., Lau, A. K. W., & Ip, A. W. H. (2021). The Impacts of Knowledge Management Practices on Innovation Activities in High- And Low-Tech Firms. *Journal of Global Information Management, 29*(6). https://doi.org/10.4018/JGIM.20211101.oa41

Lin, Z. (2023). Impact of investor sentiment on firm innovation: Evidence from textual analysis. *Borsa Istanbul Review, 23*(5), 1141-1151. https://doi.org/10.1016/j.bir.2023.07.002

Liu, X., Li, S., Wang, X., & Zhang, C. (2024). Leveraging supplier orientation for innovation: Exploring the impact of supply management innovativeness and innovation partnership. *Managerial and Decision Economics, 45*(6), 3690-3704. https://doi.org/10.1002/mde.4218

Loučanová, E., Paluš, H., Báliková, K., Dzian, M., Slašťanová, N., & Šálka, J. (2020). Stakeholders' perceptions of the innovation trends in the slovak forestry and forest-based sectors. *Journal of Business Economics and Management, 21*(6), 1610-1627. https://doi.org/10.3846/jbem.2020.13503

Marnewick, C. (2025). Project leaders digital Capabilities: A sentiment analysis perspective. *Project Leadership and Society, 6*, 100205. https://doi.org/10.1016/j.plas.2025.100205

Mojica, M., Palos-Sanchez, P. R., & Cabanas, E. (2024). Is there innovation management of emotions or just the commodification of happiness? A sentiment analysis of happiness apps. *European Journal of Innovation Management, 28*(8), 3238-3261. https://doi.org/10.1108/ejim-11-2023-0963

Moya-Fernández, P. J., & Seclen-Luna, J. P. (2024). Evaluating the Effects of Information Sources on Innovation Outcomes: Are There Differences between KIBS and Manufacturing Firms from a Latin America

Library and Learning, University of Phayao

Country? *Journal of the Knowledge Economy, 15*(1), 4024-4055. https://doi.org/10.1007/s13132-023-01305-w

Ngo, A. T. (2025). Entrepreneurship and innovation in business economics: A global bibliometric analysis from 2015 to 2024. *CTU Journal of Innovation and Sustainable Development, 17*(2), 136-147. https://doi.org/10.22144/ctujoisd.2025.042

Ozols, A., Gaile-Sarkane, E., & Avotins, V. (2025). *Role of innovation sources for external knowledge absorption readiness for Latvian enterprises*. https://doi.org/10.22616/ERDev.2025.24.TF129

Pedraza-Rodríguez, J. A., Ruiz-Vélez, A., Sánchez-Rodríguez, M. I., & Fernández-Esquinas, M. (2023). Management skills and organizational culture as sources of innovation for firms in peripheral regions. *Technological Forecasting and Social Change, 191*, 122518. https://doi.org/10.1016/j.techfore.2023.122518

Philipson, S. (2020). Sources of innovation: Consequences for knowledge production and transfer. *Journal of Innovation & Knowledge, 5*(1), 50-58. https://doi.org/10.1016/j.jik.2019.01.002

Phung Minh Thu, T., Knoben, J., Vermeulen, P., & Tran, D. T. (2018). Made in Vietnam: Internal, collaborative, and regional knowledge sources and product innovation in Vietnamese firms. *European Journal of Innovation Management, 21*(4), 581-600. https://doi.org/10.1108/ejim-10-2017-0134

Pinto, H., Guerreiro, J. A., & Fernández-Esquinas, M. (2023). Sources of knowledge in the firm: a review on influential, internal and contextual factors in innovation dynamics. *SN Business & Economics, 3*(2), 57. https://doi.org/10.1007/s43546-023-00430-7

Sánchez-García, E., Martínez-Falcó, J., Marco-Lajara, B., & Gigauri, I. (2025). Building the future through digital entrepreneurship and innovation. *European Journal of Innovation Management, 28*(7), 2873-2908. https://doi.org/10.1108/EJIM-04-2024-0360

Library and Learning, University of Pinayao

Strielkowski, W., Samoilikova, A., Smutka, L., Civín, L., & Lieonov, S. (2022). Dominant trends in intersectoral research on funding innovation in business companies: A bibliometric analysis approach. *Journal of Innovation & Knowledge, 7*(4), 100271. https://doi.org/10.1016/j.jik.2022.100271

Stundziene, A., Pilinkiene, V., Vilkas, M., Grybauskas, A., & Lukauskas, M. (2024). The challenge of measuring innovation types: A systematic literature review. *Journal of Innovation & Knowledge*, 9(4), 120600. https://doi.org/ 10.1016/j.jik.2024.100620

Suvittawat, A. (2024). Exploring Customer Experience Drivers in Night Markets: Examining the Roles of Product Preference, Service Quality, and Facility Accessibility. *Tourism and Hospitality, 5*(4), 1477-1492. https://doi.org/10.3390/tourhosp5040082

Suzuki, K. (2023). Utilization of External and Internal Information as Key Drivers for Innovations in Regional High-tech SME's. *Information Engineering Express, 9*, 1. https://doi.org/10.52731/iee.v9.i2.746

Zhou, Z., Zhang, J. Z., Zhou, L., & Liu, D. Y. (2025). From Co-Creation to Digital Servitization in Innovation Ecosystems: A Global Bibliometric Analysis. *Journal of Organizational and End User Computing, 37*(1). https://doi.org/10.4018/JOEUC.397897

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Chapter 6: Strategic New Product and Service Development for Innovation and Value Creation

Course Learning Outcomes (CLO):

1. Analyze product development and its strategic role.
2. Classify and evaluate types of product innovation.
3. Explain and assess service innovation and value creation.
4. Apply and analyze the new product development process.
5. Evaluate the role of entrepreneurs in product development.

Contents and Concepts of This Chapter:

6.1 Introduction to Product Development

6.2 Types of Product Innovation

6.3 Service Innovation

6.4 New Product Development Process

6.5 Entrepreneurs and Product Development

Case Study

Chapter Summary

Chapter Review Questions

Chapter Exercises

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6.1 Introduction to Product Development

This chapter proposes a comprehensive examination of new product and service development as a strategic capability for entrepreneurial and organizational competitiveness in dynamic markets. It begins by establishing the foundational concepts of product development and the role of innovation as a driver of value creation. The discussion then differentiates types of product innovation ranging from incremental to radical followed by an exploration of service innovation in response to evolving customer experiences and digital transformation. The chapter further outlines the stages of the new product development process, emphasizing systematic idea generation, screening, testing, and commercialization. Finally, it highlights the critical role of entrepreneurs in leveraging market opportunities, managing uncertainty, and integrating resources to successfully develop and launch new products and services.

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Product development is a strategic, structured, and multidisciplinary process through which organizations transform ideas, market needs, and technological opportunities into marketable products or services that create value for customers and stakeholders. It involves a series of interrelated activities including opportunity recognition, idea generation, concept development, design, engineering, testing, and commercialization that must be aligned with organizational objectives and evolving market demands.

This process is inherently systematic and iterative, integrating cross-functional knowledge from marketing, operations, and research and development to enhance both customer value and competitive advantage. In contemporary markets characterized by rapid technological change and shifting customer preferences, product development has become increasingly agile, customer-centric, and data-driven.

For entrepreneurial ventures, product development typically occurs under conditions of uncertainty and resource constraints. Consequently, it requires adaptive learning, rapid experimentation, and continuous refinement to achieve product–market fit and sustain long-term growth.

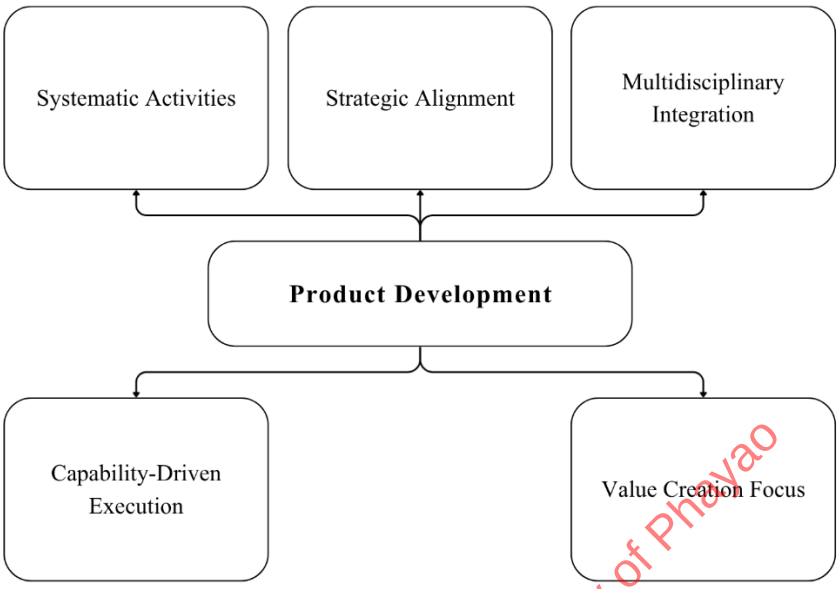

Figure 6.1 Product Development

Source: Adapted from Schmallenbach, L., & Hoisl, K. (2026). Value creation, value capture, and economic growth: Revisiting the innovation economic growth relationship and implications for sustainable technologies and AI. *Technological Forecasting and Social Change*, 233, 124843

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As illustrated in Figure 6.1, product development can be conceptualized as a systemic and organization-wide capability. At its core, it comprises several interrelated dimensions. First, it involves systematic activities, encompassing a structured sequence of stages such as ideation, design, engineering, testing, and commercialization that transform concepts into tangible offerings. Second, it requires strategic alignment, whereby all development activities are closely aligned with organizational objectives, market demand, and customer needs to ensure relevance and competitiveness. Third, product development depends on multidisciplinary integration, necessitating coordination across internal functions (e.g., marketing, R&D, and operations) as well as collaboration with external actors (e.g., suppliers and partners). Fourth, it entails capability-driven execution, where outcomes are contingent upon the firm's internal capabilities such as design management and innovation processes alongside its ability to leverage external collaborations. Finally, it maintains a strong value creation focus,

aiming to deliver superior customer value while enhancing firm performance, competitive positioning, and long-term sustainability.

In the context of small and medium-sized enterprises (SMEs), product development should be conceptualized as a structured, design-driven process that integrates strategic intent with operational execution through effective design management. Rather than emerging spontaneously, successful product development results from systematically managed design activities, where design functions both as a strategic resource and an operational capability that enhances firm performance and innovation outcomes. However, SMEs often face inherent constraints, particularly in terms of limited human, financial, and technical resources, which increase the complexity of managing multidisciplinary innovation processes. Consequently, the importance of formalized and integrated design management approaches to support SMEs in organizing, controlling, and optimizing their new product development activities. In this regard, the Integrated Design Management (IDM) model provides a comprehensive framework tailored to SMEs with limited design experience. The model conceptualizes product development as a multi-layered system encompassing both strategic and operational dimensions, structured around four core areas: (1) design management integration, (2) design management capabilities, (3) design project definition, and (4) design project management. The first two dimensions operate at the organizational level, embedding design within the firm's strategy, culture, and capabilities, while the latter two focus on the project level, guiding the transformation of ideas into marketable products through clearly defined processes, resource allocation, and control mechanisms. Importantly, the model underscores that effective product development requires alignment between organizational capabilities, structured processes, and strategic objectives, thereby enabling SMEs to manage complexity, reduce uncertainty, and enhance innovation performance (Carneiro et al., 2025).

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From the perspective of supplier involvement, product development can be understood as a multidimensional and collaborative system in which value creation emerges through the integration of internal capabilities and inter-organizational interactions. Rather than a linear sequence of activities, it comprises four interdependent dimensions: people, process, tools/technology, and interaction. The people dimension encompasses competencies, roles, and

cross-functional collaboration; the process dimension refers to structured activities and decision-making routines that translate customer needs into products; the tools/technology dimension involves the application of engineering tools, simulation systems, and design methodologies; and the interaction dimension captures communication and relational dynamics between suppliers and customers. This perspective highlights that product development is inherently inter-organizational, with suppliers contributing critical knowledge, capabilities, and innovation inputs, while also introducing challenges related to coordination, information asymmetry, and evolving requirements. Accordingly, effective product development depends on both strong internal capabilities and well-managed external interfaces, reinforcing its systemic and relational nature (Flankegård et al., 2021).

Product development may also be conceptualized as a structured transformation process through which market opportunities and technological assumptions are translated into market-ready offerings. Within this framework, product development practices consist of a systematic set of tasks, stages, and organizational routines that guide the progression from idea generation to commercialization. These practices include process-oriented activities such as ideation, requirement analysis, prototyping, testing, and launch as well as capability-driven elements, including research and development (R&D), strategic alignment, and risk management. Effective product development practices are critical determinants of new product performance, influencing adoption, customer satisfaction, market penetration, and financial outcomes. Conversely, poorly executed practices such as inadequate market research, weak customer orientation, and lack of structured processes are associated with suboptimal performance and increased risk of failure. Therefore, robust, iterative, and well-integrated product development practices are essential for achieving product–market fit and sustaining competitive advantage, particularly in dynamic and emerging markets (Iheanachor et al., 2021).

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Furthermore, product development constitutes a critical organizational function that contributes to sustainable performance, goodwill, and firm popularity, thereby reinforcing its strategic significance in manufacturing contexts. Well-developed products not only enhance long-term performance outcomes but also strengthen market reputation and public perception.

Improvements in product development are positively associated with higher levels of sustainable performance, as well as increased goodwill and firm popularity, reflecting its impact on both operational and reputational dimensions of the firm (Jermsittiparsert, 2021).

In addition, supply chain design should be integrated early in the product development process to ensure alignment between product characteristics and supply chain configurations. Early integration enables firms to make informed decisions regarding sourcing strategies, supplier involvement, network structure, and material flows before design choices become inflexible or costly to modify. This approach facilitates the proactive evaluation of resource flows and operational constraints such as supplier capabilities, production capacity, transportation limitations, and inventory positioning thereby reducing the risk of inefficiencies and disruptions throughout the product lifecycle. Moreover, it supports the alignment between supply chain strategies (e.g., efficiency versus responsiveness) and product characteristics (e.g., functional versus innovative), ultimately enhancing performance, reducing lead times, and improving supply chain resilience in dynamic market environments (Reitsma et al., 2023).

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Contemporary approaches, such as integrated product development, further enhance effectiveness by emphasizing structured process optimization, cross-functional coordination, and lifecycle integration. These approaches reorganize firms into cross-functional teams, integrate decision-making across key development stages including planning, conceptual design, engineering, and industrialization and incorporate formalized review and demand management mechanisms. Such practices enable firms, particularly in complex industries like automotive manufacturing, to improve development efficiency, strengthen interdepartmental coordination, and ensure alignment between market demand, technical development, and production processes. Additionally, integrated product development contributes to shorter development cycles, improved product quality, and more informed decision-making through staged reviews and platform-based strategies. Accordingly, product development should be viewed not merely as a technical activity, but as a strategic, organization-wide capability that integrates resources, processes, and expertise to enhance competitiveness and support continuous innovation (Zhang et al., 2024).

In conclusion, product development is a strategic, systematic, and multi-level organizational capability that extends beyond technical execution to encompass design management, inter-organizational collaboration, structured processes, and supply chain integration. For SMEs in particular, the effective alignment of strategic intent, organizational capabilities, and operational processes is essential for navigating resource constraints, reducing uncertainty, and achieving sustainable innovation performance in increasingly complex and dynamic market environments.

6.2 Types of Product Innovation

Product innovation refers to the development of new or improved products and services that create meaningful value for customers and enhance firm performance, particularly in dynamic and digitally enabled environments. Product innovation extends beyond mere technological novelty and should be understood as a multidimensional construct comprising new product newness the degree to which a product is perceived as novel and new product meaningfulness the extent to which it addresses customer needs and delivers practical value. These two dimensions jointly determine innovation effectiveness, although meaningfulness is often more influential in driving customer acceptance and market performance.

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Importantly, product innovation is increasingly shaped by firms' digital transformation capability, which integrates digital strategy, digital skills, and the application of digital technologies. This capability enables firms to generate data-driven insights, personalize offerings, and redesign development processes, thereby enhancing both the novelty and relevance of products. As a result, product innovation serves as a critical mechanism through which firms translate digital transformation into superior new product performance and sustained competitive advantage in rapidly evolving markets (Cao et al., 2025).

From an organizational perspective, product innovation can also be conceptualized as a multidimensional process encompassing the creation, development, and commercialization of new or improved offerings in response to changing market conditions. This process reflects both novelty the degree of creativity, radicalness, and inventiveness and intensity the

frequency or rate of new product introduction relative to competitors. Rather than being an isolated outcome, product innovation emerges within broader innovation ecosystems shaped by the interaction of organizational capabilities, resource configurations, and digital technologies. In this context, digital entrepreneurship plays a pivotal mediating role in translating R&D investments into tangible innovation outcomes. Digital tools and platforms enable firms to identify opportunities, iterate rapidly, and incorporate real-time customer insights, thereby improving both the speed and market relevance of product development. However, the effectiveness of this transformation process is contingent upon contextual factors, particularly digital platform risk, which can either facilitate or constrain the conversion of R&D inputs into successful product innovations (Omari et al., 2025).

External competitive conditions further influence firms' product innovation strategies. Specifically, competition from informal firms exerts a predominantly negative effect on formal firms' engagement in new-to-market innovation, especially in emerging economies characterized by weak institutional enforcement. Informal firms benefit from cost advantages, regulatory evasion, and ease of imitation, which collectively reduce the expected returns from highly novel innovations. Consequently, formal firms tend to shift toward incremental or imitative innovation strategies that emphasize cost efficiency and speed, aligning with price-sensitive markets and imitation-prone environments. This relationship is further moderated by firm-level and institutional factors, as credit constraints intensify the deterrent effect, while stronger state legitimacy mitigates it by enhancing protection mechanisms and resource advantages (Wang & Wang, 2024).

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The effectiveness of innovation protection mechanisms also varies across different types of product innovation. Formal intellectual property protections, particularly patents, are most suitable for highly novel innovations aimed at pioneering new markets. In contrast, informal mechanisms such as secrecy and first-mover advantages are more effective for less novel innovations, including quality improvements, cost reductions, and product diversification. Additionally, mechanisms such as confidentiality, design complexity, and utility models exhibit context-dependent effectiveness. Therefore, firms should align their protection strategies with

the specific objectives and novelty level of their innovations rather than relying on a simplistic incremental radical dichotomy (Kim, 2022).

Building on these foundations, Sezegen and Edis (2020) propose a comprehensive classification of product innovation based on two complementary analytical perspectives: innovation as a physical object and innovation as an affecting agent (process perspective), as illustrated in Figure 6.2.

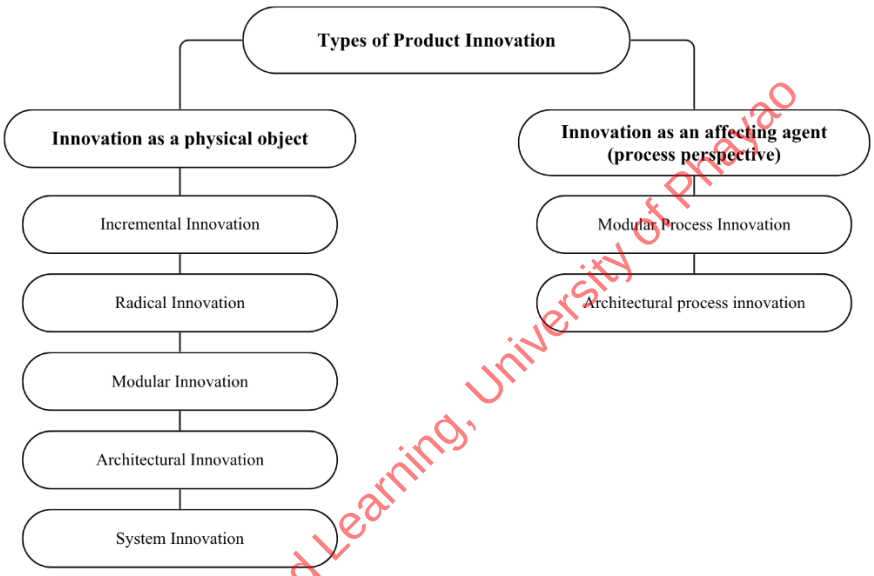

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Figure 6.2 Types of Product Innovation

Source: Adapted from Stojčić, N., Dabić, M., & Kraus, S. (2024). Customisation and co-creation revisited: Do user types and engagement strategies matter for product innovation success? *Technovation*, 134, 103-145.

From the perspective of innovation as a physical object, five primary types can be identified. (1) Incremental innovation involves minor improvements or refinements to existing product features, typically enhancing performance such as durability or efficiency without altering the core structure. These innovations are continuous, low-risk, and grounded in existing knowledge. In contrast, (2) radical innovation entails fundamental changes that significantly transform a product's function or its interaction

within a broader system, often introducing entirely new products or functionalities and involving higher uncertainty and impact. (3) Modular innovation occurs when changes are confined to specific components while the overall system architecture remains unchanged, focusing on component-level improvements without modifying interdependencies. Conversely, (4) architectural innovation involves reconfiguring the relationships among existing components, thereby altering system integration and behavior without necessarily introducing new components. Finally, (5) system innovation represents a higher-order form of innovation that integrates multiple component and architectural changes to create a new or substantially improved system, leading to significant performance enhancements at the system level.

Complementing this structural view, the process perspective conceptualizes innovation as an affecting agent that reshapes stakeholder interactions and workflows. In this dimension, (6) modular process innovation influences individual tasks or activities without significantly altering relationships among stakeholders. In contrast, (7) architectural process innovation reconfigures interactions among key actors such as designers, engineers, and suppliers resulting in changes to coordination mechanisms, decision-making structures, and collaborative processes.

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This dual perspective is particularly important in complex, multi-stakeholder environments, where innovation not only transforms product characteristics but also reshapes the underlying processes through which products are developed. Accordingly, innovation types should not be viewed as fixed or mutually exclusive categories; rather, they are contingent upon the analytical lens adopted whether focusing on product features, system architecture, or stakeholder interactions.

In conclusion, product innovation is a multidimensional and context-dependent phenomenon shaped by digital capabilities, organizational processes, and competitive environments. Its various forms ranging from incremental to systemic and from structural to process-oriented highlight the need for firms to adopt a holistic and strategically aligned approach to innovation management in order to sustain competitive advantage in rapidly changing markets.

6.3 Service Innovation

Service innovation refers to the development and implementation of new or significantly improved service offerings, processes, or business models that generate value for customers, organizations, and the broader ecosystem. It is a multidimensional and systemic phenomenon that extends beyond technological advancement to include meaning creation, resource integration, organizational capabilities, and ecosystem-level interactions.

Unlike product innovation, service innovation is characterized by intangibility, the simultaneity of production and consumption, and a high degree of customer involvement. Consequently, it requires organizations to integrate customer experience design, technology adoption, and frontline employee capabilities. Firms increasingly leverage digital platforms, data analytics, and customer co-creation to enhance service personalization, operational efficiency, and responsiveness. In dynamic and highly competitive markets, service innovation plays a critical role in differentiation, customer satisfaction, and long-term relationship building, thereby contributing to sustainable competitive advantage.

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Service innovation is inherently dynamic and is shaped by organizational capabilities, leadership characteristics, and the effective integration of market knowledge into value creation processes. At the strategic level, leadership particularly that of the Chief Marketing Officer (CMO) plays a critical role in determining the pace of service innovation, as CMOs act as a key interface between customer insights and innovation outcomes. However, this relationship is not linear. An inverted U-shaped effect of CMO career experience on service innovation. Specifically, CMOs with a balanced combination of specialist and generalist experience integrating deep domain expertise with cross-functional and cross-industry exposure are most effective in driving innovation. In contrast, overly specialized CMOs may lack adaptability, while overly generalist CMOs may lack the depth necessary to identify and exploit innovation opportunities. This optimal balance enables more effective integration of market knowledge with adaptive problem-solving capabilities, thereby enhancing service innovation in complex environments (Bendig et al., 2026).

Beyond leadership, contemporary perspectives increasingly position meaning as a foundational driver of service innovation. From a service-dominant logic and human-centered perspective, innovation is not limited to introducing new offerings or processes; rather, it involves shaping how actors interpret and experience value propositions within specific usage contexts. Meaning functions as an interpretive mechanism that precedes and guides resource integration and value co-creation, influencing whether a service is perceived as valuable. It is inherently experiential, emerging from prior interactions and embedded within cognitive, emotional, and contextual dimensions. Consequently, the success of service innovation depends not only on functional or technological novelty but also on the extent to which value propositions are perceived as meaningful by users (Kustrak Korper et al., 2021).

At the ecosystem level, service innovation emerges through interactions among multiple interdependent actors rather than within isolated firms. Collaborative mechanisms particularly coopetition and shared goals shape how organizations access and combine external resources. Coopetition, defined as the simultaneous pursuit of cooperation and competition, enables firms to leverage complementary knowledge while maintaining incentives for innovation, and has been shown to exert a positive effect on service innovation. In contrast, shared goals do not exhibit a direct significant effect, suggesting that excessive alignment may constrain novelty. Moreover, interfirm power dynamics particularly those exercised by hub firms moderate these relationships. Reward-mediated power weakens the positive impact of coopetition, whereas non-mediated power strengthens the influence of shared goals on innovation outcomes. Service innovation is contingent upon the interplay between collaboration structures and power distribution within the ecosystem (Liu et al., 2023).

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Integrative frameworks of service innovation further emphasize the need to synthesize diverse and fragmented success factors into a coherent, multidimensional system. Rather than focusing on isolated elements, these frameworks organize interrelated factors such as strategic orientation, organizational characteristics, leadership, human resources, technological capabilities, processes, co-creation mechanisms, and external conditions into an integrated configuration. The effectiveness of service innovation,

therefore, depends on the alignment and coordinated management of these elements, enabling firms to enhance both innovation processes and performance outcomes (Smania & de Sousa Mendes, 2021).

In the digital era, service innovation increasingly arises from resource integration that extends beyond firm boundaries, particularly within social commerce contexts. Consistent with service-dominant logic, consumers are active resource integrators who contribute operant resources such as knowledge, networks, and creativity to value co-creation. Social media influencers play a pivotal role in this process by leveraging their network assets, persuasion capabilities, and domain knowledge to facilitate interactions between firms and peer consumers. Through technology-enabled engagement, they integrate resources across actors and contribute to service innovation by enabling value creation for others (Wu et al., 2022). This reflects a broader shift toward participatory and networked models of innovation.

Furthermore, digitalization capability has emerged as a critical enabler of service innovation by enhancing firms' ability to acquire, develop, and integrate market knowledge. From a knowledge-based perspective, digitalization strengthens both knowledge acquisition (e.g., depth and diversity of customer insights) and knowledge integration (e.g., exploration and exploitation), which subsequently drive both incremental and radical service innovation. Thus, digitalization not only improves information processing efficiency but also enables the recombination and application of knowledge resources, thereby increasing the adaptability and scalability of service innovation processes (Zhu et al., 2025).

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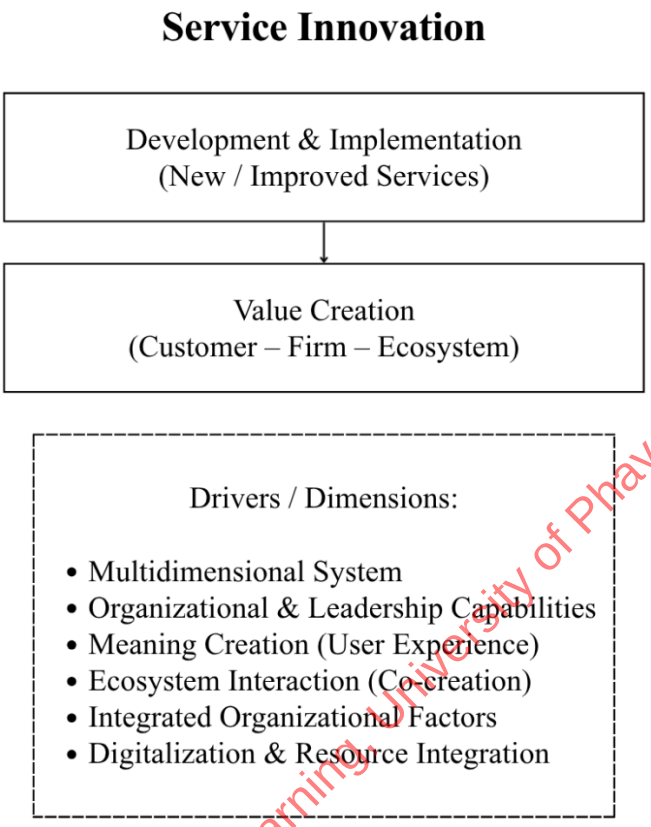

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Figure 6.3 Service Innovation

Source: Adapted from Pan, R., & Yang, Z. (2026). Synergistic effect between product innovation and service innovation on firm performance in the digital era. *Journal of Manufacturing Technology Management*. InPress.

As illustrated in Figure 6.3, service innovation can be conceptualized as a dynamic and systemic process that centers on the development and implementation of new or improved services, ultimately leading to value creation across multiple stakeholders, including customers, firms, and the broader ecosystem. This process is underpinned by several interrelated drivers or dimensions, highlighting its multidimensional nature. These include the integration of organizational and leadership capabilities that guide strategic direction and execution, the creation of meaning through enhanced user experience, and the role of ecosystem interaction in enabling co-creation

of value. Additionally, service innovation is shaped by integrated organizational factors that ensure internal alignment, as well as digitalization and resource integration, which facilitate the effective combination and deployment of resources. Collectively, these dimensions emphasize that service innovation extends beyond isolated improvements, representing a holistic, capability-driven system that continuously evolves to generate sustainable value.

In conclusion, service innovation is a complex, multidimensional process shaped by the interaction of leadership capabilities, meaning creation, ecosystem dynamics, integrative organizational frameworks, and digitalization capabilities. Its effectiveness depends on the alignment of these elements, as well as the firm's ability to integrate and recombine resources across organizational and ecosystem boundaries to generate meaningful and sustainable value.

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6.4 New Product Development Process

The new product development process constitutes a structured yet adaptive sequence of activities through which firms transform ideas into marketable offerings by integrating technological capabilities, market insights, and organizational resources. Contemporary perspectives suggest that new product development is no longer a purely linear stage-gate process; instead, it operates as a dynamic, iterative, and portfolio-based system that accommodates uncertainty, cross-functional interdependencies, and diverse innovation logics.

Effective new product development relies on cross-functional integration among marketing, research and development, operations, and finance to ensure alignment with both market needs and organizational strategy. In increasingly dynamic and uncertain environments, new product development is characterized by iterative learning, active customer involvement, and the adoption of agile methodologies. These approaches enable firms to reduce time-to-market, manage risk more effectively, and enhance overall innovation performance.

The new product development process proposed by Zhang et al. (2024) is grounded in the Integrated Product Development (IPD) paradigm, which emphasizes cross-functional integration, structured stages, and iterative optimization. This approach is designed to enhance development efficiency, shorten time-to-market, and ensure alignment between product outcomes and customer requirements.

Core Structure of the New Product Development Process

Zhang et al. (2024) conceptualize new product development as a multi-stage, end-to-end system that transforms product ideas into market-ready outputs through coordinated organizational and technical activities. As illustrated in Figure 6.4, the process comprises four primary stages:

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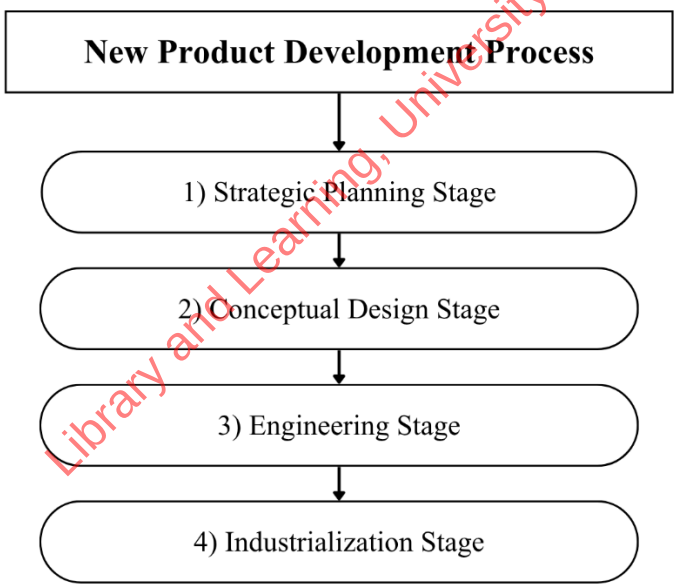

Figure 6.4 New Product Development Process

Source: Adapted from Gonçalves, A., Cardeal, G., Ribeiro, I., & Henriques, E. (2026). Absolute sustainability in product design and development: A holistic framework integrating environmental, social, economic and

functional performance. *Environmental Impact Assessment Review*, 118, 108310

(1) Strategic Planning Stage

This initial phase focuses on pre-development decision-making, including market research, demand identification, product positioning, and feasibility analysis. It also involves defining key parameters such as cost, expected sales volume, technical specifications, development timelines, and profitability targets. Decisions made at this stage are critical, as they shape strategic direction and resource allocation.

(2) Conceptual Design Stage

In this stage, firms develop product concepts and design alternatives while translating customer needs into technical requirements. Various design options are evaluated and optimized to minimize downstream defects. The primary objective is to balance quality, cost, and manufacturability early in the process, thereby reducing the need for rework in later stages.

(3) Engineering Stage

This phase involves detailed product design and engineering development, including the creation of 2D and 3D models, technical documentation, prototype development, and validation. It also requires intensive cross-functional coordination among R&D, manufacturing, suppliers, and quality management. At this stage, product specifications are finalized and verified prior to industrialization.

(4) Industrialization Stage

The final stage focuses on scaling production and optimizing manufacturing processes. Activities include tooling development, production system design, quality validation, and ensuring compliance with specifications. This stage ensures manufacturing readiness and product reliability under real-market conditions.

Beyond its staged structure, the new product development process is increasingly conceptualized as a portfolio of interrelated processes rather

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than a single linear sequence. Drawing on decoupling logic, firms distinguish between forecast-driven activities and customer-order-driven activities, enabling them to balance standardized product development (focused on time-to-market) with customized solutions (focused on time-to-customer). Furthermore, the separation between technology development and product development is emphasized: technology development involves exploratory and uncertain activities such as research and experimentation, whereas product development translates these technologies into marketable offerings through more structured processes. Importantly, the configuration of new product development processes varies depending on the degree of customer involvement and the position of the engineering decoupling point, which determines how far customer-specific requirements penetrate upstream development activities (Tiedemann et al., 2020).

Consistent with this contingent perspective, high-performing firms do not rely on a single standardized new product development model. Instead, they adopt a structured yet flexible approach that integrates multiple process configurations. These may include formal phase-review systems, cross-functional stage-gate processes, and increasingly agile and iterative methods, depending on product type (e.g., physical goods versus services or software) and environmental conditions. Leading firms are more likely to combine formalized processes with portfolio management, thereby enhancing coordination, reducing cycle times, and aligning innovation efforts with strategic objectives. However, no single process guarantees success; superior performance depends on the effective orchestration of processes, strategic orientation (e.g., long-term focus and calculated risk-taking), and the continuous adaptation of new product development capabilities to evolving technological and market conditions (Knudsen et al., 2023).

Customer involvement in new product development is increasingly conceptualized as co-creation, in which customers actively contribute across multiple stages, including idea generation, evaluation, and product refinement. However, such participation is contingent upon specific motivational drivers. Notably, a firm's perceived sustainability orientation plays a critical role in encouraging customer engagement. When firms are viewed as environmentally responsible, customers are more willing to contribute knowledge and effort, as they expect their participation to generate

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positive environmental and health outcomes. These perceived benefits act as key psychological mechanisms that mediate the relationship between sustainability perceptions and co-creation behavior. Thus, sustainability does not directly drive participation; rather, it operates through shaping customer beliefs about the value and impact of their contributions, underscoring the importance of effective sustainability communication (Jordanow, 2026).

Customer empowerment further shapes new product development outcomes by influencing both psychological states and behavioral responses. Empowerment defined as customers' active participation in new product development activities enhances feelings of ownership, accomplishment, and identification with the product, while also improving perceptions of firm innovativeness. Behaviorally, this leads to increased product preference, higher purchase intentions, stronger loyalty, and greater willingness to pay. However, these effects are context-dependent. Excessive empowerment, such as granting too much design freedom, may reduce satisfaction and purchase intention, while negative outcomes (e.g., idea rejection) can generate adverse emotional responses and discourage future participation. Moreover, different empowerment configurations (e.g., "by me for one" versus "by others for many") and customer roles (participants versus observers) produce distinct outcomes. The effectiveness of empowerment depends on its design and contextual alignment (Maier & Baccarella, 2025).

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In parallel, user-generated content (UGC) has emerged as a critical source of customer insight in new product development, enabled by the proliferation of digital platforms and social media. Firms can systematically analyze UGC such as online reviews, comments, and user interactions to access real-time, unsolicited customer feedback. This information supports multiple new product development activities, including idea generation, concept refinement, and product improvement, while also facilitating ongoing customer engagement and co-creation. However, leveraging UGC effectively requires advanced analytical capabilities, such as text mining, sentiment analysis, and machine learning, to process large volumes of unstructured data and extract actionable insights (Nasrabadi et al., 2024).

At the strategic level, CEO environmental awareness represents a critical cognitive orientation that shapes organizational decision-making and influences new product development performance. This awareness reflects

the extent to which environmental considerations are integrated into strategic priorities and managerial thinking. Its impact on new product development outcomes is indirect, operating through the implementation of corporate environmental practices that translate executive values into organizational actions. These practices include both technical and managerial initiatives aimed at reducing environmental impact and aligning innovation activities with sustainability objectives. Accordingly, CEO environmental awareness primarily influences new product development by shaping strategic direction and guiding the adoption of environmentally oriented practices (Tang et al., 2024).

In the context of food restaurants, new product development serves as a critical mechanism for sustaining competitive advantage by continuously adapting menu offerings to evolving customer needs and preferences. Rather than emphasizing a broad, integrated innovation process, effective new product development is driven by key marketing mix factors product, price, distribution (place), and promotion which directly influence both new product development and customer satisfaction. In particular, elements such as food taste, portion size, food safety, reasonable pricing, convenient location, restaurant atmosphere, and promotional activities play a significant role in shaping customer purchasing decisions and satisfaction levels. Therefore, food entrepreneurs can enhance competitiveness by systematically aligning these factors with customer expectations and feedback, ensuring that new menu offerings deliver both functional and experiential value in a highly competitive and dynamic market (Suvittawat et al., 2019).

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In conclusion, the new product development process is best understood as a structured yet flexible and multi-dimensional system that integrates staged development logic with iterative, portfolio-based, and customer-centric approaches. Its effectiveness depends not only on process design but also on the alignment of strategic orientation, technological capabilities, customer engagement mechanisms, and organizational practices in response to dynamic market and environmental conditions.

6.5 Entrepreneurs and Product Development

Entrepreneurs play a pivotal role in product development as catalysts of innovation, opportunity recognition, and resource orchestration. Operating under conditions of uncertainty, resource constraints, and market ambiguity, entrepreneurial ventures adopt a distinctive approach that contrasts with the structured R&D processes of established firms. This approach is inherently iterative, opportunity-driven, and closely aligned with evolving customer needs.

In this context, entrepreneurs identify market opportunities, mobilize limited resources, and transform innovative ideas into viable offerings. They rely on iterative experimentation, continuous customer feedback, and agile decision-making to refine product concepts and accelerate time-to-market. Moreover, their ability to leverage networks, integrate cross-functional knowledge, and maintain a proactive, opportunity-oriented mindset enables the development of differentiated products that enhance customer value. Entrepreneurial product development is therefore closely associated with innovativeness, calculated risk-taking, and resource leveraging, which collectively strengthen firm competitiveness and adaptability in dynamic market environments.

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From a micro-founded and upper echelons perspective, entrepreneurs act as key agents in new product development by recognizing, creating, and exploiting innovative opportunities that contribute to economic dynamism and societal welfare. Individual-level characteristics, particularly age and human capital, significantly influence engagement in entrepreneurial new product development. Two complementary perspectives explain this relationship: the “advantage of youth,” which suggests that younger entrepreneurs are more likely to engage in new product development due to higher levels of creativity, cognitive flexibility, and risk tolerance; and the “business acumen” view, which emphasizes the importance of prior managerial and entrepreneurial experience in enhancing opportunity recognition, resource mobilization, and the navigation of complex innovation processes (Grilli, 2022).

At the firm level, entrepreneurial orientation represents a strategic posture characterized by innovativeness, proactiveness, and risk-taking,

which guides decision-making and opportunity-seeking behavior. Within the context of new product development, entrepreneurial orientation functions as a critical mechanism that enables firms to identify market opportunities, anticipate environmental changes, and initiate product-related innovations. It fosters a forward-looking mindset that encourages investment in innovation and calculated risk-taking. However, the effectiveness of entrepreneurial orientation is contingent upon the firm's ability to mobilize and deploy relevant resources and capabilities to support the development process (Kurnia et al., 2023).

Entrepreneurial empathy has emerged as a nuanced antecedent of new product development, encompassing both enabling and constraining effects. On the one hand, empathy enhances entrepreneurs' ability to understand customers' latent needs through perspective-taking, thereby facilitating the development of user-centered product ideas. On the other hand, empathy may introduce affect-driven cognitive biases, such as the overemphasis of salient customer perspectives, which can distort information processing and impair decision quality. Consequently, entrepreneurial empathy follows a "too-much-of-a-good-thing" logic, whereby moderate levels improve new product development outcomes, while excessive levels become detrimental (Kurz et al., 2024).

From a human capital perspective, top management particularly CEOs plays a critical role in transforming technological inventions into marketable products. The impact of CEO human capital is not uniform but contingent on its composition. CEOs influence the technology conversion process through strategic decision-making, resource allocation, and organizational coordination. Generalist CEOs, characterized by diverse cross-industry and functional experience, are more effective in leveraging heterogeneous and high-quality invention portfolios. In contrast, specialist CEOs are better suited to contexts involving less complex or lower-diversity technological assets. Thus, the effectiveness of CEO human capital depends on the alignment between the CEO's expertise and the firm's technological portfolio (Nasirov et al., 2021).

In technology-intensive contexts, particularly deep-tech innovation, entrepreneurs assume an integrative role in transforming research-based knowledge into commercially viable products. This process is inherently

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nonlinear and characterized by iterative cycles of prototyping, user validation, and feedback integration. Frameworks such as the Augmented Stage-Gate model illustrate how entrepreneurs engage in staged yet flexible decision-making across phases, including ideation, business case development, testing, commercialization, and scaling. Throughout this process, entrepreneurs must align multiple dimensions such as market validation, intellectual property strategy, regulatory compliance, and resource mobilization while operating under high uncertainty. This adaptive and integrative capability is essential for bridging the gap between scientific discovery and real-world application, ensuring both technological feasibility and market relevance (Kruachottikul et al., 2023).

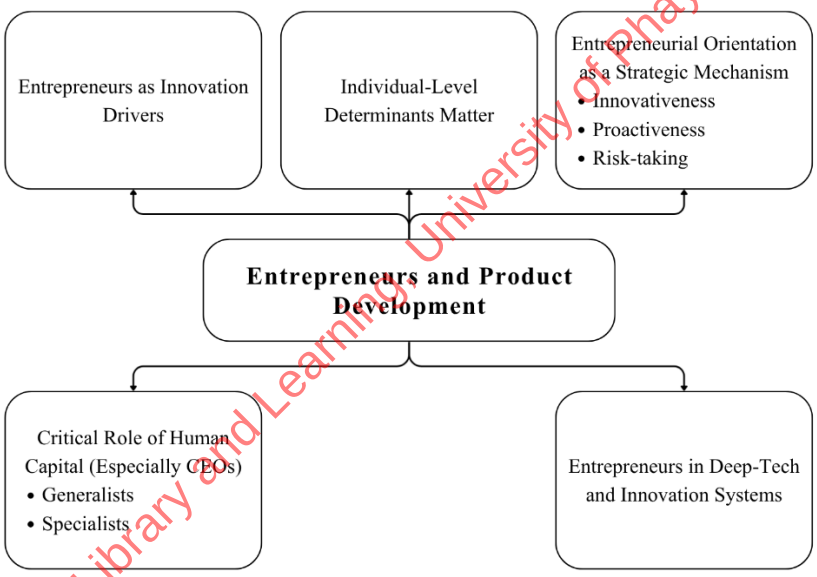

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Figure 6.5 Entrepreneurs and Product Development

Source: Adapted from Ferreras-Méndez, G., et al. (2021). Entrepreneurial orientation and new product development performance in SMEs: The mediating role of business model innovation. *Technovation*, 108, 102325.

As illustrated in Figure 6.5, entrepreneurs play a central and multifaceted role in product development by acting as key drivers of innovation, shaping outcomes through individual-level characteristics, and leveraging entrepreneurial orientation particularly innovativeness, proactiveness, and risk-taking as a strategic mechanism. Their impact is

further mediated by human capital, especially the balance between generalists and specialists at the leadership level (e.g., CEOs), which influences decision-making, resource orchestration, and adaptability. Moreover, in deep-tech and innovation-driven systems, entrepreneurs serve as critical agents who bridge technological opportunities with market needs, thereby enabling the transformation of novel ideas into viable products under conditions of uncertainty and resource constraints.

In conclusion, entrepreneurs play a multifaceted and context-dependent role in product development by integrating individual attributes, strategic orientation, cognitive capabilities, and managerial expertise. Their effectiveness lies in their ability to navigate uncertainty, orchestrate resources, and iteratively align technological innovation with market needs, thereby enhancing the likelihood of successful new product development outcomes.

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Case Study

New Product Development in Food Restaurants as a Driver of Competitive Advantage for Entrepreneurs

Adapted Reprint from:

Suvittawat, A., Maneenuam, T., & Bunliang, T. (2019). New product development for food restaurant: Competitive advantage for food entrepreneurs. Journal of Environmental Treatment Techniques, 7(4), 780-784.

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1. Introduction

The food and beverage industry in Thailand has experienced significant growth, driven by the expansion of tourism and increasing consumer awareness of health. This shift has led to rising demand for healthier food options, particularly organic products. As customer preferences continuously evolve, new product development has become essential for food entrepreneurs to maintain competitiveness and respond effectively to changing market needs.

Intensifying competition in the food sector has particularly affected small-scale entrepreneurs, who face challenges from both new market entrants and large food companies. To remain viable, many have adapted their strategies through business expansion, brand creation, pricing tactics, and cost management. However, these approaches often result in declining revenues, especially when entrepreneurs rely on imitation strategies or excessive promotional efforts rather than differentiation through innovation.

In this context, health-oriented consumer behavior presents new opportunities for food entrepreneurs. The increasing preference for organic and nutritious foods allows businesses to introduce innovative menu offerings and charge premium prices. Therefore, new product development encompassing new menus, recipe modifications, and changes in raw materials emerges as a critical success factor. Effective new product development requires a clear understanding of customer needs and feedback, as these

insights guide the development of products that align with target market expectations.

2. National Context: New Product Development in Thailand's Food Restaurant Industry

New Product Development (NPD) in Thailand's food restaurant industry is increasingly shaped by evolving consumer preferences, particularly the growing emphasis on health, personalization, and experiential value. From a product perspective, consumers evaluate food not only based on functional attributes such as taste, safety, and quality, but also through emotional and symbolic benefits that align with their identity and lifestyle. Factors such as packaging design, visual appeal (e.g., color), and variety of menu options significantly influence customer perception and satisfaction. As a result, food entrepreneurs must integrate customer insights into product design, ensuring that offerings are both aesthetically appealing and responsive to diverse consumer motivations.

From a pricing perspective, price functions as a critical signal of value and quality while directly influencing purchasing decisions and sales volume. Consumers in the food industry tend to be price-sensitive, often comparing options and opting for perceived value-for-money choices. Pricing strategies such as promotions, dynamic pricing, and preannounced pricing play a vital role in attracting new customers and encouraging repeat purchases. Additionally, market segmentation and understanding consumer-specific preferences such as those observed in niche markets like beverages are essential for designing effective pricing strategies that align with changing consumer behaviors and health consciousness.

In terms of distribution, accessibility and channel strategy are key determinants of competitive advantage. Location remains a fundamental factor influencing customer experience, pricing, and revenue, particularly in the hospitality-related food sector. At the same time, digital platforms and Online Travel Agencies (OTAs) have become important intermediaries in attracting new customers, although they also intensify competition with direct channels. Expanding food access through diverse retail formats and ensuring availability of fresh, affordable, and culturally appropriate food further enhance market reach and customer satisfaction.

Regarding promotion, integrated communication strategies particularly through digital channels play a crucial role in influencing

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consumer behavior. Electronic word-of-mouth (eWOM) and user-generated content (UGC) significantly affect purchasing decisions, making social media a powerful tool for engagement and brand building. Additionally, both online-to-offline (O2O) strategies and in-store promotions help strengthen customer relationships and drive sales. Non-monetary promotional tactics, such as experiential and relational marketing, are particularly effective in fostering long-term brand loyalty, highlighting the importance of combining transactional and emotional value in promotional efforts.

3. Methodology and Research Framework

The empirical basis of this exploratory case study examined new product establishment and customer satisfaction in relation to new product development using the marketing mix framework. The study investigated the extent to which key elements of the marketing mix influenced customers' needs for new product development and their satisfaction levels. A quantitative approach was employed, utilizing structured questionnaires for data collection. The sample comprised 398 respondents assessing new product requirements and 400 respondents evaluating customer satisfaction. Secondary data were obtained from relevant literature and were corroborated by the study's findings.

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The research process began with a comprehensive review of related literature, from which key variables and measurement indicators of success factors were developed. These measures were refined through consultation with supervisors and subject-matter experts prior to the preliminary survey administered to entrepreneurs, and were subsequently applied in the final survey. The collected data were analyzed using descriptive statistics, specifically mean and standard deviation (SD), and conclusions were derived based on the empirical results.

The survey consists of measures capturing key constructs:

- Marketing Mix – product perspective, price perspective, distribution perspective, and promotion perspective
- New Product Development
- Customer Satisfaction for New Product Development

Based on the research framework, the independent variables—product perspective, price perspective, distribution perspective, and promotion perspective—have direct effects on new product development. In turn, new

product development has a direct influence on customer satisfaction for new product development.

4. Findings and Discussion

4.1 Marketing Mix – product perspective, price perspective, distribution perspective, and promotion perspective

Among independent variables product perspective, price perspective, distribution perspective, and promotion perspective have direct effects on new product development.

The results indicate that customer responses were at an agreed level (mean = 4.01, SD = 0.74).

The means and standard deviations (SD) of the following independent variables:

- Product Perspective (mean = 4.28, SD = 0.66)
- Price Perspective (mean = 4.12, SD = 0.74)
- Distribution Perspective (mean = 3.94, SD = 0.73)
- Promotion Perspective (mean = 3.71, SD = 0.85)

These variables influence new product development.

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The findings indicate that all four marketing mix dimensions product, price, distribution, and promotion exert direct effects on new product development, confirming their strategic role as key antecedents in the new product development process. Overall, customer responses were at an agreed level, suggesting a generally positive evaluation of these factors. Among the variables, the product perspective demonstrated the strongest influence, highlighting that attributes such as taste, quality, safety, and presentation are the most critical drivers of successful new product development. The price perspective also showed a high level of importance, indicating that perceived value and price fairness significantly shape customer acceptance of new products. In contrast, the distribution perspective had a moderate influence, reflecting the supporting role of accessibility, location, and service environment. The promotion perspective recorded the lowest mean, suggesting that while promotional activities contribute to new product development, they are less influential compared to core product and pricing factors. Overall, the results imply that food entrepreneurs should prioritize product quality and value-based pricing strategies as primary levers in new

product development, while using distribution and promotion as complementary mechanisms to enhance market reach and customer engagement.

4.2 New Product Development to Drive Customer Satisfaction

New product development in the food restaurant industry is a critical strategic mechanism for enhancing customer satisfaction, driven primarily by the integration of the marketing mix (4Ps): product, price, place, and promotion.

First, the findings emphasize that product-related factors play the most influential role in both new product development and customer satisfaction. Elements such as taste, portion size, food safety, and presentation significantly shape customer perceptions and purchase decisions. This indicates that successful new product development must prioritize core product quality and sensory experience, aligning closely with evolving consumer preferences, particularly health-conscious trends.

Second, price perception emerges as a strong determinant of satisfaction. Customers evaluate new products based on value for money, where reasonable pricing relative to quality and quantity enhances acceptance. This reflects the importance of perceived value optimization rather than merely low pricing strategies.

Third, distribution (place) contributes to satisfaction through accessibility and service environment. Convenient location, appealing restaurant atmosphere, and supporting facilities (e.g., internet access) enhance the overall customer experience, suggesting that new product development should be supported by an appropriate service delivery context.

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Fourth, promotion although comparatively lower in impact still plays a meaningful role, particularly through online advertising, regular promotions, and customer experience creation. This indicates that communication strategies should reinforce awareness and engagement with new products.

Overall, food entrepreneurs should adopt an integrated, customer-centric new product development approach, where continuous menu innovation, aligned pricing strategies, service environment design, and promotional efforts collectively enhance satisfaction and sustain competitive advantage.

5. Synthesis

This case illustrates that new product development (NPD) in food restaurants operates as an integrated, market-driven mechanism in which all elements of the marketing mix product, price, place, and promotion collectively shape both the success of new menu offerings and customer satisfaction. The findings demonstrate that product-related attributes (e.g., taste, portion size, presentation, and food safety) are the most influential drivers of customer evaluation, while price fairness and value perception play a critical role in purchase decisions. Additionally, distribution factors such as convenient location and restaurant ambiance enhance accessibility and experiential value, whereas promotion activities, particularly online communication and service experience, support customer engagement but exert relatively weaker influence compared to core product attributes. Importantly, the case highlights that new product development is not a standalone activity but a continuous, customer-oriented process grounded in understanding evolving consumer preferences, especially health consciousness and demand for variety. Overall, food entrepreneurs can achieve competitive advantage by adopting a holistic new product development approach, where menu innovation, value-based pricing, accessible service environments, and targeted promotions are strategically coordinated to deliver superior customer value and sustain long-term business performance.

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6. Conclusion

The findings indicate that both new product development (NPD) and customer satisfaction in the food restaurant context are strongly influenced by the marketing mix dimensions: product, price, distribution, and promotion. From the product perspective, key determinants include food taste, portion size, packaging aesthetics, and food safety. Price-related factors emphasize perceived value, affordability, and fairness relative to quality and quantity. Distribution factors highlight the importance of convenient location, pleasant environment, restaurant attractiveness, and internet accessibility. Promotion aspects focus on online advertising, regular promotional activities, and service experience delivery. Overall, these factors collectively shape customer requirements for new menu development and significantly influence satisfaction levels.

Case Study Questions

1. How do the four marketing mix elements (product, price, place, and promotion) influence new product development decisions in food restaurants?
2. Which specific attributes within the product perspective (e.g., taste, food safety, presentation) most significantly affect customer requirements for new menu development?
3. To what extent does perceived price fairness and value-for-money influence both new product adoption and customer satisfaction?
4. How does new product development mediate the relationship between marketing mix variables and customer satisfaction in the restaurant context?
5. What strategic recommendations can food entrepreneurs implement to enhance competitive advantage through effective new product development?

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Chapter Summary

Product development is a strategic, structured, and multidisciplinary process that transforms ideas, market needs, and technological opportunities into value-creating products or services through stages such as ideation, design, testing, and commercialization. It requires alignment between organizational strategy, capabilities, and operational processes, particularly in SMEs that face resource constraints. Contemporary perspectives emphasize that product development is not linear but systemic and collaborative, integrating internal functions and external actors (e.g., suppliers), as well as incorporating design management, supply chain considerations, and cross-functional coordination. Ultimately, effective product development enhances innovation performance, reduces uncertainty, and contributes to sustainable competitive advantage.

Product innovation refers to the development of new or improved offerings that create customer value, characterized by newness (novelty) and meaningfulness (usefulness), with the latter often more critical for market success. It is shaped by digital transformation, organizational capabilities, and competitive environments. Innovation types can be classified into incremental, radical, modular, architectural, and system innovations (product-focused), alongside modular and architectural process innovations (process-focused). Firms must align innovation strategies with contextual factors such as competition and appropriability mechanisms, selecting appropriate protection methods (e.g., patents vs. secrecy). Overall, product innovation is a multidimensional and context-dependent phenomenon requiring strategic alignment across technological, organizational, and market dimensions.

Service innovation involves the creation or improvement of service offerings, processes, or business models that generate value through resource integration, meaning creation, and ecosystem interactions. It is driven by leadership (e.g., CMO capabilities), organizational factors, and digitalization, with an optimal balance of expertise enhancing innovation outcomes. Unlike product innovation, service innovation emphasizes customer experience and perceived meaning, where value is co-created through interactions among multiple stakeholders, including customers and partners. Ecosystem

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dynamics such as coopetition, power structures, and social media engagement further shape innovation processes. Thus, service innovation is a systemic, participatory, and knowledge-driven process dependent on aligning organizational capabilities, digital tools, and stakeholder collaboration.

The New Product Development (NPD) process is a structured yet flexible and iterative system that transforms ideas into market-ready products through four key stages: strategic planning, conceptual design, engineering, and industrialization. Modern NPD moves beyond linear models toward cross-functional, portfolio-based, and agile approaches, integrating technological development, customer involvement, and strategic alignment. Customer co-creation, sustainability orientation, and digital tools (e.g., user-generated content analytics) play increasingly important roles in enhancing innovation outcomes. The effectiveness of NPD depends on the integration of processes, capabilities, and strategic direction, enabling firms to manage uncertainty, reduce time-to-market, and improve product success in dynamic environments.

Entrepreneurs act as key drivers of product development by identifying opportunities, mobilizing resources, and navigating uncertainty through iterative and market-oriented approaches. Their effectiveness is influenced by individual characteristics (e.g., age, experience), strategic orientation (entrepreneurial orientation), and cognitive traits such as empathy, which can both enhance and hinder decision-making. Entrepreneurial product development is typically adaptive, nonlinear, and experimentation-based, especially in high-uncertainty contexts like deep-tech innovation. Additionally, leadership capabilities (e.g., CEO human capital) and alignment between expertise and technological complexity are critical for transforming ideas into marketable products. Overall, entrepreneurs enable innovation by integrating creativity, strategy, and resource orchestration to achieve successful new product outcomes.

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Chapter Review Questions

Review Question 1:

Explain why product development should be considered a strategic, multidisciplinary, and system-level organizational capability rather than a purely technical process. In your answer, discuss the roles of design management, cross-functional integration, and supplier involvement in enhancing innovation performance.

Review Question 2:

Critically compare incremental, radical, modular, and architectural innovation in terms of their impact on product structure and organizational processes. How should firms align their innovation and protection strategies with different levels of innovation novelty?

Review Question 3:

Analyze how meaning creation, leadership (e.g., CMO role), and ecosystem interactions (e.g., coopetition) jointly influence service innovation outcomes. Why is service innovation considered a multidimensional and systemic phenomenon?

Review Question 4:

Evaluate the New Product Development (NPD) process as a structured yet iterative system. How do the four stages (strategic planning, conceptual design, engineering, and industrialization) integrate with customer involvement and agile approaches to improve product success?

Review Question 5:

Discuss the role of entrepreneurs as opportunity recognizers and resource orchestrators in product development. How do factors such as entrepreneurial orientation, empathy, and human capital influence new product development outcomes under conditions of uncertainty?

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Chapter Exercises

Exercise 1:

A Thai SME in the food processing industry aims to develop a new plant-based snack product. However, the firm faces constraints in budget, technical expertise, and supplier coordination.

1. Explain how product development should be conceptualized as a multidisciplinary and structured process.
2. Apply the Integrated Design Management (IDM) framework to propose how the firm can organize its development activities.
3. Analyze the role of the following dimensions in improving outcomes:
   - People
   - Process
   - Tools/Technology
   - Interaction (with suppliers)
4. Critically evaluate how early supply chain integration could reduce risks and improve product–market fit.

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Exercise 2:

Consider the following product innovation scenarios:

- (A) A smartphone company improves battery life by 10%
- (B) A firm introduces the first foldable smartphone
- (C) A car manufacturer redesigns how components interact without changing parts
- (D) A company upgrades a single component (camera module) without changing the system
- (E) A smart home ecosystem integrating multiple devices into one platform

1. Classify each scenario according to innovation types:
   - Incremental
   - Radical
   - Modular
   - Architectural
   - System innovation
2. Explain your reasoning using newness vs. meaningfulness concepts.

3. Discuss how digital transformation capability enhances both novelty and meaningfulness.
4. Evaluate which innovation type is most appropriate in high-competition informal markets and justify your answer.

Exercise 3:

A healthcare startup is developing a telemedicine platform targeting rural populations.

1. Explain how service innovation differs from product innovation in this context.
2. Analyze the role of meaning creation in shaping user adoption of the service.
3. Evaluate how digitalization capability supports:
   - Knowledge acquisition
   - Knowledge integration
4. Discuss how ecosystem actors (e.g., doctors, patients, influencers, platforms) contribute to value co-creation.
5. Critically assess the role of leadership (e.g., CMO experience) in driving service innovation.

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Exercise 4:

A technology company is developing a new wearable health device.

1. Map the development process using the four stages of new product development:
   - Strategic Planning
   - Conceptual Design
   - Engineering
   - Industrialization
2. Identify key decisions and risks in each stage.
3. Explain why NPD should be considered iterative rather than linear.
4. Propose how the firm can integrate:
   - Customer co-creation
   - User-generated content (UGC)

5. Evaluate the role of portfolio-based NPD vs. single-process approaches.

Exercise 5:

Entrepreneurs often outperform large firms in developing innovative products despite limited resources.

1. Explain how entrepreneurs contribute to product development through:
   - Opportunity recognition
   - Resource orchestration
   - Iterative development
2. Compare the "advantage of youth" vs. "business acumen" perspectives.
3. Analyze the role of entrepreneurial orientation (EO) in driving innovation.
4. Discuss the double-edged role of entrepreneurial empathy in NPD.
5. Apply these concepts to a real or hypothetical startup and evaluate its likelihood of success.

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References

Bendig, D., Schäper, T., Mantke, L., & Schauerte, N. (2026). Specialist, Generalist, or Both? How Chief Marketing Officers' Career Experiences Shape the Pace of Service Innovation. *Journal of Service Research*. https://doi.org/10.1177/10946705251386793

Cao, G., Duan, Y., & Edwards, J. S. (2025). Organizational culture, digital transformation, and product innovation. *Information & Management, 62*(4), 104135. https://doi.org/10.1016/j.im.2025.104135

Carneiro, V., Rocha, A. B. D., Alves, J. L., & Rangel, B. (2025). A Design Management Model for Product Development in SMEs: The Integrated Design Management (IDM) model. *Journal of Innovation Management, 13*(2), 70-114. https://doi.org/10.24840/2183-0606_013.002_0004

Ferreras-Méndez, G., Olmos-Peñuela, J., Salas-Vallina, A., & Alegre-Vidal, J. (2021). Entrepreneurial orientation and new product development performance in SMEs: The mediating role of business model innovation. *Technovation*, 108, 102325

Flankegård, F., Granlund, A., & Johansson, G. (2021). Supplier involvement in product development: Challenges and mitigating mechanisms from a supplier perspective. *Journal of Engineering and Technology Management, 60*, 101628. https://doi.org/10.1016/j.jengtecman.2021.101628

Gonçalves, A., Cardeal, G., Ribeiro, I., & Henriques, E. (2026). Absolute sustainability in product design and development: A holistic framework integrating environmental, social, economic and functional performance. *Environmental Impact Assessment Review*, 118, 108310. https://doi.org/ 10.1016/j.eiar.2025.108310

Grilli, L. (2022). Entrepreneurship and new product development: Exploring the "advantage of youth" and "business acumen" views. *Journal of*

Library and Learning, University of Phayao

Product Innovation Management, 39(5), 662-685. https://doi.org/10.1111/jpim.12625

Iheanachor, N., Umukoro, I. O., & David-West, O. (2021). The role of product development practices on new product performance: Evidence from Nigeria's financial services providers. *Technological Forecasting and Social Change, 164*, 120470. https://doi.org/10.1016/j.techfore.2020.120470

Jermsittiparsert, K. (2021). The role of supply chain and product development in sustainable performance, goodwill and firm popularity. *Uncertain Supply Chain Management, 9*(4), 877-886. https://doi.org/10.5267/j.uscm.2021.8.001

Jordanow, S. (2026). If You Want Help, You'd Better Be Green! Investigating the Effects of Sustainability Perceptions on Customer Co-Creation in New Product Development. *Journal of Product Innovation Management*. https://doi.org/10.1111/jpim.70019

Kim, J. (2022). Which is the most effective innovation protection method for different types of product innovation?Evidence from South Korean manufacturing firms. *Applied Economics Letters, 29*(7), 665-668. https://doi.org/10.1080/13504851.2021.1922583

Knudsen, M. P., von Zedtwitz, M., Griffin, A., & Barczak, G. (2023). Best practices in new product development and innovation: Results from PDMA's 2021 global survey. *Journal of Product Innovation Management, 40*(3), 257-275. https://doi.org/10.1111/jpim.12663

Kruachottikul, P., Dumrongvute, P., Tea-makorn, P., Kittikowit, S., & Amrapala, A. (2023). New product development process and case studies for deep-tech academic research to commercialization. *Journal of Innovation and Entrepreneurship, 12*(1), Article 48. https://doi.org/10.1186/s13731-023-00311-1

Kurnia, D., Mulyadi, H., Hendrayati, H., & Denan, Z. (2023). When does entrepreneurial bricolage mediate the effect of entrepreneurial orientation on new product development? The role of environmental

Library and learning, University of Phayao

dynamism as moderator. *Entrepreneurial Business and Economics Review, 11*(2), 103-119. https://doi.org/10.15678/EBER.2023.110205

Kurz, K., Bock, C., & Hanschur, L. (2024). Flip the tweet – the two-sided coin of entrepreneurial empathy and its ambiguous influence on new product development. *Journal of Business Venturing, 39*(2), 106378. https://doi.org/10.1016/j.jbusvent.2023.106378

Kustrak Korper, A., Holmlid, S., & Patrício, L. (2021). The role of meaning in service innovation: a conceptual exploration. *Journal of Service Theory and Practice, 32*(2), 179-198. https://doi.org/10.1108/jstp-01-2020-0004

Liu, G., Aroean, L., & Ko, W. W. (2023). Service innovation in business ecosystem: The roles of shared goals, coopetition, and interfirm power. *International Journal of Production Economics, 255*, 108709. https://doi.org/10.1016/j.ijpe.2022.108709

Maier, L., & Baccarella, C. V. (2025). The psychological and behavioral consequences of customer empowerment in new product development: Situational framework, review, and research agenda. *Journal of Product Innovation Management, 42*(1), 220-252. https://doi.org/10.1111/jpim.12734

Nasirov, S., Li, Q. C., & Kor, Y. Y. (2021). Converting technological inventions into new products: The role of CEO human capital. *Journal of Product Innovation Management, 38*(5), 522-547. https://doi.org/10.1111/jpim.12601

Nasrabadi, M. A., Beauregard, Y., & Ekhlassi, A. (2024). The implication of user-generated content in new product development process: A systematic literature review and future research agenda. *Technological Forecasting and Social Change, 206*, 123551. https://doi.org/10.1016/j.techfore.2024.123551

Omari, D., Serwaah, P., Adomako, S., & Amankwah-Amoah, J. (2025). R&D Support, Digital Entrepreneurship, and Product Innovation. *R&D Management, 55*(5), 1582-1594. https://doi.org/10.1111/radm.12770

Library and Learning, University of Phayao

Pan, R., & Yang, Z. (2026). Synergistic effect between product innovation and service innovation on firm performance in the digital era. *Journal of Manufacturing Technology Management*. InPress. https://doi.org/10.1108/JMTM-05-2025-0411

Reitsma, E., Hilletofth, P., & Johansson, E. (2023). Supply chain design during product development: a systematic literature review. *Production Planning & Control, 34*(1), 1-18. https://doi.org/10.1080/09537287.2021.1884763

Schmallenbach, L., & Hoisl, K. (2026). Value creation, value capture, and economic growth: Revisiting the innovation–economic growth relationship and implications for sustainable technologies and AI. *Technological Forecasting and Social Change*, 233, 124843. https://doi.org/ 10.1016/j.techfore.2026.124843

Sezegen, A., & Edis, E. (2020). Product innovation types: a discussion considering building facade products. *Engineering, Construction and Architectural Management, 27*(9), 2379-2408. https://doi.org/10.1108/ecam-10-2018-0454

Smania, G. S., & de Sousa Mendes, G. H. (2021). A conceptual framework for integrating the critical success factors to service innovation. *Gestao e Producao, 28*(3), Article e0026. https://doi.org/10.1590/1806-9649-2021v28e26

Stojčić, N., Dabić, M., & Kraus, S. (2024). Customisation and co-creation revisited: Do user types and engagement strategies matter for product innovation success? *Technovation*, 134, 103-145. https://doi.org/10.1016/j.technovation.2024.103045

Suvittawat, A., Maneenuam, T., & Bunliang, T. (2019). New product development for food restaurant: Competitive advantage for food entrepreneurs. *Journal of Environmental Treatment Techniques, 7*(4), 780-784. https://www.scopus.com/inward/record.uri?eid=2-s2.0-85075798667&partnerID=40&md5=c2b01b2b7c3f84b3a3230d0ce461a1de

Library and Learning University of Phayao

Tang, J., Liu, A., Gu, J., & Liu, H. (2024). Can CEO environmental awareness promote new product development performance? Empirical research on Chinese manufacturing firms. *Business Strategy and the Environment, 33*(2), 985-1003. https://doi.org/10.1002/bse.3527

Tiedemann, F., Johansson, E., & Gosling, J. (2020). Structuring a new product development process portfolio using decoupling thinking. *Production Planning & Control, 31*(1), 38-59. https://doi.org/10.1080/09537287.2019.1629037

Wang, K., & Wang, T. (2024). Competition from informal firms and new-to-market product innovation: A competitive rivalry framework. *Journal of Product Innovation Management, 41*(4), 816-842. https://doi.org/10.1111/jpim.12712

Wu, Y., Nambisan, S., Xiao, J., & Xie, K. (2022). Consumer resource integration and service innovation in social commerce: the role of social media influencers. *Journal of the Academy of Marketing Science, 50*(3), 429-459. https://doi.org/10.1007/s11747-022-00837-y

Zhang, H., He, J., & Zhong, Z. (2024). The Optimization of Automobile Part Product Development Using Integrated Product Development (IPD). *Information Resources Management Journal, 37*(1). https://doi.org/10.4018/IRMJ.338392

Zhu, Q., Chen, J., Yang, H., & Cao, M. (2025). Digitalization Capability and Service Innovation From the Knowledge-Based View. *Journal of Global Information Management, 33*(1). https://doi.org/10.4018/JGIM.393093

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Chapter 7: Strategic Innovation Operations Management for Competitive Advantage and Sustainability

Course Learning Outcomes (CLO):

1. Analyze the role of operations management in transforming inputs into value-added outputs in modern organizations.
2. Evaluate the key stages of the operations management process and their contribution to efficiency and value creation.
3. Examine the relationship between operations management and innovation in enhancing organizational performance.
4. Assess the impact of technological and process innovations on operations management.
5. Apply operations management principles in entrepreneurial contexts to support decision-making and growth.

Contents and Concepts of This Chapter:

7.1 Introduction to Operations Management

7.2 The Operations Management Process

7.3 Operations Management and Innovation

7.4 Innovations in Operations Management

7.5 Entrepreneurs and Operations Management

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7.1 Introduction to Operations Management

Operations management refers to the systematic design, planning, execution, control, and continuous improvement of organizational processes that transform inputs such as raw materials, labor, capital, information, and technology into value-added goods and services. It is a core organizational function that ensures the efficient and effective conversion of resources into outputs that meet customer requirements and strategic objectives.

From a broader perspective, operations management can be conceptualized as an integrative and data-driven discipline encompassing planning, sourcing, production, delivery, and return processes, often structured through frameworks such as the Supply Chain Operations Reference (SCOR) model. In contemporary contexts, particularly within Industry 4.0, operations management is increasingly augmented by artificial intelligence (AI), which enhances decision-making, process efficiency, and system responsiveness across interconnected activities. AI applications ranging from demand forecasting and inventory optimization to supplier selection, predictive maintenance, and logistics optimization enable organizations to reduce operational costs and lead times while improving service levels, quality, safety, and sustainability. These capabilities are driven by AI's ability to process large volumes of historical and real-time data, identify complex patterns, and automate both routine and strategic decisions. However, despite its transformative potential, AI adoption remains constrained by challenges related to data quality, skill shortages, high investment costs, and uncertain economic returns, which limit its widespread integration into operational systems (Cannas et al., 2024).

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Beyond traditional process coordination, operations management has evolved into an intelligent, data-driven, and highly integrated system that manages the end-to-end flow of materials, information, and decisions across the supply chain. It involves synchronizing production, logistics, and distribution activities to meet customer demand while enhancing responsiveness, visibility, and overall system efficiency. This evolution is largely driven by digitalization and the adoption of AI technologies, which enable real-time data processing, autonomous decision-making, and adaptive learning systems. As a result, operations are transitioning from static, rule-based processes to dynamic, predictive, and adaptive systems capable of

addressing complex and uncertain environments. Furthermore, the integration of advanced technological infrastructures such as cloud computing, Internet of Things (IoT), and machine learning facilitates improved planning, scheduling, forecasting, and quality control. Consequently, operations management plays a strategic role in enhancing process automation, decision accuracy, and continuous improvement across supply chain networks (Helo & Hao, 2022).

Within the domain of supply chain and operations management (SCOM), operations management is increasingly viewed as a capability-driven discipline shaped by the integration of artificial intelligence and generative AI. Rather than focusing solely on efficiency and resource utilization, contemporary approaches emphasize the development and deployment of organizational capabilities such as learning, perception, prediction, interaction, adaptation, and reasoning to support decision-making across key operational functions, including demand forecasting, inventory management, production planning, and risk management. Grounded in the resource-based view (RBV), these AI-enabled capabilities are considered strategic assets that can generate sustained competitive advantage when effectively embedded in operational processes. In addition, generative AI extends traditional AI by enabling advanced functionalities such as content generation and scenario simulation, thereby enhancing organizational capacity to optimize processes, improve resilience, and manage uncertainty. As a result, operations management is evolving into an adaptive system in which human and AI capabilities are increasingly integrated to drive efficiency, innovation, and strategic agility (Jackson et al., 2024).

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Moreover, operations management extends beyond process optimization to emphasize the strategic integration of operations and project management, particularly in large-scale and complex system development. In this context, operations management is conceptualized as a system-oriented function focused on resource utilization, process efficiency (e.g., Lean practices and continuous improvement), and performance optimization, which must be aligned with project management activities such as planning, execution, and monitoring. This integration is facilitated by key enablers, including agile methodologies, cross-functional collaboration, and coordinated decision-making structures, forming a unified framework that

links operational processes with project objectives. Such alignment enhances operational performance by reducing lead times, minimizing rework, improving resource utilization, and strengthening schedule adherence, while also increasing organizational responsiveness and adaptability. Consequently, the integration of project and operations management generates synergistic effects, enabling continuous learning, faster decision-making, and improved coordination, thereby reinforcing the strategic role of operations management in achieving efficiency, flexibility, and competitive advantage (Satish et al., 2025).

Finally, sustainable operations management represents an important extension of the field, integrating environmental and social considerations into the design, execution, and improvement of operational systems. Rather than constituting a single unified framework, it encompasses multiple interrelated research streams, including closed-loop supply chains (e.g., product returns, remanufacturing, and recycling), low-carbon operations (e.g., emissions reduction, energy efficiency, and renewable energy integration), environmental performance management (e.g., pollution control and eco-labeling), sustainable innovation (e.g., clean technologies and business model redesign), and social responsibility (e.g., responsible sourcing and inclusive supply chains). These streams reflect evolving business and policy priorities, highlighting the interdisciplinary nature of sustainable operations management and its responsiveness to global challenges such as climate change, resource scarcity, and social inequality. As such, it extends the scope of operations management beyond efficiency and profitability toward broader societal and ecological impact (Atasu et al., 2020).

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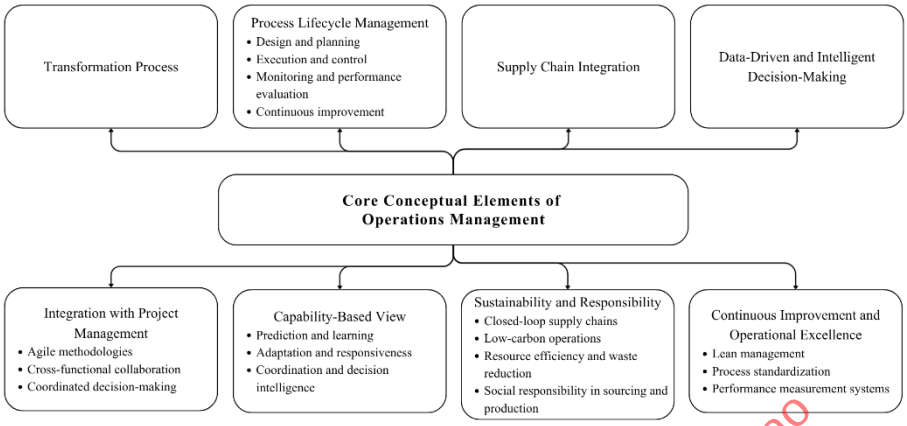

Figure 7.1 Core Conceptual Elements of Operations Management

Source: Adapted from Keller, M., & Viaene, S. (2026). From a literature review to a conceptual framework for organisations and management transitioning towards I5.0. *International Journal of Organizational Analysis*, InPress.

Figure 7.1 presents the core conceptual elements of operations management as an integrated and multi-dimensional framework centered on the transformation process, where inputs are converted into value-added outputs. This process is supported by process lifecycle management, which encompasses design and planning, execution and control, monitoring and performance evaluation, and continuous improvement. The framework further emphasizes supply chain integration and data-driven, intelligent decision-making to enhance coordination, visibility, and responsiveness across operations. Additionally, operations management is closely aligned with project management through agile methodologies, cross-functional collaboration, and coordinated decision-making. A capability-based view highlights the importance of organizational learning, adaptability, and decision intelligence, while sustainability and responsibility focus on closed-loop systems, low-carbon operations, resource efficiency, and ethical sourcing. Finally, continuous improvement and operational excellence are reinforced through lean management, process standardization, and

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performance measurement systems, collectively ensuring efficiency, innovation, and long-term competitiveness.

In conclusion, operations management has evolved from a traditionally efficiency-oriented function into a strategic, data-driven, and capability-based discipline that integrates advanced technologies, cross-functional coordination, and sustainability considerations. Its transformation is largely driven by digitalization and artificial intelligence, which enable adaptive, predictive, and intelligent operational systems. As organizations operate in increasingly complex and dynamic environments, operations management plays a critical role in enhancing organizational performance, resilience, and long-term competitive advantage.

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7.2 The Operations Management Process

The operations management process encompasses the systematic design, execution, monitoring, and continuous improvement of organizational activities that transform inputs into value-added outputs. In contemporary contexts, this process increasingly integrates digital technologies, sustainability principles, and data-driven decision-making to enhance efficiency and long-term value creation.

According to Das et al. (2025), the operations management process consists of seven interconnected lifecycle stages: product development, procurement, inbound logistics, and upstream supply chain, production, distribution, outbound logistics, and downstream supply chain, maintenance, technical assistance, and repair, reverse logistics, and end-of-life treatment and processing, as illustrated in Figure 7.2. These stages collectively form a comprehensive system that integrates both forward and reverse flows, enabling organizations to manage resources efficiently while supporting circular economy principles and environmental sustainability.

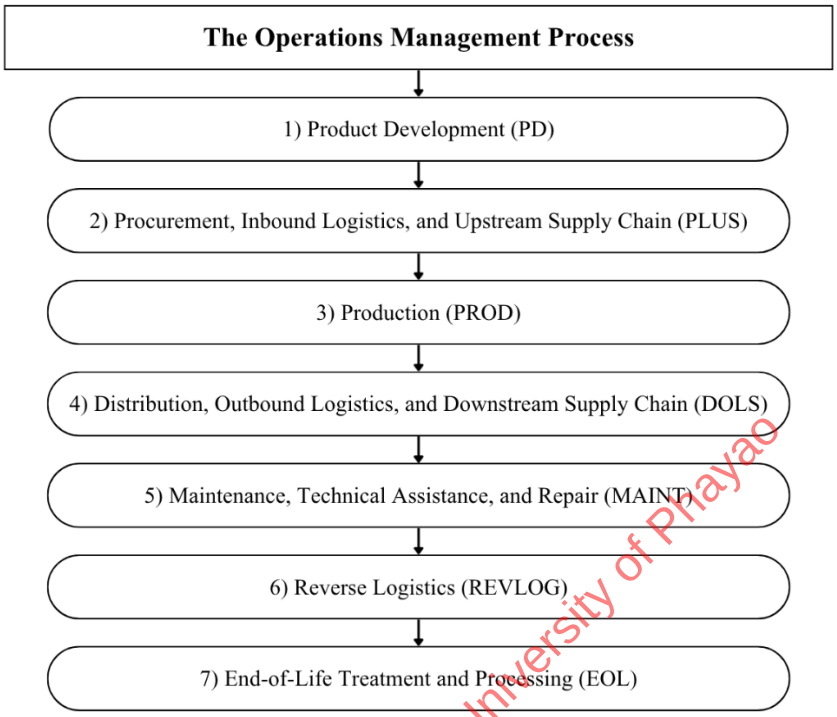

Figure 7.2 The Operations Management Process

Source: Adapted from Angelopoulos, S. et al. (2023). Digital transformation in operations management: Fundamental change through agency reversal. *Journal of Operations Management*, 69(6), 876–889.

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This process can be structured into seven key stages:

1. Product Development (PD) focuses on designing products that align with customer needs and sustainability objectives. It incorporates eco-design, modularity, and lifecycle thinking, which are critical for enabling downstream efficiency and circularity.
2. Procurement, Inbound Logistics, and Upstream Supply Chain (PLUS) involves sourcing raw materials, coordinating with suppliers, and managing inbound logistics. This stage emphasizes supplier integration, inventory control, and material traceability, increasingly supported by digital technologies to enhance transparency and operational efficiency.
3. Production (PROD) represents the core transformation stage in which inputs are converted into finished goods. It includes

manufacturing operations, process optimization, and quality control, and is often highlighted in the literature due to its direct impact on operational efficiency and environmental performance.

4. Distribution, Outbound Logistics, and Downstream Supply Chain (DOLS) encompasses product distribution to customers, including warehousing, transportation, and delivery coordination. The primary focus is on optimizing logistics networks and improving service responsiveness.
5. Maintenance, Technical Assistance, and Repair (MAINT) includes after-sales services such as maintenance, repair, and technical support. This stage extends product lifespan, enhances customer value, and contributes to sustainability through lifecycle extension.
6. Reverse Logistics (REVLOG) manages the return of products from customers for reuse, refurbishment, recycling, or disposal. It involves coordinating reverse flows and multiple stakeholders, playing a critical role in enabling circular economy practices.
7. End-of-Life Treatment and Processing (EOL) represents the final stage, involving recycling, remanufacturing, or disposal of products and materials. It focuses on value recovery and minimizing environmental impact, thereby supporting closed-loop systems.

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From a process perspective, operations management can also be conceptualized as a structured sequence of interrelated phases, including planning, design, execution, monitoring, and continuous improvement. Planning and design ensure alignment between operational resources, system architecture, and strategic objectives, while execution focuses on the efficient transformation of inputs into outputs. Monitoring and control mechanisms particularly those enabled by intelligent technologies allow organizations to track performance, identify deviations, and implement timely corrective actions.

In this context, intelligent monitoring systems play a crucial role by enabling real-time data acquisition, system status tracking, and automated fault diagnosis. For instance, multisensor-based operation and maintenance systems integrate environmental and equipment data through distributed sensing and networked platforms, facilitating real-time monitoring, anomaly detection, and operational supervision. These capabilities enhance

management efficiency and reduce reliance on manual processes while improving maintenance effectiveness through data-driven insights (Lei, 2022).

Furthermore, digital twin technology represents a significant advancement in operations management by creating dynamic, data-driven connections between physical systems and their virtual counterparts. Unlike static models, digital twins enable real-time simulation, analysis, and optimization of operational processes. In complex systems, such as large-scale infrastructure, digital twin–based platforms support data integration, improve decision-making, and enable proactive maintenance. This enhances system coordination, operational resilience, and the ability to anticipate and mitigate potential failures (Wang et al., 2024).

In manufacturing contexts, lean management principles further strengthen operations management by emphasizing waste reduction, process optimization, and value creation. Lean practices align production with customer demand through precise, just-in-time operations, while reducing material waste and improving product quality. Additionally, lean management promotes continuous improvement, standardized workflows, and data-driven decision-making, fostering a culture of efficiency, employee involvement, and ongoing process enhancement (Ge, 2023).

Moreover, a holistic and systemic framework for manufacturing operations management highlights the importance of aligning technological implementation with organizational and strategic objectives. This framework emphasizes structured collaboration between technology providers and manufacturing firms, multi-level engagement processes, and the integration of decision-making mechanisms across the production lifecycle. It moves beyond purely technological considerations by underscoring the roles of communication, organizational alignment, and consultative processes in achieving operational excellence (van der Walt et al., 2020).

Operations management is not limited to manufacturing but is equally critical in service-oriented contexts, particularly in the public sector. In municipal environments, it involves transforming resources, infrastructure, and human capital into services that meet required quality and performance standards. This includes core managerial functions such as planning,

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organizing, controlling, and continuous improvement. Well-structured operational systems supported by clear strategies, standardized procedures, effective resource allocation, and performance monitoring enable consistent and reliable service delivery. These principles are essential for managing public services such as water supply, sanitation, healthcare, and infrastructure, demonstrating the broad applicability of operations management across both manufacturing and service sectors (Potlaki & Naidoo, 2024).

In conclusion, the operations management process represents a holistic, lifecycle-oriented system that integrates forward and reverse activities, supported by digital technologies and sustainability principles. By combining structured process stages, intelligent monitoring systems, advanced digital tools such as digital twins, and management approaches such as lean and manufacturing operations management frameworks, organizations can enhance operational efficiency, resilience, and value creation across both manufacturing and service contexts.

While the operations management process provides the structural backbone for value creation (Section 7.2), innovation acts as a dynamic capability that transforms and reconfigures these processes (Section 7.3).

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7.3 Operations Management and Innovation

Operations management and innovation are deeply interconnected, with their mutual reinforcement enhancing organizational competitiveness, resilience, and long-term value creation. Innovation within operations is no longer confined to incremental efficiency improvements; rather, it encompasses broader strategic transformation driven by digitalization, human-centricity, and sustainability considerations.

From the perspective of Industry 5.0, operations management and innovation represent a systemic transformation that extends beyond technological advancement to include business model innovation, human-centered design, and the integration of sustainability principles. In contrast to Industry 4.0, which primarily emphasizes automation and efficiency, Industry 5.0 redefines operations management as a multidimensional discipline aligned with broader societal objectives, including resilience, environmental

sustainability, and human well-being. This shift necessitates the redesign of operations strategies, value chains, and supply chain configurations to support circular economy principles, stakeholder integration, and long-term value creation. Furthermore, innovation in this context involves not only technological adoption but also the co-evolution of human capabilities and intelligent systems, particularly through human–robot collaboration and knowledge-intensive processes. Consequently, organizations must develop new competencies, enhance organizational agility, and integrate digital technologies with human-centric approaches to improve both productivity and employee well-being (Borchardt et al., 2022).

In parallel, operations management and innovation are increasingly linked to diversity, equity, and inclusion (DEI), where innovation extends beyond technological advancements to encompass systemic and organizational transformation. Operations management plays a critical role in operationalizing inclusive innovation by designing processes, systems, and supply chains that incorporate diverse perspectives and address the needs of marginalized populations. Innovation within this domain spans workforce design, supply chain configuration, healthcare delivery, and digital platforms, where inclusive practices can enhance adaptability, resilience, and overall performance. However, emerging technologies such as artificial intelligence and data-driven systems may either support or hinder DEI outcomes, depending on their design and implementation particularly when biases embedded in data or algorithms remain unaddressed. Inclusive innovation therefore requires rethinking products, services, business models, and supply chain structures to expand access and equity. As such, operations management-driven innovation must balance efficiency with fairness by integrating DEI considerations into process design, performance metrics, and strategic decision-making to enable sustainable and socially responsible value creation (Corbett et al., 2025).

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Moreover, innovation can be conceptualized as a process-oriented activity involving the systematic identification of needs, the development of novel solutions, and alignment with market or societal demands. Within this framework, operations management provides essential analytical tools and methodologies for structuring, optimizing, and improving innovation processes, particularly in new product and service development. Historically,

the field has approached innovation through a process lens, emphasizing product design, development workflows, resource allocation, and project execution. This perspective positions innovation as an operational capability rather than solely a strategic or creative function. Although prior research has advanced understanding across areas such as competitive positioning, design–market alignment, intra-project resource allocation, contractual coordination, and performance evaluation, it has often remained narrowly focused on product development and design optimization. This suggests the need for broader engagement with emerging domains, including service innovation, business model innovation, and entrepreneurial contexts. Overall, integrating innovation into operations management is essential, as innovation processes are inherently operational, and firm performance increasingly depends on the joint optimization of product development and operational execution (Kavadias & Ulrich, 2020).

In addition, the integration of advanced digital technologies particularly cloud computing and the Internet of Things (IoT) is reshaping the relationship between operations management and innovation by enabling data-driven and intelligent production systems. Contemporary operations management extends beyond traditional process optimization to incorporate real-time data acquisition, predictive analytics, and secure information infrastructures. Through edge–cloud collaborative architectures, operational processes are enhanced by distributing computational functions across layers: edge computing enables real-time processing at the production level, while cloud computing supports large-scale storage, advanced analytics, and forecasting. These capabilities improve production efficiency, optimize resource utilization, and strengthen decision-making through techniques such as ARIMA-based forecasting and machine learning algorithms for fault detection. Furthermore, innovation is reinforced by robust data governance mechanisms including encryption protocols, blockchain-enabled traceability, and access control systems which ensure data security and system reliability. Such digitally integrated systems reduce latency, enhance predictive accuracy, and support adaptive, intelligent production environments, thereby positioning innovation as a central driver of operational performance and sustainable competitiveness (Luo & Li, 2025).

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Finally, operations management and innovation should not be viewed as conflicting domains but as complementary capabilities that jointly influence firm performance, particularly in the context of R&D investments. The financial returns of R&D are highly contingent upon operational capabilities, including quality management and process efficiency. While traditional perspectives often highlight a trade-off between process discipline and exploratory innovation, structured operational routines such as quality control systems and efficiency-oriented practices can enhance innovation outcomes. Specifically, process reliability and efficiency enable firms to more effectively translate technological advancements into marketable products, improve delivery performance, and reduce the risk of failure. These complementarities are particularly pronounced in complex operational environments, where strong operations management capabilities function as dynamic enablers that amplify the value creation potential of innovation investments (Yiu et al., 2020).

As illustrated in Figure 7.3, operations management and innovation are conceptualized as an integrative and multidimensional system in which strategic, technological, human-centric, and sustainability-oriented elements are interconnected. At the core, the integration of operations and innovation enables organizations to align process efficiency with value creation and competitive strategy. This integration is further reinforced by Industry 5.0 principles, emphasizing human-centric design, sustainability, and system resilience, alongside digitalization and intelligent operations that leverage advanced technologies and data-driven decision-making. Additionally, the framework highlights a process-oriented view of innovation, ensuring continuous improvement across operational workflows, while promoting inclusive and ethical innovation through diversity, equity, and inclusion (DEI). Ultimately, these dimensions collectively contribute to sustainability and long-term value creation, positioning operations management not only as a functional discipline but as a strategic driver of innovation and organizational transformation.

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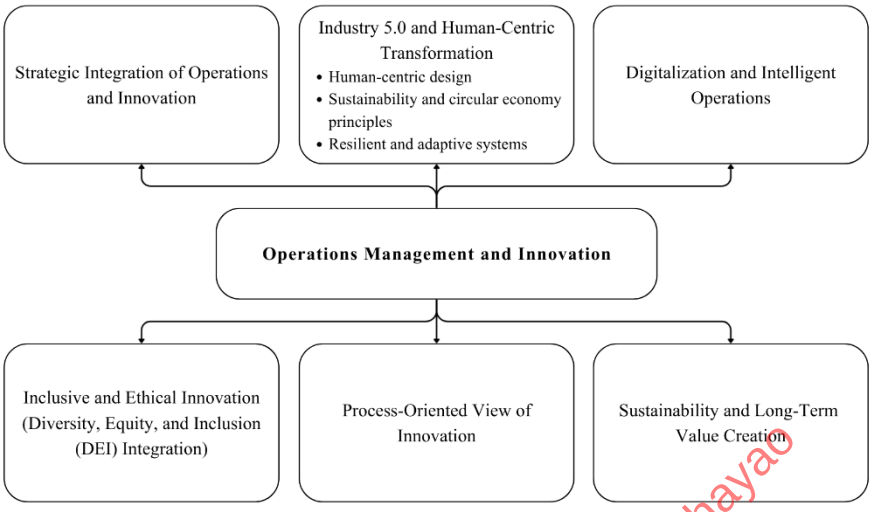

Figure 7.3 Operations Management and Innovation

Source: Adapted from Garrido, S., Muniz Jr, J., & Ribeiro, V. (2024). Operations Management, Sustainability & Industry 5.0: A critical analysis and future agenda. *Cleaner Logistics and Supply Chain*, 10, 100141.

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A critical examination of AI integration in operations reveals several structural limitations and strategic tensions. Despite its capacity to enhance predictive accuracy and process efficiency, AI systems are inherently constrained by data bias, high implementation and maintenance costs, and the risk of over-automation, which can diminish adaptability in dynamic environments. These limitations generate fundamental trade-offs, particularly between efficiency and flexibility, where highly optimized, algorithm-driven processes may lack responsiveness to unforeseen disruptions, and between automation and human-centricity, as emphasized in Industry 5.0, which advocates for balancing technological advancement with human judgment and creativity. Moreover, organizations face systemic risks such as digital dependency, where excessive reliance on AI infrastructures reduces resilience and increases vulnerability to system failures, and the sustainability paradox, wherein the environmental costs of large-scale digitalization may offset operational gains. For instance, although AI enhances decision accuracy, excessive reliance may reduce organizational learning and human judgment,

ultimately constraining long-term capability development and strategic agility.

In conclusion, operations management and innovation are fundamentally interdependent, with their integration serving as a critical foundation for achieving sustainable competitive advantage. As organizations navigate increasingly complex, digital, and socially oriented environments, the alignment of operational excellence with innovative capabilities encompassing technological, organizational, and human dimensions becomes essential for delivering resilient, inclusive, and long-term value creation.

7.4 Innovations in Operations Management

Innovations in operations management have evolved significantly in response to technological advancements, globalization, and increasing environmental uncertainty, fundamentally reshaping both strategic and operational decision-making processes. Traditionally centered on efficiency and cost reduction, operations management has expanded toward a more strategic role that emphasizes value creation through innovation, digital transformation, and cross-functional integration.

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A unified innovation-operations ecosystem model conceptualizes innovation as a dynamic, embedded flow across interconnected operational stages typically spanning input acquisition, process transformation, output delivery, and post-market learning rather than as a discrete, upstream activity. Innovation originates from opportunity recognition and knowledge recombination, then diffuses through operations via process redesign, technology adoption, and value chain reconfiguration, ultimately materializing in enhanced products, services, or delivery mechanisms. Entrepreneurs act as catalytic agents who activate operational innovation by orchestrating resources, leveraging market intelligence, and embedding adaptive capabilities (e.g., agility, flexibility, and customer-centric iteration) within operational routines, thereby aligning innovation with execution. Crucially, the model is sustained by multi-directional feedback loops: real-time operational data, customer insights, and performance metrics continuously feed back into innovation processes, enabling iterative refinement, rapid experimentation, and strategic recalibration. This recursive

interaction transforms operations from a passive execution system into an active innovation engine, reinforcing organizational learning, resilience, and sustained competitive advantage.

Contemporary innovations in operations management are driven by the need to generate research and practices that are both meaningful and impactful, rather than narrowly optimized within isolated domains. This evolution reflects a shift away from highly specific, context-bound models toward more generalizable insights that address real-world complexity and emerging societal challenges. The field is increasingly extending into new domains such as digital platforms, data-intensive environments, and innovative business models, while incorporating interdisciplinary perspectives to mitigate fragmentation. Impactful innovation arises when operations management moves beyond traditional efficiency-focused paradigms such as inventory optimization toward addressing broader issues related to scalability, societal relevance, and cross-functional coordination. Furthermore, the growing reliance on big data, real-time decision-making, and novel organizational forms necessitates new analytical approaches and methodological flexibility (Cachon et al., 2020).

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In parallel, technological advancements particularly in artificial intelligence (AI), machine learning (ML), and digital systems are transforming operational processes across industries. These technologies enable real-time data acquisition, predictive analytics, and automated decision-making throughout supply chains. For example, in healthcare, AI enhances operational efficiency through applications such as diagnostic prediction, patient scheduling, and personalized treatment planning. In manufacturing, Industry 4.0 technologies including digital twins, the Internet of Things (IoT), and autonomous systems facilitate predictive maintenance, process optimization, and cost reduction. In retail, AI-driven systems improve demand forecasting, inventory management, and last-mile delivery through advanced routing and scheduling algorithms. While these innovations enhance productivity, responsiveness, and customization, they also introduce challenges related to data privacy, algorithmic bias, workforce displacement, and system integration. Addressing these challenges requires robust data governance, interdisciplinary collaboration, and adaptive organizational capabilities (Dogru & Keskin, 2020).

From a supply chain perspective, innovations in operations management involve the integration of advanced technologies with redesigned processes to improve both operational efficiency and service effectiveness. These innovations encompass technology-driven advancements such as real-time information systems, tracking technologies, and digital infrastructure as well as process-oriented improvements, including workflow optimization, logistics reconfiguration, and the development of adaptive operational routines. Such transformations enhance information processing capabilities, increase operational visibility, and support more accurate planning, coordination, and control in complex environments. Additionally, process innovations contribute to continuous improvement by enhancing service quality and reducing costs through more efficient organizational practices (Kwak et al., 2018).

Another important dimension of innovation lies in the integration of operations and financial decision-making, particularly within the operations–finance interface under conditions of uncertainty. Rather than treating these functions independently, contemporary approaches emphasize the joint optimization of material, information, and financial flows. This includes aligning operational strategies such as capacity flexibility, sourcing, and inventory management with financial instruments such as hedging, trade credit, and supply chain finance. Such integration enables more effective risk management and strengthens cross-functional coordination, reflecting how operations management evolves in increasingly complex and uncertain environments (Wang et al., 2021).

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Moreover, innovation in operations management increasingly reflects a paradigm shift toward addressing large-scale societal challenges, particularly sustainability. The field possesses unique capabilities to contribute to global issues such as those outlined in the United Nations Sustainable Development Goals through efficient resource allocation and system design. However, achieving this potential requires expanding disciplinary boundaries, developing context-sensitive knowledge, integrating multidisciplinary perspectives, and prioritizing real-world impact. Innovation, therefore, extends beyond methodological advancements to include redefining research priorities, engaging with complex environments (e.g.,

humanitarian operations and sustainable supply chains), and translating theoretical insights into practical solutions (Van Wassenhove, 2019).

Finally, recent developments highlight the growing importance of strategic foresight, knowledge management, and open innovation as key drivers of operational innovation and organizational performance. Contemporary operations management increasingly emphasizes the integration of internal and external knowledge through systematic processes of knowledge exploration and exploitation. Open innovation enables firms to collaborate with external stakeholders including partners, customers, and research institutions to access diverse capabilities and resources. At the same time, strategic foresight functions as a dynamic capability that allows organizations to anticipate future trends, align operations with emerging opportunities, and proactively respond to uncertainty. This integrated, knowledge-driven approach underscores a shift toward more collaborative and forward-looking operations systems, where effective knowledge orchestration is essential for innovation and performance in dynamic environments (Mubarak et al., 2025).

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As illustrated in Figure 7.4, innovations in operations management are conceptualized as a multidimensional and integrative framework that encompasses five key domains: technology, processes, strategy, integration, and sustainability. At the core, innovations in operations management are driven by technology (digitalization), which enables automation, data analytics, and real-time decision-making; and process innovation (optimization and redesign), which focuses on improving efficiency, flexibility, and responsiveness through continuous improvement and reengineering. These operational advancements are aligned with strategy (value creation and foresight), emphasizing long-term competitiveness, proactive adaptation, and the creation of customer and stakeholder value. Beyond these core elements, the framework highlights the importance of integration (cross-functional and financial), which ensures coordination across organizational units and alignment between operational activities and financial performance. This integration facilitates seamless information flow and enhances decision-making quality. Finally, sustainability (societal alignment) reflects the growing emphasis on environmentally and socially responsible operations, ensuring that innovation not only improves efficiency

but also contributes to broader societal and ecological objectives. Collectively, these interconnected dimensions illustrate that innovations in operations management extend beyond isolated improvements, representing a holistic transformation of how organizations design, manage, and continuously evolve their operations in a complex and dynamic environment.

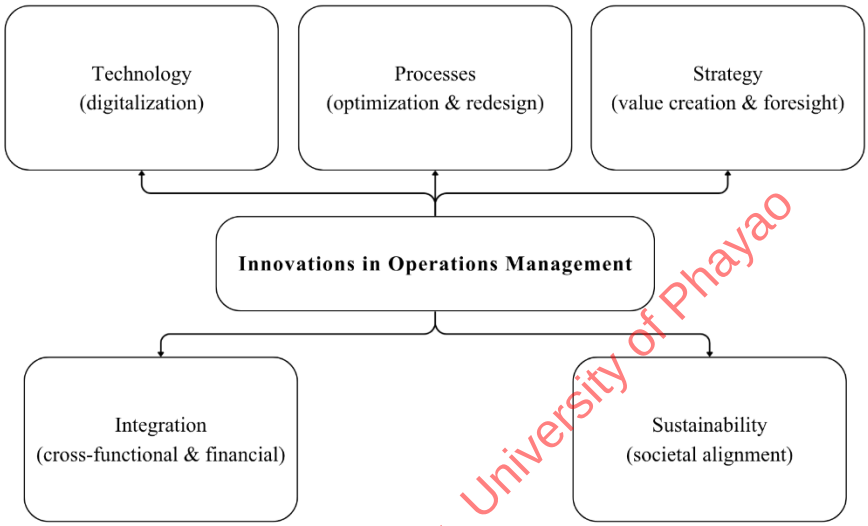

Figure 7.4 Innovations in Operations Management

Source: Adapted from Bécue, A., Gama, J., & Brito, P. Q. (2024). AI's effect on innovation capacity in the context of Industry 5.0: A scoping review. *Artificial Intelligence Review*, 57, 215.

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In conclusion, innovations in operations management represent a multidimensional transformation encompassing technological advancement, process redesign, cross-functional integration, and strategic orientation. The field is evolving beyond its traditional efficiency-driven focus toward a broader role in addressing complex organizational and societal challenges. By leveraging digital technologies, integrating interdisciplinary knowledge, and embracing sustainability and collaboration, operations management continues to enhance its relevance and impact in an increasingly dynamic and uncertain global landscape.

7.5 Entrepreneurs and Operations Management

Entrepreneurs operate in environments characterized by high uncertainty, resource constraints, and rapid change, rendering operations management a critical function that directly influences venture success. Rather than serving merely as a support activity, operations management functions as a strategic mechanism through which entrepreneurs structure and evaluate opportunity-related decisions under conditions of true uncertainty. In this context, data-driven entrepreneurial decision-making does not eliminate uncertainty; instead, it enables entrepreneurs to iteratively analyze imperfect and partially observable market information using dynamic, algorithmic approaches. Specifically, entrepreneurs allocate resources across an investment portfolio that simultaneously generates financial returns and reveals information about external market conditions, thereby enhancing the observability of latent market states. This process requires managing trade-offs between expected returns and information acquisition, while accounting for individual risk preferences and operational constraints, including limited resources, routines, reputation, and regulatory knowledge (Canakoglu et al., 2018).

Operations management further provides entrepreneurs with adaptable principles and tools such as process design, capacity planning, and performance evaluation that become increasingly critical as ventures transition from experimentation to growth. Importantly, these operational elements are rarely fully formalized at the outset; instead, they tend to emerge iteratively and unevenly during early-stage development. Decisions related to process configuration, supply chain design, and scalability play a pivotal role in shaping cost structures, responsiveness, and long-term competitiveness. Consequently, integrating operations thinking early in the venture lifecycle is essential not as a rigid methodology, but as strategic foresight since initial operational choices can either constrain or enable future scaling and value creation (Fine et al., 2022).

In parallel, digital technologies are fundamentally transforming entrepreneurial operations, particularly in areas such as inventory management and supply chain coordination. Blockchain-based systems, for example, enhance supply chain performance by enabling decentralized, secure, and real-time information sharing among stakeholders. These

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capabilities improve traceability, transparency, and coordination across inventory networks, addressing persistent challenges in traditional systems, including information asymmetry, limited visibility, and operational inefficiencies. As a result, entrepreneurs can make more accurate replenishment decisions, reduce holding costs especially for perishable goods and improve stock availability. Furthermore, blockchain facilitates synchronized coordination between suppliers and retailers, supports more precise demand forecasting and pricing decisions, and ultimately enhances operational efficiency and profitability (Kaushik, 2025).

Beyond operational improvements, blockchain technology also reshapes organizational structures and inter-organizational relationships. By ensuring data immutability, transparency, and traceability across shared ledgers, it strengthens trust among supply chain participants. Its decentralized, peer-to-peer architecture enables transaction validation without intermediaries, thereby reducing information asymmetry and enhancing coordination reliability. Moreover, blockchain adoption introduces significant organizational changes, including process automation through smart contracts, reduced administrative burdens, and the reconfiguration of coordination mechanisms among supply chain actors. Rather than merely decentralizing decision-making, the technology transforms how firms collaborate, exchange information, and manage transactions within distributed networks. These transformations can lead to improved efficiency, reduced costs and lead times, and enhanced supply chain performance, while simultaneously enabling new business models and value creation opportunities for entrepreneurial firms (Varriale et al., 2021).

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Entrepreneurs' engagement with operations management is also evident in routine activities such as raw material purchasing, which are shaped by key organizational characteristics, including business size, business model, firm age, number of employees, and revenue levels. These factors influence purchasing behavior, particularly in relation to inventory decisions, cost control, and supplier coordination. In resource-constrained contexts, entrepreneurs must carefully balance inventory sufficiency with cost efficiency and product quality. Effective coordination with suppliers is therefore essential for improving operational efficiency, reducing procurement time, and ensuring input quality. Empirical evidence from café

business entrepreneurs further suggests that the use of digital tools and applications can significantly enhance purchasing processes by streamlining operations, reducing costs, and improving overall performance (Suvittawatt et al., 2018).

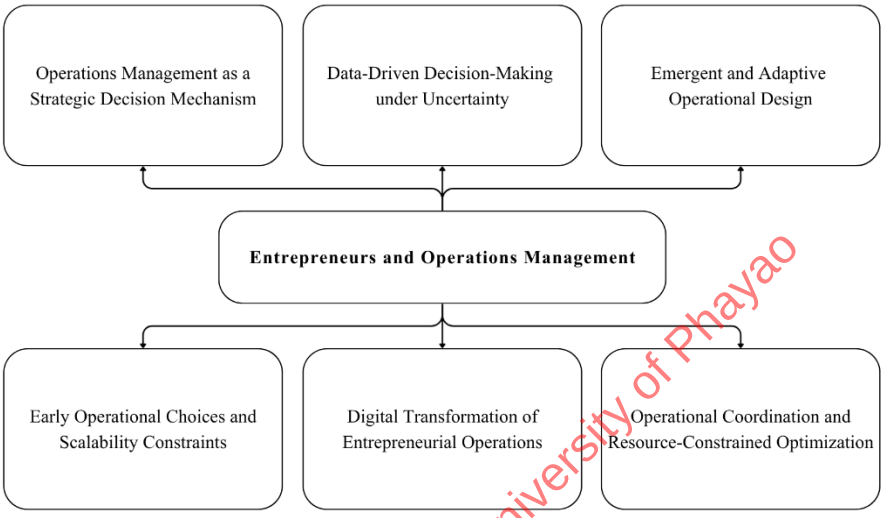

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Figure 7.5 Entrepreneurs and Operations Management

Source: Adapted from Fine, C. H., Padurean, L., & Naumov, S. (2022). Operations for entrepreneurs: Can Operations Management make a difference in entrepreneurial theory and practice? *Production and Operations Management*, 31, 4599–4615.

As illustrated in Figure 7.5, the relationship between entrepreneurs and operations management can be conceptualized as an integrated and dynamic system in which operations management functions as a strategic decision mechanism that enables data-driven decision-making under conditions of uncertainty while supporting emergent and adaptive operational design. Within this framework, entrepreneurs must navigate early operational choices that impose long-term scalability constraints, making initial decisions regarding processes, technology, and resource configuration critically path-dependent. Simultaneously, digital transformation plays a pivotal role in enhancing entrepreneurial operations by enabling real-time data analytics, process automation, and improved responsiveness to market changes. Given inherent resource limitations, effective operational coordination and resource-

constrained optimization become essential capabilities, requiring entrepreneurs to strategically allocate scarce resources while maintaining efficiency and flexibility. Collectively, these interconnected dimensions highlight that operations management in entrepreneurial contexts is not merely operational but fundamentally strategic, shaping venture adaptability, resilience, and sustainable growth trajectories.

In conclusion, operations management constitutes a foundational strategic capability in entrepreneurship, enabling firms to navigate uncertainty, optimize resource allocation, and build scalable and resilient operations. By integrating data-driven decision-making, adaptive operational design, and emerging digital technologies, entrepreneurs can enhance both short-term efficiency and long-term competitive advantage in increasingly complex and dynamic business environments.

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Case Study

Concept Testing of the DAZH Mobile Application: Purchase Intentions among Café Entrepreneurs in Nakhon Ratchasima Province, Thailand

Adapted Reprint from:

Suvittawatt, A., Petkaew, T., & Prasongsub, P. (2018). DAZH Mobile Application Concept Testing: A Purchase Intentions of Café Business Entrepreneurs in Nakhon Ratchasima Province, Thailand. Open Journal of Social Science Research, 4, 258-263. https://doi.org/10.32861/jssr.spi4.258.263

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1. Introduction

Entrepreneurial environments characterized by rapid technological change and intensifying competition have made new product development (NPD) increasingly critical. Market dynamics such as evolving customer preferences, frequent product launches, and pressure from both domestic and international competitors necessitate structured approaches like marketing-driven concept testing to validate product viability. At the same time, collaboration between suppliers and buyers has become a strategic imperative, enhancing cost efficiency and product quality within contemporary operations.

The café and coffee business sector in Thailand has experienced steady growth, driven by shifting consumer behaviors and digital influence. With a market value of approximately 308 million USD in 2018 and continued annual expansion, the industry is dominated by small and medium-sized independent entrepreneurs. Low entry barriers have intensified competition, while the rise in coffee consumption among younger generations has further stimulated market expansion across both urban and regional areas.

Despite this growth, café entrepreneurs face persistent challenges in raw material procurement, particularly in inventory control and maintaining supply quality. To address these issues, the DAZE mobile application

developed by student entrepreneurs at Suranaree University of Technology under the Student Entrepreneurship Development Academy (SEDA) aims to function as an intermediary platform connecting suppliers and café operators. By supporting demand–supply coordination and inventory management, DAZE seeks to enhance operational efficiency. Its concept testing phase evaluates purchase intentions and market feasibility, focusing on user needs, purchasing behaviors, and the application's commercialization potential.

2. National Context: DAZH App Concept Testing and Purchase Intentions of Thai Café Entrepreneurs

The national context of DAZH application concept testing highlights that raw material purchasing is a critical component of supply chain management among Thai café entrepreneurs, particularly in relation to business size. Purchasing decisions directly affect cost efficiency, inventory control, and cash flow management through mechanisms such as economic order quantity and just-in-time (JIT) practices. Smaller enterprises, especially microenterprises, often face financial constraints that limit inventory investment and increase reliance on efficient logistics coordination and supplier communication. These operational strategies enable businesses to reduce waste, optimize production time, and respond effectively to customer demand.

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From a business model perspective, purchasing intentions are strongly influenced by customer-centric factors such as loyalty, trust, and engagement, particularly within the context of social commerce. The integration of digital platforms and social networking has transformed how café entrepreneurs interact with customers and develop value propositions. Strategies such as word-of-mouth marketing, personalized customer experiences, and retention-focused approaches enhance long-term profitability. Additionally, structural characteristics such as family ownership can shape strategic decision-making and resource allocation, further influencing purchasing behaviors.

Business duration reflects organizational experience and survival capability, which are closely linked to innovation and technological adoption. Firms with longer operational histories tend to benefit from process innovation, stronger supplier relationships, and improved communication through digital tools such as the internet. These factors enhance purchasing efficiency and decision-making by enabling better evaluation of supplier

value propositions. Consequently, experienced businesses are more likely to adopt advanced purchasing practices and innovative products.

Finally, organizational capacity and financial status represented by number of employees and estimated monthly income play significant roles in shaping purchasing behavior. SMEs with more employees tend to have more structured and sophisticated purchasing functions, higher levels of resource utilization, and stronger implementation of practices such as total quality management. Meanwhile, income levels influence purchasing intentions by affecting preferences for product quality, pricing, and purchasing channels. Higher-income entrepreneurs are more inclined toward premium-quality inputs, while younger or lower-income groups often prioritize convenience and cost efficiency, particularly through online purchasing platforms.

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3. Methodology and Research Framework

This case study adopted an exploratory research design to examine the key determinants of raw material purchasing behavior and purchase intention, and to assess the extent to which these factors influenced the acceptance of the DAZE mobile application. A quantitative approach was employed, utilizing structured questionnaires as the primary data collection instrument, while qualitative contextual insights were incorporated to support interpretation.

Secondary data were obtained through an extensive literature review, which also served to validate and reinforce the research findings. The research process commenced with a comprehensive review of relevant literature, from which measurement parameters for key success factors were developed. These measurement constructs were subsequently refined through consultation with academic supervisors and domain experts prior to the administration of the initial survey to entrepreneurs. The validated measures were then applied in the final survey instrument.

Data analysis was conducted using descriptive statistics, specifically mean and standard deviation, to evaluate the responses. Conclusions were drawn based on the empirical findings derived from the analysis. The study focused on a sample of 44 café business entrepreneurs who were actively operating their businesses and participated in the final questionnaire survey.

The survey consists of measures capturing key constructs:

- Independent Variables – business size, business model, business duration, number of employees, and estimated monthly income
- Raw Materials Purchasing Behavior
- DAZE Mobile Application Concept Testing
- Purchase Intentions – purchase intention, purchase amount of the first order, purchase frequency per week, acceptable service charge rate, and reduce raw material purchasing problems

Based on the research framework, the independent variables business size, business model, business duration, number of employees, and estimated monthly income—have direct effects on raw materials purchasing behavior. The concept testing of the DAZE mobile application aims to assess the purchase intentions of café business entrepreneurs.

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4. Findings and Discussion

The results from a survey of 44 café business entrepreneurs indicate several key characteristics related to business profile and purchasing behavior. Regarding business size, 21 entrepreneurs (47.7%) reported an initial investment exceeding USD 24,000, followed by 15 entrepreneurs (34.1%) with investments between USD 3,030 and USD 24,000, and 8 entrepreneurs (18.2%) with investments ranging from USD 1,000 to USD 3,000. In terms of business format, the majority of respondents (36 entrepreneurs, 81.8%) operated under their own brand, while 8 entrepreneurs (18.2%) were franchisees. With respect to business duration, most businesses had been operating for 1–3 years (15 entrepreneurs, 34.1%), followed by those operating for more than 5 years (11 entrepreneurs, 25.0%), 3–5 years (10 entrepreneurs, 22.7%), and less than 1 year (8 entrepreneurs, 18.2%). Regarding workforce size, 23 entrepreneurs (60.5%) employed 1–3 employees, 9 entrepreneurs (23.7%) employed 4–6 employees, and 3 entrepreneurs each (6.8%) reported employing 7–9 employees and more than 10 employees. In terms of estimated monthly income, 19 entrepreneurs (43.2%) earned less than USD 3,000, 16 entrepreneurs (36.4%) earned between USD 3,001 and USD 6,000, 5 entrepreneurs (11.4%) earned between USD 6,001 and USD 9,000, and 4 entrepreneurs (9.1%) reported earnings exceeding USD 9,000. Concerning purchase intentions toward the DAZE mobile application, 30 entrepreneurs (68.2%) expressed an intention to adopt the application, while 14 entrepreneurs (31.8%) indicated low purchase intention. For the initial purchase amount, 18 entrepreneurs (40.9%) reported spending less than USD 60, while another 18 entrepreneurs (40.9%) indicated

no fixed purchase amount. Additionally, 8 entrepreneurs (18.2%) reported a purchase range of USD 60.1–150. Regarding purchase frequency, 17 entrepreneurs (38.6%) reported irregular purchasing patterns, 16 entrepreneurs (36.4%) purchased 3–6 times per week, and 11 entrepreneurs (25.0%) purchased 1–2 times per week. In terms of acceptable service charges, 21 entrepreneurs (47.7%) preferred a rate of USD 1.01–3.00 per transaction, 14 entrepreneurs (31.8%) accepted rates above USD 3.01, and 9 entrepreneurs (20.5%) preferred rates between USD 0.30 and USD 1.00. Finally, regarding the perceived benefits of the application in reducing raw material purchasing problems, 19 entrepreneurs (43.2%) highlighted time reduction, 15 entrepreneurs (34.0%) emphasized cost reduction, and 10 entrepreneurs (22.8%) identified improvements in raw material quality.

Raw material purchasing behavior among café entrepreneurs is influenced by five key factors: business size, business model, business duration, number of employees, and estimated monthly income. These factors shape how entrepreneurs manage inventory, purchasing decisions, and cost optimization. For example, larger businesses are more affected by inventory levels and cash flow considerations, while business models (e.g., own brand vs. franchise) influence purchasing strategies and demand-side decisions. Additionally, business duration reflects organizational experience and innovation capability, which can enhance profitability and purchasing efficiency. The number of employees relates to resource availability, affecting purchasing processes, while monthly income directly impacts purchasing decisions through financial capacity and preferences. Regarding the DAZE mobile application, most café entrepreneurs show a positive purchase intention. The application is perceived to provide key benefits, including reduction in purchasing time, cost savings, and improved raw material quality. However, pricing sensitivity is evident entrepreneurs consider a service fee of 1.01–3.00 USD per transaction acceptable, while higher costs may negatively affect production expenses. Finally, moving forward with a soft launch phase to gather real user feedback and further refine the application to better align with entrepreneurs' needs and market expectations.

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5. Synthesis

This case demonstrates that innovation in operations management through the DAZE mobile application acts as a strategic mechanism to enhance purchasing efficiency and supply chain coordination for café SMEs.

From an Innovation operations management perspective, the application integrates key operational functions (procurement, inventory management, and supplier coordination) into a digital platform, thereby reducing transaction time, lowering costs, and improving raw material quality. The findings indicate that operational decisions are contingent on firm-specific characteristics (e.g., business size, cash flow, and resource constraints), highlighting the need for adaptive and technology-enabled processes. Moreover, the system reflects principles of process innovation and digital supply chain integration, where real-time information flow enhances decision-making and operational agility. Ultimately, the DAZE application exemplifies how innovative operational tools can transform traditional purchasing practices into more responsive, data-driven, and value-creating activities within SME contexts.

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6. Conclusion

Raw material purchasing behavior among café entrepreneurs is primarily influenced by business characteristics, including business size, format, duration, number of employees, and estimated monthly income. These factors shape inventory management, purchasing lot sizes, and cost optimization strategies, as well as decision-making processes related to resource constraints and cash flow. Additionally, purchase intentions toward the DAZE mobile application are positive, with entrepreneurs recognizing its potential to reduce purchasing time, lower costs, and improve raw material quality. An acceptable service fee ranges between 1.01–3.00 USD per transaction, although higher fees may increase production costs. It is recommended that the DAZE application proceed to the next stage of the new product development process through a soft launch with selected café entrepreneurs, using their feedback to refine the application and better align it with user needs.

Case Study Questions

1. How do differences in business size and monthly income influence café entrepreneurs' willingness to adopt the DAZH mobile application, particularly in terms of acceptable service charge rates?
2. In what ways do raw material purchasing behaviors (e.g., purchasing frequency, lot size, supplier coordination) mediate the relationship between firm characteristics and purchase intention?
3. Compare how owner-operated cafés vs. franchise cafés differ in their adoption intentions toward DAZH. What strategic or structural factors explain these differences?
4. To what extent does the perceived value of DAZH (e.g., time reduction, cost reduction, quality improvement) influence purchase intention among entrepreneurs?
5. How does business duration (experience level) affect decision-making in adopting new digital solutions like DAZH? Do more established businesses behave differently from newer ones?

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Chapter Summary

This chapter contributes to innovation management literature by conceptualizing operations management as a capability-driven system integrating digital technologies, innovation processes, and entrepreneurial dynamics.

Operations management is a strategic, data-driven discipline that designs, executes, and improves processes transforming inputs into value-added outputs. It integrates supply chain activities and increasingly leverages AI, IoT, and digital systems to enhance efficiency, decision-making, and adaptability, while incorporating sustainability and circular economy principles to support long-term competitive advantage.

The operations management process is a lifecycle system comprising seven stages from product development to end-of-life processing integrating forward and reverse flows. Supported by digital technologies, lean practices, and real-time monitoring, it enables efficient resource transformation, continuous improvement, and sustainable, resilient operations across manufacturing and services.

Operations management and innovation are interdependent, with operations providing structure and efficiency for innovation, while innovation enhances operational capabilities. Enabled by digital technologies and Industry 5.0 principles, their integration supports human-centric, sustainable, and data-driven systems that improve performance and value creation.

Innovations in operations management involve the integration of advanced technologies, process redesign, and cross-functional coordination to enhance efficiency and strategic value. These innovations also address broader challenges such as sustainability, uncertainty, and digital transformation through data-driven and interdisciplinary approaches.

Operations management enables entrepreneurs to manage uncertainty, allocate resources effectively, and scale ventures. Through adaptive processes and digital technologies like blockchain, it improves decision-making, operational efficiency, and supply chain coordination, supporting sustainable growth and competitive advantage.

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Chapter Review Questions

Review Question 1:

How has operations management evolved from a traditional efficiency-focused function into a strategic, data-driven, and capability-based discipline, and what role do artificial intelligence and digital technologies play in this transformation?

Review Question 2:

Analyze how the seven-stage lifecycle of the operations management process (from product development to end-of-life processing) contributes to both operational efficiency and sustainability within a circular economy framework.

Review Question 3:

Critically evaluate the interdependence between operations management and innovation in the context of Industry 5.0, particularly in balancing technological advancement, human-centric design, and sustainability objectives.

Review Question 4:

To what extent do emerging technologies (e.g., AI, IoT, and digital platforms) and interdisciplinary approaches redefine the scope of operations management from efficiency optimization to addressing complex organizational and societal challenges?

Review Question 5:

Discuss how operations management serves as a strategic capability for entrepreneurs in managing uncertainty, resource constraints, and scalability, particularly through the use of data-driven decision-making and digital technologies.

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Chapter Exercises

Exercise 1:

Based on the evolution of operations management into a data-driven and AI-enabled discipline, evaluate how artificial intelligence transforms traditional operations management practices. In your answer, address:

- The shift from efficiency-focused to capability-driven operations
- The role of AI in enhancing decision-making and process performance
- Key challenges in AI adoption within operations systems

Exercise 2:

Select a real-world product (e.g., smartphone, electric vehicle, or packaged food) and map its operations management process using the seven lifecycle stages:

1. Product Development (PD)
2. Procurement & Inbound Logistics (PLUS)
3. Production (PROD)
4. Distribution & Outbound Logistics (DOLS)
5. Maintenance (MAINT)
6. Reverse Logistics (REVLOG)
7. End-of-Life (EOL)

Then:

- Explain how digital technologies (e.g., IoT, digital twins) enhance at least two stages
- Identify sustainability practices embedded in the lifecycle

Exercise 3:

Critically discuss how operations management supports innovation in organizations. Your answer should include:

- The role of Industry 5.0 in redefining operations and innovation
- The importance of human-centric and sustainable innovation

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- How operational capabilities (e.g., quality management, efficiency) enhance R&D outcomes

Provide at least one real or hypothetical example.

Exercise 4:

Identify and analyze two major innovations in operations management (e.g., AI, blockchain, digital twins, open innovation, supply chain finance). For each innovation:

- Explain how it transforms operational processes
- Evaluate its benefits and potential risks
- Discuss its impact on organizational performance

Exercise 5:

Assume you are launching a startup (e.g., café, e-commerce business, or manufacturing venture). Develop an operations strategy by addressing:

- Process design and capacity planning
- Inventory and supply chain decisions
- The role of digital technologies (e.g., blockchain, mobile apps)
- How operations decisions support scalability and competitive advantage

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References

Angelopoulos, S., Bendoly, E., Fransoo, J., Hoberg, K., Ou, C., & Tenhiälä, A. (2023). Digital transformation in operations management: Fundamental change through agency reversal. Journal of Operations Management, 69(6), 876–889. https://doi.org/10.1002/joom.1271

Atasu, A., Corbett, C. J., Huang, X., & Toktay, L. B. (2020). Sustainable Operations Management Through the Perspective of Manufacturing & Service Operations Management. *Manufacturing & Service Operations Management, 22*(1), 146-157. https://doi.org/10.1287/msom.2019.0804

Bécue, A., Gama, J., & Brito, P. Q. (2024). AI's effect on innovation capacity in the context of Industry 5.0: A scoping review. Artificial Intelligence Review, 57, 215. https://doi.org/10.1007/s10462-024-10864-6

Borchardt, M., Pereira, G. M., Milan, G. S., Scavarda, A. R., Nogueira, E. O., & Poltosi, L. C. (2022). Industry 5.0 Beyond Technology: An Analysis Through the Lens of Business and Operations Management Literature. *Organizacija, 55*(4), 305-321. https://doi.org/10.2478/orga-2022-0020

Cachon, G. P., Girotra, K., & Netessine, S. (2020). Interesting, important, and impactful operations management. *Manufacturing and Service Operations Management, 22*(1), 214-222. https://doi.org/10.1287/msom.2019.0813

Canakoglu, E., Erzurumlu, S. S., & Erzurumlu, Y. O. (2018). How data-driven entrepreneur analyzes imperfect information for business opportunity evaluation. *IEEE Transactions on Engineering Management, 65*(4), 604-617, Article 8371296. https://doi.org/10.1109/TEM.2018.2826983

Cannas, V. G., Ciano, M. P., Saltalamacchia, M., & Secchi, R. (2024). Artificial intelligence in supply chain and operations management: a

Library and Learning, University of Phayao

multiple case study research. *International Journal of Production Research, 62*(9), 3333-3360. https://doi.org/10.1080/00207543.2023.2232050

Corbett, C. J., Narayanan, S., Aloysius, J., Berenguer, G., Bish, E. K., Bjarnadóttir, M. V., Gao, G., Glover, W. J., Johnson, M. P., Kalkanci, B., Li, J., Martonosi, S. E., Mejia, J., Mishra, A., Natarajan, K. V., Parker, C., Sodhi, M. S., Tang, W., Wowak, K. D., & Zobel, C. W. (2025). Diversity, Equity and Inclusion and Operations Management: Critical Linkages and Research Opportunities. *Production and Operations Management, 34*(3), 310-330. https://doi.org/10.1177/10591478251318107

Das, S. K., Saccani, N., & Bressanelli, G. (2025). How do digital technologies trigger sustainability and circularity in operations management processes? The role of environmental drivers. *Business Process Management Journal*, 1-31. https://doi.org/10.1108/bpmj-05-2025-0653

Dogru, A. K., & Keskin, B. B. (2020). AI in operations management: applications, challenges and opportunities. *Journal of Data, Information and Management, 2*(2), 67-74. https://doi.org/10.1007/s42488-020-00023-1

Fine, C. H., Padurean, L., & Naumov, S. (2022). Operations for entrepreneurs: Can Operations Management make a difference in entrepreneurial theory and practice? *Production and Operations Management, 31*(12), 4599-4615. https://doi.org/10.1111/poms.13851

Garrido, S., Muniz Jr, J., & Ribeiro, V. (2024). Operations Management, Sustainability & Industry 5.0: A critical analysis and future agenda. Cleaner Logistics and Supply Chain, 10, 100141. https://doi.org/10.1016/j.clscn.2024.100141

Ge, G. (2023). Lean Management Application in Vehicle Engine Manufacturing Enterprises. *Manufacturing and Service Operations Management, 4*(5), 33-42. https://doi.org/10.23977/msom.2023.040505

Library and Learning, University of Phayao

Helo, P., & Hao, Y. (2022). Artificial intelligence in operations management and supply chain management: an exploratory case study. *Production Planning & Control, 33*(16), 1573-1590. https://doi.org/10.1080/09537287.2021.1882690

Jackson, I., Ivanov, D., Dolgui, A., & Namdar, J. (2024). Generative artificial intelligence in supply chain and operations management: a capability-based framework for analysis and implementation. *International Journal of Production Research, 62*(17), 6120-6145. https://doi.org/10.1080/00207543.2024.2309309

Kaushik, J. (2025). An inventory model for deteriorating items with blockchain process: how will it transform inventory management system. *Cogent Business & Management, 12*(1), 2479571. https://doi.org/10.1080/23311975.2025.2479571

Kavadias, S., & Ulrich, K. T. (2020). Innovation and New Product Development: Reflections and Insights from the Research Published in the First 20 Years of Manufacturing & Service Operations Management. *Manufacturing & Service Operations Management, 22*(1), 84-92. https://doi.org/10.1287/msom.2019.0816

Keller, M., & Viaene, S. (2026). From a literature review to a conceptual framework for organisations and management transitioning towards I5.0. International Journal of Organizational Analysis, InPress. https://doi.org/ 10.1108/IJOA-07-2025-5773.

Kwak, D.-W., Seo, Y.-J., & Mason, R. (2018). Investigating the relationship between supply chain innovation, risk management capabilities and competitive advantage in global supply chains. *International Journal of Operations & Production Management, 38*(1), 2-21. https://doi.org/10.1108/ijopm-06-2015-0390

Lei, X. (2022). Laboratory Intelligent Monitoring Operation and Maintenance Management System with Multisensor Technology. *Mobile Information Systems, 2022*(1), 7710977. https://doi.org/10.1155/2022/7710977

Library and Learning, University of Phayao

Luo, F., & Li, Z. (2025). Integration and Innovation of Cloud Computing and the Internet of Things in Enterprise Production and Operations Management. *Journal of Engineering, Project, and Production Management, 16*(1), Article 2025-45. https://doi.org/10.32738/JEPPM-2025-45

Mubarak, M. F., Jucevicius, G., Shabbir, M., Petraite, M., Ghobakhloo, M., & Evans, R. (2025). Strategic foresight, knowledge management, and open innovation: Drivers of new product development success. *Journal of Innovation & Knowledge, 10*(2), 100654. https://doi.org/10.1016/j.jik.2025.100654

Potlaki, P. P., & Naidoo, S. (2024). THE INFLUENCE OF OPERATIONS MANAGEMENT ON SERVICE DELIVERY: THE CASE OF A SOUTH AFRICAN MUNICIPALITY. *South African Journal of Industrial Engineering, 35*(4), 116-131. https://doi.org/10.7166/35-4-3016

Satish, R., Selvakumar, B., Aravindhan, G., & Radhakrishnan, M. (2025). STRATEGIC INTEGRATION OF PROJECT AND OPERATIONS MANAGEMENT FOR IMPROVING EFFICIENCY IN LARGE-SCALE TECHNICAL SYSTEM DEVELOPMENT. *Archives for Technical Sciences, 3*(34), 189-197. https://doi.org/10.70102/afts.2025.1834.189

Suvittawatt, A., Petkaew, T., & Prasongsub, P. (2018). DAZH Mobile Application Concept Testing: A Purchase Intentions of Café Business Entrepreneurs in Nakhon Ratchasima Province, Thailand. *Open Journal of Social Science Research, 4*, 258-263. https://doi.org/10.32861/jssr.spi4.258.263

van der Walt, C., Tosen, G., & Govender, K. K. (2020). Unlocking opportunities in manufacturing operations management systems: A proposed framework. *South African Journal of Industrial Engineering, 31*(1), 26-34. https://doi.org/10.7166/31-1-2210

Van Wassenhove, L. N. (2019). Sustainable Innovation: Pushing the Boundaries of Traditional Operations Management. *Production and*

Library and Learning, University of Phayao

Operations Management, 28(12), 2930-2945. https://doi.org/10.1111/poms.13114

Varriale, V., Cammarano, A., Michelino, F., & Caputo, M. (2021). New organizational changes with blockchain: a focus on the supply chain. *Journal of Organizational Change Management, 34*(2), 420-438. https://doi.org/10.1108/JOCM-08-2020-0249

Wang, H., Yu, C., Zheng, J., Jia, Y., Liu, Z., & Yang, K. (2024). Digital-Twin-Based Operation and Maintenance Management Method for Large Underground Spaces. *Buildings, 14*(8), 2577. https://doi.org/10.3390/buildings14082577

Wang, J., Zhao, L., & Huchzermeier, A. (2021). Operations-Finance Interface in Risk Management: Research Evolution and Opportunities. *Production and Operations Management, 30*(2), 355-389. https://doi.org/10.1111/poms.13269

Yiu, L. M. D., Lam, H. K. S., Yeung, A. C. L., & Cheng, T. C. E. (2020). Enhancing the Financial Returns of R&D Investments through Operations Management. *Production and Operations Management, 29*(7), 1658-1678. https://doi.org/10.1111/poms.13186

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Chapter 8: Strategic Knowledge Management for Innovation and Sustainable Competitive Advantage

Course Learning Outcomes (CLO):

1. Explain the concept and components of knowledge management.
2. Analyze the stages of the knowledge management process.
3. Evaluate the functions of knowledge management systems.
4. Analyze key knowledge management mechanisms and concepts.
5. Assess the role of knowledge management technologies.

Contents and Concepts of This Chapter:

8.1 What Is Knowledge Management?

8.2 Knowledge Management Process

8.3 Knowledge Management Systems

8.4 Knowledge Management Mechanisms and Concepts

8.5 Knowledge Management Technologies

Case Study

Chapter Summary

Chapter Review Questions

Chapter Exercises

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8.1 What Is Knowledge Management?

Knowledge management refers to a systematic organizational process through which knowledge is created, captured, organized, shared, and effectively utilized to achieve strategic objectives, enhance performance, and sustain competitive advantage. It encompasses both explicit knowledge codified information such as procedures, databases, and reports and tacit knowledge embedded in individuals' experiences, skills, and insights.

An integrated knowledge management architecture can be understood as a multilayered design in which technologies, systems, processes, and governance mechanisms interact to create organizational value. At the foundational level, technologies such as cloud computing, databases, enterprise platforms, artificial intelligence, collaboration tools, and analytics engines enable systems by providing the digital infrastructure for storing, searching, classifying, connecting, and securing knowledge assets. Building on this foundation, knowledge management systems operationalize processes by translating strategic knowledge goals into repeatable routines such as knowledge creation, capture, codification, sharing, retrieval, application, and organizational learning through workflows, repositories, expert directories, communities of practice, and decision-support interfaces. At the regulatory level, formal and informal mechanisms govern knowledge flows by determining who can access, contribute, validate, and use knowledge, thereby balancing openness with control. These mechanisms include governance policies, incentives, leadership norms, trust relationships, intellectual property safeguards, data privacy rules, quality standards, and feedback loops that ensure knowledge remains accurate, relevant, and ethically managed. Together, technologies enable capability, systems convert capability into operational practice, and mechanisms coordinate behavior to sustain effective knowledge exchange across the organization.

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In the digital context, knowledge management is conceptualized as a strategic and integrated process involving the acquisition, organization, dissemination, and application of knowledge assets to support decision-making, enhance organizational capabilities, and improve both operational and strategic outcomes. This perspective extends to digital knowledge management, which emphasizes knowledge generated and applied through digital technologies, including data-driven insights, technical expertise, and

process know-how. Rather than functioning as a passive repository, digital knowledge management operates as an integrated framework that combines technological infrastructure, organizational processes, and a collaborative culture to facilitate continuous learning and knowledge exchange. It also enhances an organization's absorptive capacity by enabling the identification, assimilation, and application of new knowledge, thereby supporting innovation, improving efficiency, and enabling adaptation in dynamic environments. Furthermore, effective knowledge management reduces knowledge silos, supports workforce upskilling, and embeds digital competencies into organizational routines, positioning it as a core operational capability (Fang et al., 2026).

From a human resource management perspective, knowledge management enhances organizational capability through structured processes such as knowledge acquisition, sharing, utilization, and protection. These processes support the systematic management and development of knowledge resources by facilitating the organization, dissemination, and application of employee expertise, while fostering a culture of continuous learning and collaboration. In service-oriented enterprises, knowledge management also contributes to the development of knowledge repositories and ensures that relevant knowledge is accessible to the right individuals at the appropriate time, thereby improving workforce capability and operational efficiency (Nhut et al., 2024).

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From an organizational standpoint, knowledge management is conceptualized as a strategic mechanism that enables firms to identify, acquire, organize, store, share, and apply knowledge to support problem-solving and achieve organizational objectives. It facilitates the effective utilization of intellectual capital comprising human, structural, and relational resources by improving knowledge flows and enhancing information accessibility across the organization. Through well-developed knowledge management systems, organizations can transform dispersed knowledge into actionable insights, strengthen decision-making capabilities, and support continuous learning and adaptation. Consequently, knowledge management contributes to value creation by improving internal processes and knowledge utilization, while also fostering innovation through the integration of experience, expertise, and information into new ideas, products, and

processes, thereby enhancing overall organizational effectiveness and long-term performance (Suparwadi et al., 2024).

Knowledge management also plays a critical role in enhancing innovation capability by facilitating the systematic creation, sharing, and application of knowledge across the organization. It improves access to relevant information, supports problem-solving, and encourages the development of new ideas, thereby strengthening innovative performance. Its effectiveness is further reinforced by intangible organizational factors such as psychological capital and authentic leadership, which promote trust, openness, and employee motivation. Accordingly, knowledge management is embedded within organizational systems, routines, and culture, and requires continuous learning and supportive leadership to maximize its contribution to innovation outcomes (Yuwono et al., 2026).

The development of knowledge management practices requires alignment among key organizational enablers that influence how knowledge is created, shared, and utilized. These enablers include organizational strategy, information technology, people, culture, and structural support, which collectively shape knowledge processes and outcomes. Effective knowledge management practices emerge when organizations establish clear mechanisms for knowledge sharing, leverage appropriate technological tools, and foster collaborative interactions that enable the conversion of tacit knowledge into explicit forms. In contexts such as SMEs and indigenous settings, knowledge management often relies on informal processes, including observation and word-of-mouth knowledge transfer; however, the formalization, documentation, and adoption of digital technologies can significantly enhance innovation, productivity, and overall organizational performance (Pepple & Dore-Okuiomse, 2023).

Finally, knowledge management plays a pivotal role in sustaining organizational performance by enabling the systematic capture, storage, sharing, and utilization of knowledge to enhance both operational effectiveness and strategic outcomes. It improves decision-making quality, fosters innovation, and increases organizational responsiveness to dynamic environments. Moreover, knowledge management supports continuous learning, allowing organizations to adapt to market changes, refine internal processes, and create sustained value for stakeholders. It also strengthens the

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integration of key organizational resources such as human capital, technology, and culture thereby improving efficiency and facilitating the development of competitive advantage. However, its effectiveness is contingent upon contextual factors, including alignment with organizational strategy and integration with complementary resources and capabilities (Yudhistira et al., 2024).

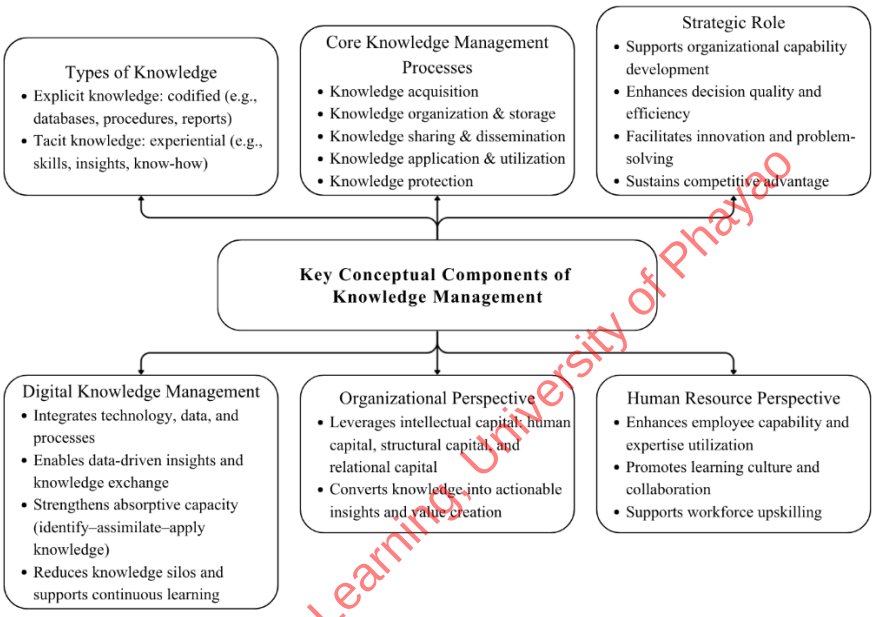

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Figure 8.1 Key Conceptual Components of Knowledge Management

Source: Adapted from Henz, J. L., & Oliveira, M. (2024). Knowledge management implementation: A systematic literature review. *Knowledge and Process Management*, 31(4), 284–294.

Figure 8.1 illustrates that knowledge management is a multidimensional construct comprising several interrelated components that collectively enhance organizational effectiveness and competitiveness. At its foundation, knowledge is categorized into explicit knowledge, which is codified and easily documented, and tacit knowledge, which is experiential and embedded in individuals' skills and insights. These knowledge types are operationalized through core processes, including knowledge acquisition, organization and storage, sharing and dissemination, application and utilization, and protection. Strategically, knowledge management supports

organizational capability development, improves decision-making quality and efficiency, fosters innovation and problem-solving, and sustains competitive advantage. From a digital perspective, it integrates technology, data, and processes to enable data-driven insights, enhance absorptive capacity, and reduce knowledge silos. Furthermore, the organizational perspective emphasizes the leveraging of intellectual capital human, structural, and relational to transform knowledge into actionable value, while the human resource perspective highlights the role of employee capability development, collaborative learning culture, and continuous upskilling in maximizing knowledge utilization.

In conclusion, knowledge management is a strategic and integrative organizational capability that enables the effective creation, sharing, and utilization of knowledge to enhance decision-making, foster innovation, and sustain performance. By embedding knowledge processes within organizational systems, culture, and digital infrastructure, firms can strengthen their adaptability, optimize resource utilization, and maintain long-term competitive advantage in dynamic and complex environments.

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8.2 Knowledge Management Process

The knowledge management process constitutes a structured and dynamic set of organizational activities through which knowledge is systematically created, acquired, stored, shared, and applied to achieve strategic objectives and sustain competitive advantage. Rather than representing a single activity, it functions as an integrated and continuous cycle that transforms individual and organizational knowledge into actionable value.

This process is grounded in a procedural and cyclical approach that integrates strategic, operational, and evaluative dimensions of knowledge management. It begins with the formulation of a knowledge strategy, which defines the direction for managing knowledge resources in alignment with organizational goals and environmental conditions. This strategy is operationalized through an ongoing cycle of interrelated processes, including knowledge acquisition, knowledge sharing, knowledge development, knowledge preservation, and knowledge application. Knowledge acquisition

involves obtaining insights from both internal and external sources, while knowledge sharing facilitates the dissemination of knowledge across individuals and organizational units. Knowledge development focuses on the creation of new competencies and insights, whereas knowledge preservation ensures that valuable knowledge is systematically stored to prevent loss. Finally, knowledge application emphasizes the use of knowledge to enhance decision-making and organizational performance. Importantly, these processes are iterative and mutually reinforcing rather than linear, forming a dynamic system that supports organizational adaptability and value creation. The cycle concludes with the evaluation of knowledge strategy implementation, enabling organizations to assess effectiveness, identify gaps, and refine future strategies. This integrated perspective highlights the importance of feedback mechanisms, strategic alignment, and process continuity in achieving sustained organizational effectiveness (Raudeliūnienė et al., 2018).

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Within this framework, knowledge creation is conceptualized as a core process involving the generation of new knowledge through interactions between tacit and explicit forms. Mechanisms such as socialization and externalization facilitate the transformation of experiential knowledge into codified forms, enabling continuous knowledge development that supports strategic decision-making. Rather than relying solely on external acquisition, knowledge creation is embedded within organizational practices that integrate human experience, skills, and information transformation processes. Furthermore, when supported by business intelligence systems such as data analytics and information integration tools these processes enhance organizations' ability to interpret complex data environments and make timely, evidence-based decisions, thereby improving overall performance (Abusweilem & Abualoush, 2019).

According to Bloem and Salimi (2023) conceptualize knowledge management processes as four core capabilities that operate across different stages of technological innovation. Each process has a distinct functional role in managing knowledge as an organizational resource, as illustrated in Figure 8.2.

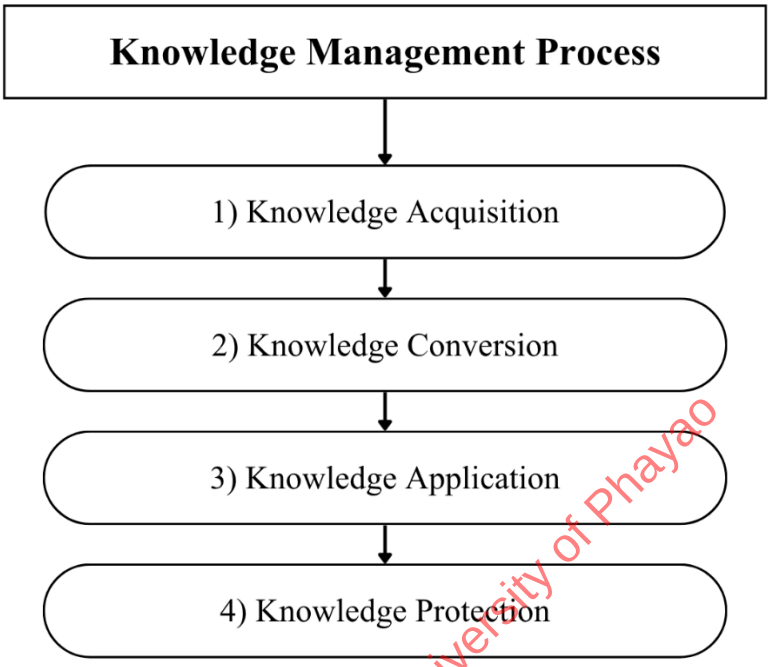

Figure 8.2 Knowledge Management Process

Source: Adapted from Fan, Z., & Beh, L.-S. (2024). Knowledge sharing among academics in higher education: A systematic literature review and future agenda. *Educational Research Review*, 42, 100573.

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1) Knowledge Acquisition

This process refers to identifying, collecting, and generating knowledge from both internal and external sources. It includes:

- Internal learning (e.g., R&D activities, employee experience)
- External sourcing (e.g., customers, competitors, scientific research)
- Knowledge accumulation and creation

It is strongly linked to absorptive capacity, meaning the organization's ability to recognize, assimilate, and utilize valuable knowledge.

2) Knowledge Conversion

Knowledge conversion involves transforming knowledge into usable and meaningful forms within the organization. This includes:

- Converting tacit ↔ explicit knowledge (e.g., through the SECI model: socialization, externalization, combination, internalization)
- Structuring, organizing, and integrating knowledge
- Sharing knowledge across individuals or units

This process enables organizations to reconfigure knowledge so it becomes actionable and transferable.

3) Knowledge Application

Knowledge application refers to the practical use of knowledge to create value, particularly in:

- Developing new products or processes
- Supporting decision-making
- Responding to technological changes

It represents the stage where knowledge is translated into concrete outputs, such as innovation outcomes or operational improvements.

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4) Knowledge Protection

Knowledge protection involves safeguarding valuable knowledge assets to maintain competitive advantage. It includes:

- Formal mechanisms: patents, copyrights, trademarks, NDAs
- Informal mechanisms: retention of tacit knowledge, organizational routines

This process prevents knowledge leakage or imitation, ensuring that unique knowledge remains a strategic asset.

These four processes are not isolated; rather, they form an interdependent and iterative system that supports technological innovation across different stages. Their relative importance varies depending on

whether the firm is in the research, development, or implementation phase of innovation.

Digital transformation further strengthens the knowledge management process by embedding advanced technological infrastructures such as databases, software systems, and digital communication platforms into organizational operations. These technologies enhance knowledge storage, organization, and retrieval through the development of robust knowledge repositories, including digital databases and organizational memory systems. Moreover, digital tools enable real-time access to knowledge by improving the speed, accuracy, and reach of information flows across organizational units. Such capabilities are particularly critical in service-sector environments characterized by high information intensity and rapid change, where timely access to updated knowledge is essential for effective decision-making and operational responsiveness (Ardda et al., 2025).

In knowledge-intensive service contexts, organizational mechanisms such as high-performance work systems (HPWS), knowledge management processes, and supervisor support play a crucial role in shaping employee experiences and workplace dynamics. High-performance work systems comprise synergistic bundles of human resource practices including training, participation, empowerment, and performance feedback designed to enhance employees' skills, motivation, and opportunities to contribute. Concurrently, knowledge management processes encompass structured activities such as knowledge acquisition, sharing, and interpretation, which facilitate the effective utilization of organizational knowledge embedded in human capital. Supervisor support, reflecting the extent to which managers value employee contributions and provide necessary resources, serves as an important contextual factor influencing employee engagement and behavior. Together, these mechanisms underscore the importance of human-centered and organizational support systems in knowledge-intensive environments (Revuelto-Taboada et al., 2023).

Finally, knowledge management processes can be understood as a set of interrelated activities knowledge creation, knowledge sharing, and knowledge utilization that collectively influence knowledge worker productivity. Among these, knowledge utilization represents the primary mechanism through which productivity is realized, as it involves the practical

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application of knowledge to task execution, problem-solving, and decision-making. In contrast, knowledge creation and sharing play supportive roles by enriching the knowledge base and facilitating its effective use. Without deliberate application, the generation and dissemination of knowledge alone do not translate into improved performance outcomes. This perspective emphasizes that productivity gains depend on the organization's ability to convert knowledge assets into actionable outputs through utilization-oriented practices (Umer et al., 2023).

In conclusion, the knowledge management process is a dynamic, cyclical, and strategically aligned system that integrates multiple interdependent activities to transform knowledge into organizational value. Its effectiveness depends on the continuous interaction between knowledge processes, technological support, and organizational mechanisms, all of which collectively enable adaptability, innovation, and sustained competitive advantage.

While the knowledge management process defines the dynamic flow of knowledge activities (Section 8.2), knowledge management systems provide the technological and structural infrastructure that enables the execution and scalability of these processes (Section 8.3).

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8.3 Knowledge Management Systems

Knowledge management systems constitute a critical technological and organizational infrastructure that supports the systematic processes of knowledge creation, storage, retrieval, sharing, and application within organizations. In the context of business management, knowledge management systems are conceptualized as integrated, IT-enabled frameworks that facilitate the effective management of both explicit and tacit knowledge to enhance decision-making and organizational performance. These systems typically comprise knowledge repositories, capture and retrieval tools, and collaborative platforms that enable seamless knowledge exchange across functional and hierarchical boundaries.

While knowledge management systems enhance accessibility, efficiency, and knowledge sharing, excessive reliance on codified knowledge

and AI may undermine tacit knowledge richness, human judgment, creativity, and contextual interpretation. A central challenge is the codification versus personalization trade-off: although databases and digital platforms enable scalable knowledge dissemination, tacit knowledge is often more effectively transferred through social interaction, mentoring, and experiential learning. Firms also confront a knowledge sharing versus protection paradox, as openness can stimulate collaboration and innovation, while excessive disclosure may erode proprietary advantages. In addition, KM systems may face privacy concerns, outdated content, information overload, and scalability limitations. Therefore, effective knowledge management depends on balancing technological systems with human expertise, sound governance, and continuous renewal of knowledge assets.

Beyond managing documented information, knowledge management systems also support the transfer of experiential and tacit knowledge through mechanisms such as communities of practice, mentoring, and interactive communication. As a result, they play a strategic role in enabling data-driven decision-making, improving operational efficiency, and fostering innovation across key domains, including supply chain management, customer relationship management, and regulatory compliance. The integration of semantic technologies further enhances knowledge management systems capabilities by enabling advanced functionalities such as semantic search, intelligent recommendation systems, and knowledge inference, thereby strengthening organizational responsiveness and strategic planning. Nevertheless, challenges related to scalability, semantic ambiguity, and data privacy remain significant constraints that organizations must address to fully leverage knowledge management systems in dynamic and complex business environments (Mohammad et al., 2025).

From a functional perspective, knowledge management systems are not merely traditional information systems but multidimensional platforms that transform data into actionable knowledge. By enabling structured access to relevant knowledge resources and incorporating advanced search and retrieval mechanisms, these systems enhance organizational learning, improve job performance, and increase productivity. Furthermore, knowledge management systems facilitate efficient knowledge transfer among stakeholders and contribute to the development of intellectual capabilities. In

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knowledge-intensive settings, particularly in higher education institutions, knowledge management systems support research, teaching, collaboration, and the dissemination and commercialization of knowledge. Consequently, they are increasingly recognized as key enablers of innovation, organizational effectiveness, and sustained competitive advantage (Mohammed, 2021).

Information technologies (IT) play a foundational and transformative role in the development and operation of knowledge management systems. Acting as the underlying infrastructure, IT enables the systematic acquisition, storage, dissemination, and utilization of knowledge across organizational processes. Digital tools such as corporate portals, intranets, knowledge bases, data analytics systems, and collaborative platforms enhance communication, reduce information-processing costs, and support both individual and collective knowledge work. Moreover, IT facilitates the development of advanced knowledge-oriented applications, including R&D management systems, innovation platforms, knowledge formalization tools, and corporate knowledge bases, thereby strengthening the organization's capacity to manage complex knowledge flows and drive innovation. In this sense, IT embeds knowledge management systems within the broader organizational information infrastructure and supports the transition toward a knowledge-driven enterprise (Polyakov et al., 2020).

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The successful implementation of knowledge management systems requires a comprehensive approach to organizational readiness that integrates structural, technological, and human dimensions. Key determinants include organizational agility, collaborative infrastructure, knowledge empowerment, and employee engagement. Organizational agility identified as the most influential factor emphasizes adaptive decision-making structures, decentralized authority, and performance evaluation systems aligned with knowledge utilization. Collaborative infrastructure underscores the importance of robust IT systems that facilitate efficient knowledge storage, accessibility, and transfer. Knowledge empowerment focuses on enhancing human capital through strategic alignment, training, incentives, and trust-building mechanisms that encourage active participation in knowledge processes. Conversely, low levels of employee engagement can hinder readiness, necessitating targeted interventions such as internal communication

strategies and team-building initiatives to foster commitment and collaboration (Purwadi & Sardjono, 2024).

From a governance perspective, knowledge management systems can also be understood as structured, standards-aligned frameworks that integrate knowledge management processes with organizational systems to ensure consistency, transparency, and effectiveness in managing knowledge assets. For instance, within the framework of ISO 30401:2018, knowledge management systems provide a common language and set of criteria that support the systematic design, evaluation, and communication of knowledge practices for purposes such as auditing, accreditation, and stakeholder engagement. Importantly, this framework does not prescribe specific tools or methods but allows flexibility in implementation, accommodating both centralized and decentralized approaches while emphasizing alignment with organizational context, value creation processes, and continuous improvement (Schmitt, 2022).

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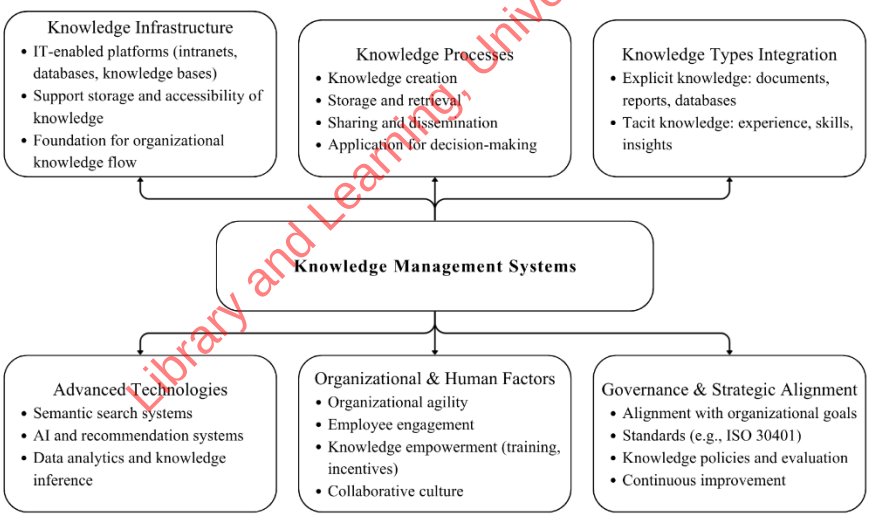

Figure 8.3 Knowledge Management Systems

Source: Adapted from Gelashvili-Luik, T., Vihma, P., & Pappel, I. (2025). Navigating the AI revolution: challenges and opportunities for integrating emerging technologies into knowledge management systems. *Frontiers in Artificial Intelligence*, 8, 1595930.

As illustrated in Figure 8.3, knowledge management systems are conceptualized as an integrated framework that combines technological infrastructure, organizational processes, and human-centric elements to enable effective knowledge utilization. At the foundational level, knowledge infrastructure comprising IT-enabled platforms such as intranets, databases, and knowledge repositories facilitates the storage, accessibility, and flow of knowledge across the organization. Building on this, core knowledge processes, including knowledge creation, storage and retrieval, sharing and dissemination, and application, ensure that knowledge is continuously transformed into actionable insights for decision-making. The system further emphasizes the integration of both explicit knowledge (e.g., documents and databases) and tacit knowledge (e.g., experience and skills), enabling a holistic approach to knowledge utilization. Supporting these components are advanced technologies such as AI, semantic search, and data analytics, alongside organizational and human factors like employee engagement, agility, and collaborative culture. Finally, governance and strategic alignment ensure that knowledge management systems initiatives are aligned with organizational objectives, guided by standards and policies, and continuously improved to sustain long-term competitive advantage.

In conclusion, knowledge management systems are integral to modern organizations as they enable the systematic transformation of knowledge into strategic value. By integrating technological infrastructure with organizational processes and human capabilities, knowledge management systems enhance decision-making, foster innovation, and improve overall performance. Despite existing challenges, their strategic importance continues to grow, particularly in increasingly complex and knowledge-intensive business environments.

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8.4 Knowledge Management Mechanisms and Concepts

Knowledge management mechanisms and concepts represent the structural, technological, and behavioral enablers that support the effective implementation of knowledge management processes within organizations. These mechanisms encompass both formal and informal practices, technological infrastructures, and governance arrangements that facilitate the

creation, sharing, protection, and utilization of knowledge to generate organizational value and mitigate risks.

At a foundational level, mechanisms such as codification systems, personalization strategies, and collaborative platforms function as critical enablers that transform dispersed individual knowledge into shared or "common knowledge." These mechanisms support multiple modes of knowledge interaction, including social learning, learning from others through information technology (IT), learning directly from IT, and IT-based knowledge substitution. Each mode contributes differently to knowledge sharing and utilization. Through these processes, organizations create intersections among individual knowledge bases, fostering common knowledge defined as a shared understanding that enables individuals to interpret, integrate, and apply knowledge effectively across contexts. This shared cognitive foundation enhances the ability to identify relevant knowledge, assimilate new insights, and coordinate actions, thereby improving both individual decision-making and organizational performance. However, the effectiveness of these mechanisms depends not only on accessibility but also on the extent to which knowledge is socially and contextually embedded. Interpersonal mechanisms, such as social learning and IT-enabled interaction, tend to strengthen the perceived value of knowledge, whereas purely IT-driven mechanisms may yield mixed effects depending on the level of analysis. Consequently, knowledge management mechanisms shape not only access to knowledge but also how it is interpreted, valued, and applied within organizations (Sabherwal et al., 2023).

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From an operational perspective, knowledge-sharing mechanisms play a central role in enhancing problem-solving capabilities and organizational learning. Structured approaches including participative practices (e.g., meetings, discussions, and feedback processes) and standardized practices (e.g., procedures, manuals, and guidelines) create a supportive context for knowledge generation, articulation, and dissemination. Participative practices facilitate direct interaction and collaboration, enabling the exchange and articulation of tacit knowledge, while standardized practices codify knowledge into accessible formats that support consistency and organizational memory. Together, these mechanisms improve employees' capacity to access relevant knowledge, interpret complex situations, and

apply appropriate solutions. Importantly, knowledge management mechanisms should be conceptualized not merely as technical tools but as socio-organizational arrangements that embed communication structures, shared understanding, and collective learning into everyday work practices (Galeazzo & Furlan, 2019).

From a strategic standpoint, knowledge management mechanisms also involve the protection and appropriation of valuable knowledge assets. Secrecy appropriation mechanisms are employed to safeguard innovations by restricting access to critical knowledge, thereby enabling firms to capture economic value. Beyond formal protections such as intellectual property rights, these mechanisms include broader secrecy-based practices, such as access restrictions (e.g., secure systems and physical barriers) and handling rules (e.g., non-disclosure agreements). These measures ensure that knowledge is selectively shared internally while being protected from external exposure. Notably, secrecy mechanisms involve an inherent trade-off: while they are designed to prevent knowledge leakage and maintain exclusivity, they must also allow sufficient internal knowledge flows to support value creation. Their effectiveness therefore depends on achieving a balance between protection and accessibility, as excessive secrecy can hinder collaboration and innovation, whereas insufficient protection may weaken competitive advantage (Hannah et al., 2018).

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Technological advancements have further expanded the scope and sophistication of knowledge management mechanisms. The integration of artificial intelligence (AI) techniques enables the development of self-learning knowledge management systems that continuously improve through user interaction. In this context, knowledge matching is enhanced through bidirectional dimension reduction, which reduces redundancy in both case instances and their attributes. Information gain is used to retain critical attributes, while spectral clustering identifies and eliminates inconsistent knowledge cases, thereby improving matching accuracy and efficiency. As a result, these systems provide more precise and relevant knowledge to support decision-making processes (Zhou et al., 2025).

In parallel, blockchain technology enhances knowledge management mechanisms by strengthening trust, traceability, and data integrity. Through its decentralized, transparent, and immutable architecture, blockchain enables

the creation of a shared ledger in which knowledge transactions are securely recorded, time-stamped, and cryptographically linked. This structure ensures a verifiable and auditable history of knowledge creation, modification, and access. As a result, data integrity is reinforced by preventing unauthorized alterations, while traceability is improved by allowing stakeholders to track the origin and flow of knowledge assets. Furthermore, the absence of a central authority reduces single points of failure and fosters trust among participants operating within a shared data infrastructure. The use of smart contracts further enhances governance by automating validation, access control, and knowledge-sharing rules, thereby reducing human error and opportunistic behavior. Collectively, these features improve accountability, protect intellectual assets, and promote secure knowledge exchange, ultimately strengthening the sustainability and resilience of organizational knowledge systems (Khachaturyan & Klicheva, 2026).

Moreover, knowledge management mechanisms are increasingly associated with risk management and sustainability objectives. In particular, mechanisms embedded within green implementation networks play a critical role in manufacturing environments by supporting systematic knowledge acquisition, sharing, and utilization across organizational and inter-organizational contexts. Knowledge-sharing practices ensure that relevant technical information is available in a timely manner, enabling employees, engineers, and managers to address operational challenges, improve decision accuracy, and maintain process continuity. The integration of knowledge management processes within green-oriented communication, learning, planning, and R&D networks facilitates coordinated information exchange, enhances knowledge efficiency, and supports effective responses to complex technical issues. Additionally, the timely dissemination of technical knowledge contributes to improved planning, monitoring, and maintenance of production systems, which are essential for managing uncertainties related to system design, processes, and technological implementation. In this context, knowledge management mechanisms function as organizational capabilities that support effective information flow, collaborative problem-solving, and continuous learning within environmentally oriented operational frameworks (Alam et al., 2023).

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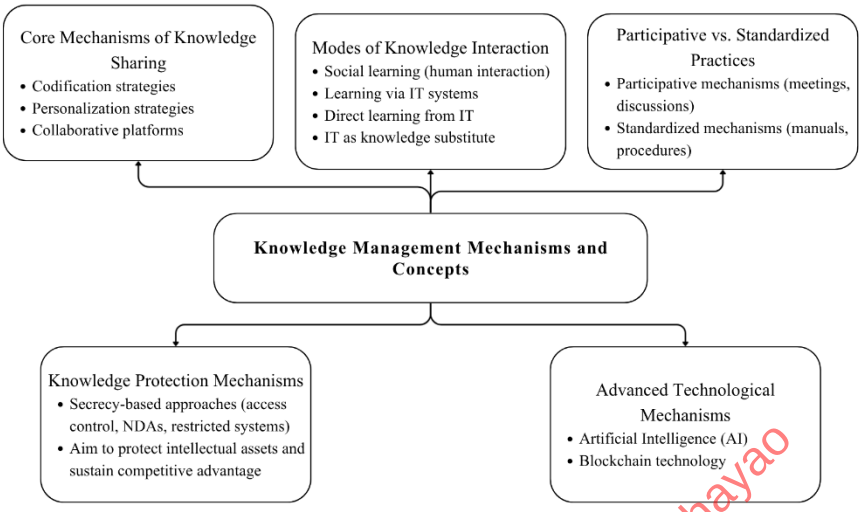

Figure 8.4 Knowledge Management Mechanisms and Concepts

Source: Adapted from Pereira, C., Delgoulet, C., & Santos, M. (2023). Conceptual framework for management or transmission of knowledge in companies: A systematic review. *Frontiers in Psychology*, 14, 1124650.

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As illustrated in Figure 8.4, knowledge management mechanisms and concepts encompass a comprehensive set of structural, behavioral, and technological enablers that facilitate effective knowledge processes within organizations. At the core, knowledge sharing is driven by codification strategies, personalization approaches, and collaborative platforms, which support both explicit and tacit knowledge exchange. These mechanisms operate through various modes of interaction, including social learning, IT-mediated learning, and the substitution of human knowledge by technological systems. Furthermore, organizations balance participative practices such as meetings and discussions with standardized approaches like manuals and formal procedures to ensure consistency and adaptability. Complementing these are knowledge protection mechanisms that safeguard intellectual assets through access controls and confidentiality practices, thereby sustaining competitive advantage. Finally, advanced technological mechanisms, particularly artificial intelligence and blockchain, enhance the efficiency, security, and scalability of knowledge management systems in the digital era.

In conclusion, knowledge management mechanisms constitute a multifaceted system of structural, technological, and socio-organizational enablers that shape how knowledge is created, shared, protected, and utilized within organizations. Their effectiveness depends on the alignment between technological infrastructures, social interaction processes, and governance structures, as well as the organization's ability to balance knowledge accessibility with protection. When effectively designed and implemented, these mechanisms enhance decision-making quality, strengthen organizational learning, safeguard strategic knowledge assets, and support resilience and sustainability in increasingly complex and dynamic environments.

8.5 Knowledge Management Technologies

Knowledge management technologies constitute the digital and infrastructural backbone that enables the systematic creation, storage, sharing, integration, and application of knowledge across organizational contexts. These technologies refer to the application of information technology infrastructures, tools, and platforms that support a wide range of knowledge management activities, including knowledge creation, acquisition, storage, retrieval, sharing, and application. By facilitating these processes, knowledge management technologies enable organizations to manage knowledge resources in a more structured, efficient, and scalable manner.

Knowledge management technologies encompass both standardized and customized IT solutions, such as databases, collaborative systems, communication platforms, and decision-support tools. These systems enhance organizational learning, improve problem-solving capabilities, and increase knowledge accessibility. In addition, they play a crucial role in supporting communication and collaboration among organizational members, thereby enabling the integration of dispersed knowledge and fostering continuous learning environments. Through the embedding of technological support into knowledge-related activities, organizations can streamline workflows, improve information accuracy, and enhance the overall effectiveness of knowledge utilization in both operational and strategic contexts (Liu et al., 2022).

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From a digital perspective, knowledge management technologies involve the application of information and communication technologies (ICT) to systematically manage organizational knowledge within increasingly complex digital environments. These technologies include advanced systems such as artificial intelligence, cloud computing, big data analytics, and semantic-based platforms, which facilitate the integration of heterogeneous data and support data-driven decision-making. They also enable the management of both structured and unstructured knowledge such as text, images, and multimedia through advanced processing capabilities. Furthermore, functionalities such as intelligent search, personalized information retrieval, and virtual assistant interactions enhance the efficiency and effectiveness of knowledge utilization. As digital transformation progresses, these technologies continue to evolve into more intelligent, adaptive, and scalable systems capable of supporting continuous knowledge flows across organizational and inter-organizational contexts (Lim & Hwang, 2024).

In addition, knowledge management technologies increasingly incorporate environmentally sustainable infrastructures, including green information technology (GIT). These systems support the systematic processes of knowledge creation, storage, dissemination, and application while minimizing environmental impact. By enabling efficient data transmission, processing, and storage, such technologies facilitate the management of both tacit and explicit knowledge across organizational boundaries. They also provide mechanisms for organizing, codifying, and distributing knowledge resources, while supporting real-time communication and coordination among stakeholders in a sustainable manner (Sadiq et al., 2025).

Emerging technologies further expand the capabilities of knowledge management systems by introducing new paradigms for knowledge governance and exchange. For example, blockchain technology provides a decentralized and distributed ledger infrastructure that enables secure and transparent knowledge transactions. Its core features immutability, cryptographic security, and consensus-based validation ensure data integrity, traceability, and resistance to unauthorized modification. As a result, blockchain enhances the reliability of knowledge sharing, supports real-time

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information synchronization among stakeholders, and strengthens trust in inter-organizational knowledge exchanges (Sun et al., 2022).

Moreover, big data analytics and neural network technologies play a pivotal role in advanced knowledge management by enabling the processing and analysis of large-scale, heterogeneous datasets. These technologies transform raw data into actionable knowledge through computational models capable of pattern recognition, feature extraction, and predictive analysis. Neural networks, in particular, support adaptive learning and continuous improvement through iterative processing, thereby enhancing the accuracy and reliability of knowledge outputs. This integration enables organizations to refine knowledge management practices, optimize decision-making processes, and support continuous organizational learning (Zhao et al., 2022).

The integration of these advanced technologies is transforming traditional knowledge management systems into adaptive, data-driven ecosystems that support real-time decision-making, continuous learning, and innovation. In this context, emerging technologies such as the metaverse provide immersive and interactive environments for knowledge exchange. These virtual environments facilitate collaboration, simulation-based learning, and experiential knowledge creation across spatial and organizational boundaries. When supported by strong knowledge management practices and high levels of technological readiness, such environments enhance organizational capabilities in leveraging digital insights, improving coordination, and fostering innovation, while also contributing to sustainability through reduced reliance on physical resources (Jabeen et al., 2026).

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At the operational level, knowledge management technologies are embedded in domain-specific applications, particularly in logistics and warehouse management. In these contexts, technologies such as warehouse management systems, inventory management systems, and inventory picking systems support the organization, processing, and utilization of operational data. These tools facilitate key activities, including storage management, product handling, and inventory control, while IT systems enable data integration and coordination across operational processes. Consequently, knowledge management technologies play a critical role in structuring and

managing operational knowledge, enhancing efficiency, and supporting routine decision-making in warehouse environments (Suvittawat, 2016).

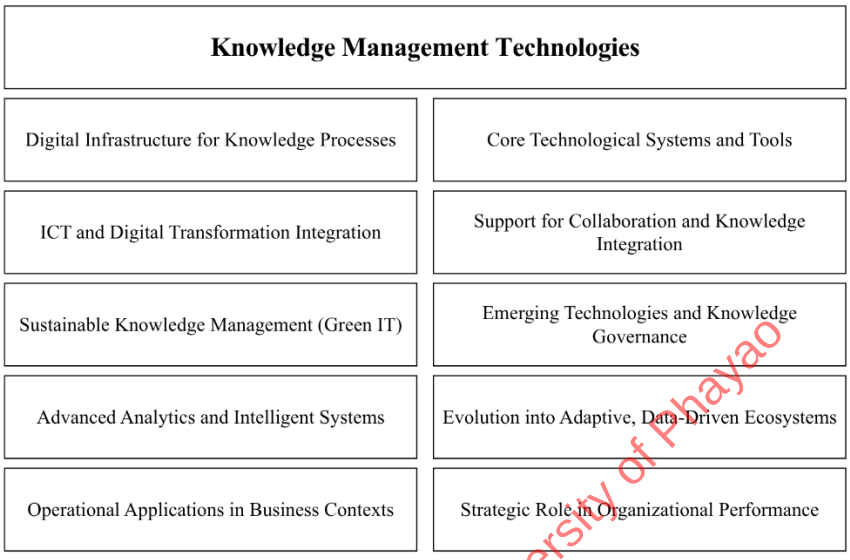

Figure 8.5 Knowledge Management Technologies

Source: Adapted from Gelashvili-Luik, T., Vihma, P., & Pappel, I. (2025). Navigating the AI revolution: challenges and opportunities for integrating emerging technologies into knowledge management systems. *Frontiers in Artificial Intelligence*, 8, 1595930.

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As illustrated in Figure 8.5, knowledge management technologies constitute a comprehensive and integrated digital ecosystem that underpins the effective execution of organizational knowledge processes. These technologies encompass digital infrastructures that enable knowledge creation, storage, and dissemination, alongside core technological systems and tools that facilitate systematic knowledge handling. The integration of ICT and digital transformation further enhances connectivity and real-time accessibility, while collaborative platforms support knowledge sharing and integration across organizational boundaries. Additionally, the incorporation of sustainable practices through Green IT reflects an increasing emphasis on environmentally responsible knowledge management. Emerging technologies and governance mechanisms ensure adaptability, security, and compliance,

while advanced analytics and intelligent systems enable data-driven decision-making and insight generation. Collectively, these elements drive the evolution of knowledge management into adaptive, data-driven ecosystems, reinforcing their strategic role in improving operational efficiency, innovation capacity, and overall organizational performance.

In conclusion, knowledge management technologies represent a critical enabler of effective knowledge management by providing the digital infrastructure necessary for managing, integrating, and utilizing knowledge across organizational levels. Their continuous evolution driven by advancements in digital, intelligent, and sustainable technologies enhances organizational capabilities in knowledge creation, sharing, and application, thereby supporting more efficient operations and informed decision-making in increasingly complex environments.

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Case Study

Key Determinants of Effective Warehouse Management: Evidence from Eastern Thailand

Adapted Reprint from:

Suvittawat, A. (2016). Majors factors for effective warehouse management: Eastern part of Thailand perspective. International Journal of Applied Business and Economic Research, 14(6), 3757-3763.

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1. Introduction

Warehouses play a critical role in modern supply chain management, even as firms attempt to move toward direct-to-customer distribution models. Despite these efforts, effective warehouse management remains essential due to its complexity and the multiple factors influencing operational performance. Organizations must therefore continue to optimize warehouse functions to support overall supply chain efficiency.

Thai logistics entrepreneurs currently face several structural challenges, including ineffective purchasing planning, high production and transportation costs, and suboptimal warehouse management practices. These issues weaken their competitiveness, particularly as foreign logistics firms increasingly enter the Thai market. In this context, warehouse management becomes a key source of competitive advantage, especially through improved inventory optimization and enhanced customer service.

Effective warehouse management is multidimensional and varies according to business type, firm size, and competitive environment. This study focuses on identifying key warehouse management parameters among Thai entrepreneurs, with a distinction between public and private warehouses. The findings aim to provide practical insights that help improve inventory management and customer service, thereby strengthening long-term competitive advantage.

2. National Context: Determinants of Effective Warehouse Management in Eastern Thailand

Advanced logistics planning plays a critical role in optimizing warehouse space utilization and reducing procurement and inventory costs. Adequate warehouse capacity allows firms to store larger volumes, leading to lower ordering costs, improved transportation efficiency, and reduced risk of stockouts. Additionally, a clear understanding of SKU and pallet requirements is essential for designing warehouses that maximize space efficiency and support appropriate material handling systems.

Modern warehouses face increasing pressure to remain flexible and responsive to demand fluctuations. Traditional warehouse systems must adapt quickly to changing economic conditions and seasonal variations, making operational flexibility a key competitive advantage. However, maintaining this adaptability while sustaining efficiency presents an ongoing challenge for warehouse managers.

One of the most complex tasks in warehouse management is determining optimal storage locations for a large number of products. This decision is influenced by multiple factors, including picking methods, warehouse layout, material handling systems, product characteristics, demand variability, and turnover rates. Effective storage assignment is therefore essential to ensure operational efficiency and responsiveness.

Effective warehouse design enhances space utilization, equipment allocation, and accessibility of goods. Key operational decisions include layout design, picking policies, storage assignment, and routing strategies. Since warehouse operations significantly impact customer service levels, logistics costs, and overall business performance accounting for approximately 22% of total logistics costs well-designed and efficiently managed warehouses are essential for achieving cost efficiency and competitive advantage.

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3. Methodology and Research Framework

This exploratory study examined emerging determinants influencing effective inventory management within Thailand's logistics sector and assessed the extent to which warehouse management factors contribute to firms' competitive advantage. A quantitative approach was employed using structured questionnaires, complemented by qualitative contextual methods

for initial parameter identification. Secondary data were derived from a comprehensive literature review to support and validate the findings.

The research process began with an extensive review of the literature, from which measurement parameters particularly those related to workforce issues were developed. These measures were refined through consultations with supervisors and domain experts, followed by pilot testing with selected entrepreneurs. The validated instruments were subsequently applied in the final survey. Data were analyzed using descriptive statistics, specifically mean and standard deviation. The study sample comprised 53 entrepreneurs engaged in warehousing operations. To further corroborate the survey results, direct observations of workers were conducted.

The survey consists of measures capturing key constructs:

- Independent Variables – effective warehouse space utilization, specific product handling methods, different product feature handling methods, effective warehouse management system, effective inventory management system, effective inventory picking system, warehouse management for cost reduction, regular problems of inventory management, effective IT system, and benefits of specific software for warehouse management
- Effective Warehouse Management
- Optimum Inventory Level
- Customer Service Improvement
- Competitive Advantage

Based on the research framework, the independent variables—effective warehouse space utilization, specific product handling methods, different product feature handling methods, effective warehouse management system, effective inventory management system, effective inventory picking system, warehouse management for cost reduction, regular problems of inventory management, effective IT system, and benefits of specific software for warehouse management have direct effects on effective warehouse management. In turn, effective warehouse management has a direct influence on optimum inventory level and customer service improvement. Furthermore, optimum inventory level and customer service improvement have direct effects on competitive advantage.

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4. Findings and Discussion

The findings from the three sets of results indicate a generally moderate to high level of agreement among firms regarding the factors influencing effective warehouse management, although the relative importance of specific factors varies across contexts. In the first dataset (Mean = 2.97, S.D. = 0.85), firms demonstrated strong agreement on operational and physical aspects, particularly effective warehouse space utilization (Mean = 4.25) and specific product handling methods (Mean = 3.78), suggesting that tangible, process-oriented practices are perceived as critical drivers. However, comparatively lower mean scores for effective IT systems (Mean = 2.51) and software benefits (Mean = 2.50) indicate a limited emphasis on technological integration, possibly reflecting constraints in digital adoption or investment.

In contrast, the second dataset (Mean = 3.46, S.D. = 0.90) reflects a shift toward stronger recognition of technological and system-based capabilities. The highest-rated factors include benefits of warehouse management software (Mean = 4.17), effective IT systems (Mean = 3.86), and warehouse management systems (Mean = 3.72), highlighting the growing importance of digital infrastructure in enhancing warehouse performance. Interestingly, traditional operational factors such as warehouse space utilization (Mean = 2.79) and inventory picking systems (Mean = 2.65) received relatively lower ratings, suggesting that firms in this group may prioritize technological efficiency over physical optimization.

The third dataset (Mean = 3.34, S.D. = 0.85) presents a more balanced perspective, where both operational and technological factors are moderately emphasized. Key variables such as effective warehouse management systems (Mean = 3.57), specific product handling methods (Mean = 3.57), and effective inventory management (Mean = 3.53) indicate that firms recognize the need for integrated approaches combining process efficiency and system support. Meanwhile, moderate scores for IT systems (Mean = 3.18) and software benefits (Mean = 3.33) suggest an increasing, but not yet dominant, role of technology.

Overall, the discussion reveals a progression in warehouse management priorities: from a strong reliance on physical operations and manual processes, toward a more technology-driven approach, and finally to an integrated model that balances both dimensions. This variation may reflect differences in firm size, digital maturity, or strategic orientation. Importantly,

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the findings suggest that achieving effective warehouse management in the Thai logistics context requires not only optimizing space and handling processes but also leveraging IT systems and specialized software to enhance efficiency, accuracy, and competitiveness.

5. Synthesis

This case study demonstrates that effective warehouse management is not merely an operational function, but a knowledge-intensive capability that integrates information, experience, and technology to enhance organizational performance. From a knowledge management perspective, warehouse effectiveness is determined by the organization's ability to create, share, and apply knowledge across multiple dimensions. First, factors such as warehouse space utilization, product handling methods, and inventory systems represent explicit knowledge embedded in standard operating procedures, system design, and technological tools. These codified forms of knowledge promote consistency, efficiency, and scalability in warehouse operations. Second, operational practices such as adapting to changes in material flow, managing diverse product characteristics, and resolving recurring inventory issues illustrate the importance of tacit knowledge, particularly the experiential insights of managers and frontline employees. The study's use of observational evidence to validate survey findings further reinforces the significance of practical know-how in effective decision-making. Third, the increasing importance of IT systems and warehouse management software highlights the role of knowledge integration mechanisms. These technologies serve as platforms for capturing, storing, and disseminating real-time operational data, thereby improving coordination, visibility, and responsiveness across the supply chain. Finally, the relationship between effective warehouse management and outcomes such as optimal inventory levels, cost reduction, and enhanced customer service indicates that knowledge management contributes directly to competitive advantage. Organizations that successfully leverage both tacit and explicit knowledge can achieve greater agility, improved resource utilization, and superior service performance. Accordingly, effective warehouse management can be understood as a knowledge management process in which continuous learning, knowledge sharing, and technology-enabled decision-making drive operational excellence and sustained competitiveness.

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The theoretical implications of warehouse knowledge management suggest that warehouse performance is shaped not only by physical assets

and operational routines, but also by the ways knowledge is acquired, transferred, and utilized throughout logistics activities. First, the study reinforces the importance of core knowledge management processes, particularly knowledge acquisition and knowledge application. Warehouses acquire knowledge through operational data, employee experience, supplier collaboration, and system feedback, while knowledge application occurs when these insights are translated into decisions concerning inventory control, space optimization, picking accuracy, and cost efficiency. Second, the findings highlight the dynamic interaction between tacit and explicit knowledge. Tacit knowledge resides in employees' experiential understanding of product handling, workflow adaptation, and problem-solving, whereas explicit knowledge is embedded in procedures, databases, and standardized manuals. Effective warehouse management therefore depends on converting tacit insights into explicit routines while simultaneously preserving valuable human expertise. Third, the study underscores the growing strategic role of digital knowledge management systems, including warehouse management systems, inventory platforms, and IT-enabled tracking tools. These systems codify operational knowledge, enhance visibility, and support real-time decision-making. Consequently, warehouse competitiveness can be theorized as a knowledge-based capability in which technology-enabled systems complement human expertise to improve efficiency, adaptability, and responsiveness.

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6. Conclusion

The study identifies a general consensus among warehousing entrepreneurs regarding the key determinants of effective warehouse management. Efficient warehouse space utilization requires continuous adaptation to fluctuating material flows, distinguishing it from manufacturing operations. Proper rack design plays a critical role in maximizing both vertical and horizontal storage capacity while maintaining safety standards. Organizations increasingly optimize space by integrating advanced storage systems such as racks and shelving. Additionally, the allocation of designated areas for unused pallets is essential to ensure operational readiness and flexibility, particularly when handling varied customer requirements. In specialized contexts, such as food processing, strict spatial separation is necessary to maintain sanitation standards. Finally, the adoption of user-friendly computer systems enhances warehouse efficiency by supporting storage management and facilitating both new facility development and renovation.

Case Study Questions

1. A logistics company in Eastern Thailand is experiencing inefficiencies in warehouse operations. Evaluate how factors such as warehouse space utilization, product handling methods, and IT systems influence effective warehouse management. Which factors are most critical and why?
2. A warehouse reports frequent inventory discrepancies and delays in order picking. Using the conceptual framework, analyze how regular inventory problems and ineffective picking systems affect overall warehouse performance. Propose corrective strategies.
3. Explain how effective warehouse management acts as a mediating variable between operational factors (e.g., inventory management systems, cost reduction practices) and outcomes such as optimum inventory level and customer service improvement. Provide real or hypothetical examples.
4. Compare two warehouses: one public and one private. Based on the study findings, analyze how differences in IT systems and software utilization impact their warehouse management effectiveness and competitive advantage.
5. A firm aims to improve its competitive advantage through warehouse operations. Using the conceptual framework, design a strategic plan that integrates key variables (e.g., warehouse management system, inventory system, cost reduction) to enhance customer service and inventory optimization.

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Chapter Summary

This chapter advances knowledge management literature by conceptualizing knowledge management as an integrated capability ecosystem that aligns processes, technologies, and organizational mechanisms to enhance innovation and performance.

Knowledge management is a strategic and systematic organizational capability that involves the creation, capture, organization, sharing, and application of both explicit and tacit knowledge to enhance decision-making, innovation, and overall performance. It integrates technological infrastructure, organizational processes, and a collaborative culture to facilitate continuous learning, improve knowledge accessibility, and reduce knowledge silos. By strengthening absorptive capacity and embedding knowledge into organizational routines, knowledge management enables firms to effectively utilize intellectual capital, enhance adaptability, and sustain competitive advantage in dynamic environments.

The knowledge management process is a dynamic, cyclical system of interrelated activities through which knowledge is acquired, developed, stored, shared, applied, and evaluated to generate organizational value. It encompasses key processes such as knowledge acquisition, conversion, application, and protection, supported by continuous feedback and strategic alignment. These processes are iterative rather than linear, enabling organizations to transform knowledge into actionable outcomes, enhance decision-making, and support innovation. The integration of digital technologies further strengthens this process by improving knowledge storage, accessibility, and real-time utilization, thereby increasing organizational responsiveness and effectiveness.

Knowledge management systems are integrated, IT-enabled platforms that support the systematic handling of knowledge through functions such as creation, storage, retrieval, sharing, and application. These systems combine knowledge repositories, collaborative tools, and advanced technologies to facilitate both explicit and tacit knowledge exchange across organizational boundaries. By transforming data into actionable insights, knowledge management systems enhance organizational learning, improve productivity,

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and support innovation and decision-making. Their effectiveness depends on the alignment of technological infrastructure, organizational processes, and human factors such as engagement, collaboration, and readiness.

Knowledge management mechanisms and concepts refer to the structural, technological, and socio-organizational enablers that facilitate knowledge creation, sharing, protection, and utilization. These include formal mechanisms (e.g., codification systems, standardized procedures) and informal mechanisms (e.g., social learning, collaboration), which collectively help transform individual knowledge into shared organizational knowledge. Advanced mechanisms such as AI and blockchain further enhance knowledge accuracy, security, and traceability. Importantly, these mechanisms must balance knowledge accessibility with protection, as effective knowledge management depends on both efficient knowledge flow and safeguarding strategic knowledge assets.

Knowledge management technologies represent the digital infrastructure and tools that enable efficient knowledge creation, storage, sharing, integration, and application across organizations. These technologies include databases, collaborative platforms, artificial intelligence, big data analytics, cloud computing, and blockchain, all of which support the management of both structured and unstructured knowledge. By enhancing communication, enabling data-driven decision-making, and supporting real-time knowledge flows, these technologies transform traditional knowledge management into adaptive, intelligent ecosystems. Their integration also improves operational efficiency, fosters continuous learning, and strengthens organizational capability in complex and rapidly changing environments.

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Chapter Review Questions

Review Question 1:

How does knowledge management function as a strategic organizational capability in integrating tacit and explicit knowledge to enhance decision-making, innovation, and long-term competitive advantage?

Review Question 2:

Critically explain how the cyclical and interdependent nature of knowledge management processes (e.g., acquisition, conversion, application, and protection) contributes to organizational adaptability and value creation.

Review Question 3:

Evaluate the role of knowledge management systems as IT-enabled infrastructures in transforming organizational knowledge into actionable insights and supporting decision-making and innovation.

Review Question 4:

Analyze how knowledge management mechanisms such as codification, personalization, and knowledge-sharing practices facilitate the creation of common knowledge and improve organizational learning and problem-solving capabilities.

Review Question 5:

Discuss how emerging knowledge management technologies (e.g., AI, big data analytics, and blockchain) enhance the efficiency, scalability, and strategic value of knowledge management in digital organizations.

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Chapter Exercises

Exercise 1:

Based on the definition of knowledge management, explain how knowledge management differs from traditional information management. In your answer:

1. Distinguish between explicit knowledge and tacit knowledge.
2. Discuss how knowledge management contributes to organizational performance and innovation.
3. Provide a real-world example (e.g., SME, hospital, or logistics firm) illustrating how knowledge management supports decision-making.

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Exercise 2:

Analyze the knowledge management process as a dynamic and cyclical system.

1. Identify and explain the key stages:
   - Knowledge acquisition
   - Knowledge sharing
   - Knowledge development
   - Knowledge preservation
   - Knowledge application
2. Draw a process diagram illustrating how these stages interact.
3. Critically evaluate why knowledge application is considered the most crucial stage for organizational performance.

Exercise 3:

A mid-sized company plans to implement a Knowledge Management System (KMS).

1. Identify the core components of a KMS (e.g., repositories, collaboration tools).
2. Evaluate the role of information technology (IT) in supporting KMS.

3. Propose three key success factors for effective implementation (e.g., organizational readiness, employee engagement).
4. Discuss one potential challenge (e.g., data privacy, scalability) and suggest a solution.

Exercise 4:

Critically analyze the role of knowledge management mechanisms in enabling knowledge sharing and protection.

1. Compare codification vs. personalization strategies.
2. Explain how participative practices and standardized practices support knowledge sharing.
3. Analyze the trade-off between knowledge accessibility and knowledge protection (e.g., secrecy mechanisms).
4. Provide an example of how organizations balance this trade-off.

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Exercise 5:

Evaluate the role of digital technologies in enhancing knowledge management.

1. Identify and explain at least three technologies (e.g., AI, big data analytics, blockchain, cloud computing).
2. Discuss how these technologies improve:
   - Knowledge creation
   - Knowledge sharing
   - Decision-making
3. Analyze how emerging technologies (e.g., metaverse) may transform future knowledge management practices.

References

Abusweilem, M. A., & Abualoush, S. (2019). The impact of knowledge management process and business intelligence on organizational performance. *Management Science Letters, 9*(12), 2143-2156. https://doi.org/10.5267/j.msl.2019.6.020

Alam, S., Zhang, J., Muhammad, S., Ali, A., & Khan, N. (2023). The mechanism of knowledge management process toward minimizing technical risks under green implementation network: a direct and configurational approach. *Journal of Manufacturing Technology Management, 34*(6), 937-960. https://doi.org/10.1108/JMTM-03-2023-0085

Ardda, A., Yahya Mohammed, H. O., & Khairi, K. F. (2025). The Mediating Role of Knowledge Management Processes in the Relationship Between Digital Transformation and Intellectual Capital in the Service Sector. *Paper Asia, 41*(4), 369-379. https://doi.org/10.59953/paperasia.v41i4b.507

Bloem, V., & Salimi, N. (2023). Role of knowledge management processes within different stages of technological innovation: evidence from biotechnology SMEs. *Knowledge Management Research & Practice, 21*(4), 822-836. https://doi.org/10.1080/14778238.2022.2064352

Fan, Z., & Beh, L.-S. (2024). Knowledge sharing among academics in higher education: A systematic literature review and future agenda. Educational Research Review, 42, 100573. https://doi.org/10.1016/j.edurev.2023.100573

Fang, Z., Daniela, P. C., Zhang, W., Marian, M. L., Alfawzan, A. S., & Wang, Y. (2026). Digital Strategy, Leadership, and Knowledge Management as Economic Drivers of Transformation Success in the Manufacturing Sector. *Journal of Global Information Management, 34*(1). https://doi.org/10.4018/JGIM.402044

Library and Learning, University of Phayao

Galeazzo, A., & Furlan, A. (2019). Good problem solvers? Leveraging knowledge sharing mechanisms and management support. *Journal of Knowledge Management, 23*(6), 1017-1038. https://doi.org/10.1108/JKM-05-2018-0290

Gelashvili-Luik, T., Vihma, P., & Pappel, I. (2025). Navigating the AI revolution: challenges and opportunities for integrating emerging technologies into knowledge management systems. Frontiers in Artificial Intelligence, 8, 1595930. https://doi.org/10.3389/frai.2025.1595930

Hannah, D., Parent, M., Pitt, L., & Berthon, P. (2018). Secrets and knowledge management strategy: the role of secrecy appropriation mechanisms in realizing value from firm innovations. *Journal of Knowledge Management, 23*(2), 297-312. https://doi.org/10.1108/JKM-09-2017-0389

Henz, J. L., & Oliveira, M. (2024). Knowledge management implementation: A systematic literature review. Knowledge and Process Management, 31(4), 284–294. https://doi.org/10.1002/kpm.1780

Jabeen, M., Jafar, R. M. S., & Li, Z. (2026). Leveraging metaverse technologies for a sustainable future: The role of knowledge management practices and technology readiness. *Technology in Society, 84*, 103122. https://doi.org/10.1016/j.techsoc.2025.103122

Khachaturyan, M. V., & Klicheva, E. V. (2026). Transformation of the Economic Sustainability Management System of Russian Industrial Companies Utilizing Blockchain Technologies and Knowledge Management Mechanisms. *Journal of Innovation & Knowledge, 15*, 100997. https://doi.org/10.1016/j.jik.2026.100997

Lim, J., & Hwang, J. (2024). Exploring knowledge management technologies to enhance sustainability and mitigate technostress from a collaborative perspective. *Journal of Knowledge Management, 30*(2), 448-467. https://doi.org/10.1108/jkm-12-2023-1304

Library and Learning, University of Jinan

Liu, G., Kianto, A., & Tsui, E. (2022). Knowledge management technologies and organizational performance: a meta-analytic study. *Industrial Management & Data Systems, 123*(2), 386-408. https://doi.org/10.1108/imds-02-2022-0121

Mohammad, Y., Nachouki, M., & Mohamed, E. A. (2025). Knowledge Management Systems in Business Management Using Knowledge Graphs and Semantic Technologies. *International Journal of Knowledge Management, 21*(1). https://doi.org/10.4018/IJKM.369121

Mohammed, A. A. (2021). Assessing the Success of the Perceived Usefulness for Knowledge Management Systems: A Case Study of Iraqi Higher Education. *International Journal of Knowledge Management, 18*(1). https://doi.org/10.4018/IJKM.291098

Nhut, Q. L., Quoc, T. V., Xuan, N. N. A., & Le, D. V. (2024). Leveraging Knowledge Management to Enhance Human Resource Management Efficiency: Insights from Mekong Delta Service Enterprises. *Journal of Chinese Human Resources Management, 15*(2), 91-100. https://doi.org/10.47297/wspchrmWSP2040-800505.20241502

Pepple, D. G., & Dore-Okuiomse, M. M. (2023). An enabler framework for developing knowledge management practices: Perspectives from Nigeria. *South African Journal of Information Management, 25*(1), Article a1647. https://doi.org/10.4102/sajim.v25i1.1647

Pereira, C., Delgoulet, C., & Santos, M. (2023). Conceptual framework for management or transmission of knowledge in companies: A systematic review. Frontiers in Psychology, 14, 1124650. https://doi.org/10.3389/fpsyg.2023.1124650

Polyakov, M., Khanin, I., Bilozubenko, V., Korneyev, M., & Nebaba, N. (2020). Information technologies for developing a company's knowledge management system. *Knowledge and Performance Management, 4*(1), 15-25. https://doi.org/10.21511/kpm.04(1).2020.02

Library and Learning, University of Phayao

Purwadi, I. K. B., & Sardjono, W. (2024). Developing Strategies to Improve Organizational Readiness for Knowledge Management System Implementation. *Journal of System and Management Sciences, 14*(2), 372-384. https://doi.org/10.33168/JSMS.2024.0223

Raudeliūnienė, J., Davidavičienė, V., & Jakubavičius, A. (2018). Knowledge management process model. *Entrepreneurship and Sustainability Issues, 5*(3), 542-554. https://doi.org/10.9770/jesi.2018.5.3(10)

Revuelto-Taboada, L., Portalanza-Chavarría, A., & Cedeño-Alejandro, F. (2023). Promoting intrapreneurial behavior in banking: the role of high-performance work systems, knowledge management processes, and supervisor support. *Service Business, 17*(3), 789-817. https://doi.org/10.1007/s11628-023-00539-7

Sabherwal, R., Steelman, Z., & Becerra-Fernandez, I. (2023). Knowledge management mechanisms and common knowledge impacts on the value of knowledge at individual and organizational levels. *International Journal of Information Management, 72*, 102660. https://doi.org/10.1016/j.ijinfomgt.2023.102660

Sadiq, M., Pham Thi, T. D., Nguyen, C. M., & Do, H.-D. (2025). Sustainable entrepreneurship and knowledge management: Role of green information technology in building sustainable entrepreneurial ecosystems. *Journal of Innovation & Knowledge, 10*(3), 100689. https://doi.org/10.1016/j.jik.2025.100689

Schmitt, U. (2022). Validating and documenting a new knowledge management system philosophy: a case based on the ISO 30401:2018-KMS standard. *Knowledge Management Research & Practice, 20*(6), 960-974. https://doi.org/10.1080/14778238.2022.2064349

Sun, Y., Shahzad, M., & Razzaq, A. (2022). Sustainable organizational performance through blockchain technology adoption and knowledge management in China. *Journal of Innovation & Knowledge, 7*(4), 100247. https://doi.org/10.1016/j.jik.2022.100247

Library and Learning, University of Phayao

Suparwadi, n., Musadieq, M. A., Riza, M. F., & Hutahayan, B. (2024). Leveraging intellectual capital and knowledge management to drive innovation and organizational performance. *International Journal of Engineering Business Management, 16*, 18479790241304563. https://doi.org/10.1177/18479790241304563

Suvittawat, A. (2016). Majors factors for effective warehouse management: Eastern part of Thailand perspective. *International Journal of Applied Business and Economic Research, 14*(6), 3757-3763. https://www.scopus.com/inward/record.uri?eid=2-s2.0-84989888957&partnerID=40&md5=963a4f9c57d5f0ef35a1b7ba143d7a85

Umer, M., Nawaz, F., & Ali, M. (2023). Reconciling the impact of knowledge management processes on knowledge worker productivity. *Knowledge Management and E-Learning, 15*(2), 269-286. https://doi.org/10.34105/j.kmel.2023.15.015

Yudhistira, P. G. A., Riana, I. G., Supartha, I. W. G., & Wibawa, I. M. A. (2024). Knock! Knock! How Does Knowledge Management Maintain Organizational Performance in Organization? A Systematic Literature Review. *Global Business and Finance Review, 29*(6), 129-142. https://doi.org/10.17549/gbfr.2024.29.6.129

Yuwono, W., Seputra, J. K., Mulyaningrum, M., & Kesumahati, E. (2026). DEVELOPMENT OF INNOVATION CAPABILITY THROUGH INTELLECTUAL CAPITAL, PSYCHOLOGICAL CAPITAL, AUTHENTIC LEADERSHIP, AND KNOWLEDGE MANAGEMENT IN THE TRADING INDUSTRY. *Business: Theory and Practice, 27*(1), 45-55. https://doi.org/10.3846/btp.2026.22722

Zhao, Y., Wen, S., Zhou, T., Liu, W., Yu, H., & Xu, H. (2022). Development and innovation of enterprise knowledge management strategies using big data neural networks technology. *Journal of Innovation & Knowledge, 7*(4), 100273. https://doi.org/10.1016/j.jik.2022.100273

Zhou, X., Cao, Z., Alam, S., & He, L. (2025). Mechanism of knowledge management system self-learning case and knowledge matching based on bidirectional dimension reduction. *Engineering Applications*

Library and Learning, University of Phayao

of Artificial Intelligence, 154, 110985. https://doi.org/10.1016/j.engappai.2025.110985

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Chapter 9: Strategic Collaboration and Innovation Ecosystems: Alliances, Franchising, Branding, and Licensing for Sustainable Competitive Advantage

Course Learning Outcomes (CLO):

1. Explain strategic alliances and joint ventures for growth and market expansion.
2. Analyze franchising as a business expansion strategy.
3. Examine branding in creating competitive value.
4. Evaluate licensing for commercialization and revenue generation.
5. Assess cooperation in improving organizational performance.

Contents and Concepts of This Chapter:

9.1 Introduction to Strategic Alliances and Joint Ventures

9.2 Franchising

9.3 Branding

9.4 Licensing

9.5 Cooperation

Case Study

Chapter Summary

Chapter Review Questions

Chapter Exercises

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9.1 Introduction to Strategic Alliances and Joint Ventures

Strategic alliances and joint ventures are cooperative interorganizational arrangements through which firms combine selected resources, capabilities, and market access to achieve objectives that would be more costly, slower, or riskier to pursue independently. A strategic alliance generally refers to a collaborative agreement between two or more legally independent firms that coordinate activities such as research and development, technology sharing, production, marketing, or distribution while remaining separate entities. In contrast, a joint venture is a more formalized arrangement in which participating firms establish a separate legal entity that is jointly owned and governed by the parent organizations. These collaborative forms are widely used to accelerate innovation, facilitate market entry, share financial and operational risks, access complementary knowledge, and strengthen competitive positioning. Their effectiveness, however, depends on strategic fit, governance quality, trust, resource complementarity, and the management of cultural and organizational differences. Accordingly, strategic alliances and joint ventures are widely recognized as important mechanisms for growth, learning, and long-term value creation in increasingly interconnected global markets.

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Alliance learning and knowledge leakage represent two opposing yet interconnected dynamics within interorganizational collaborations. Alliance learning refers to the deliberate acquisition, transfer, and integration of valuable knowledge, capabilities, technologies, and managerial practices between partner firms, enabling innovation, capability development, and enhanced competitive advantage. Through strategic alliances, firms can access complementary resources, accelerate organizational learning, and improve market responsiveness. In contrast, knowledge leakage occurs when proprietary, tacit, or strategically sensitive knowledge unintentionally spills over to partners or external actors, potentially eroding a firm's unique advantages and strengthening competitors. While alliance learning creates mutual value and long-term growth opportunities, excessive knowledge leakage increases opportunism risks, imitation threats, and loss of strategic control. Therefore, effective alliance governance, trust-building, contractual safeguards, and absorptive capacity are critical to maximizing learning benefits while minimizing unintended knowledge spillovers.

A strategic alliance may also be understood as a deliberately structured governance arrangement that evolves over time rather than as a static contractual agreement. Alliances typically progress through stages of formation, operation, and continuation, restructuring, or termination. During the formation stage, partner selection, strategic compatibility, and alignment of objectives are critical, as firms seek complementarities in resources, capabilities, and market access while minimizing the risk of opportunism. During the operational stage, coordination mechanisms such as relational governance, trust development, knowledge-sharing routines, and conflict resolution processes become central to sustaining alliance performance, particularly under conditions of environmental uncertainty and asymmetry in power or information. Successful alliances therefore require an appropriate balance between formal contractual safeguards and adaptive, trust-based relational norms capable of addressing unforeseen contingencies. Over time, alliances may generate learning and capability development, but they can also create tensions associated with knowledge appropriation, dependency, and competitive overlap. Consequently, alliance stability and longevity depend on continuous strategic alignment, adaptive governance, and the partners' ability to manage the simultaneous cooperative and competitive dynamics inherent in interfirm collaboration (Dhaundiyal & Coughlan, 2020).

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Recent scholarship further emphasizes alliance learning as a critical dynamic capability in increasingly digitalized and networked business environments. Strategic alliance research identifies several streams of learning. These include learning in strategic alliances, which views alliances as a source of competitive advantage; relationship learning, which focuses on joint information sharing and integration within dyadic partnerships; learning in innovation networks, which highlights knowledge creation in collaborative ecosystems; and learning in social networks, which emphasizes the role of embedded relationships and interpersonal ties in learning processes. Although this body of literature is substantial, further process-oriented and interpretivist research is needed to address emerging issues such as digitalization, managerial microfoundations, and evolving forms of interorganizational collaboration (Kohtamäki et al., 2023).

Strategic alliances are particularly valuable in uncertain and complex business environments because they facilitate multidirectional flows of information, capabilities, and innovation resources among partner firms. Rather than relying solely on internal resources, firms use alliances to access complementary assets such as advanced technologies, managerial expertise, distribution channels, financial resources, and sustainability-related knowledge. Compared with conventional transactional relationships, strategic alliances place greater emphasis on long-term collaboration, resource complementarity, and synergistic value creation. Such arrangements can generate economic benefits, including cost reduction, market expansion, and improved innovation performance. They may also contribute to environmental performance by enhancing green total factor productivity through stronger dynamic capabilities, improved managerial environmental cognition, and participation in sustainability standard-setting activities. Strategic alliances should therefore be viewed as strategic governance mechanisms that enhance competitiveness, adaptability, and sustainable transformation in rapidly changing markets (Wei et al., 2025).

In the context of small and medium-sized enterprises (SMEs), strategic alliances represent an especially important mechanism for overcoming resource constraints. Through collaboration, SMEs can share risks, reduce costs, access external knowledge, and expand market opportunities that would otherwise be difficult to attain independently. Alliances with customers, suppliers, and other firms may be particularly valuable for supporting innovation and improving organizational performance. However, empirical evidence suggests that alliances do not automatically strengthen firm outcomes. For example, strategic alliances were found not to significantly moderate the relationship between innovation capabilities and firm performance, implying that alliance effectiveness depends substantially on how partnerships are designed, governed, and implemented in practice (Kamalrulzaman et al., 2021).

Within international contexts, joint ventures play a pivotal role in facilitating market entry, resource pooling, and risk sharing. However, their stability and longevity are influenced by both external institutional conditions and internal organizational capabilities. Host-country risk has been shown to exert a significant negative effect on the stability of international joint

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ventures by increasing the likelihood of unplanned ownership changes, dissolution, or exit. More importantly, this adverse effect can be mitigated by firm-specific host-country experience and venture age, suggesting that accumulated experiential knowledge, learning effects, and stronger inter-partner routines enhance alliance resilience over time. Thus, although institutional risk remains consequential, relational embeddedness and organizational learning may become more decisive determinants of joint venture survival in the long run (Aib, 2024).

Complementing this perspective, partner-level institutional compatibility particularly alignment in corporate social responsibility (CSR) has also been associated with lower risks of joint venture termination. A parent firm's stronger CSR performance can generate legitimacy spillover effects, whereby stakeholders transfer favorable perceptions of the responsible parent to the jointly owned venture. This enhanced legitimacy can improve stakeholder support and increase survival prospects. However, the magnitude of this effect depends on contextual factors such as venture age, ownership structure, state ownership, and industry relatedness rather than solely on inter-partner trust or commitment (Dai & Wang, 2024).

Another critical dimension of strategic alliances and international joint ventures concerns the management of knowledge transfer and protection. Although collaborative arrangements enable firms to access complementary resources, capabilities, and market-specific knowledge, they also create inherent tensions between sharing valuable knowledge and protecting proprietary assets. Multinational enterprises operating through international joint ventures frequently face the paradox that conditions facilitating effective knowledge transfer may simultaneously increase the risk of unintended knowledge leakage or partner opportunism. As a result, successful alliance governance requires balancing these competing objectives through both formal mechanisms such as contracts, intellectual property protections, and monitoring systems and informal relational governance based on trust, reciprocity, and social control. These governance arrangements help firms capture learning benefits while reducing the erosion of competitive advantage caused by knowledge misappropriation (Kim et al., 2024).

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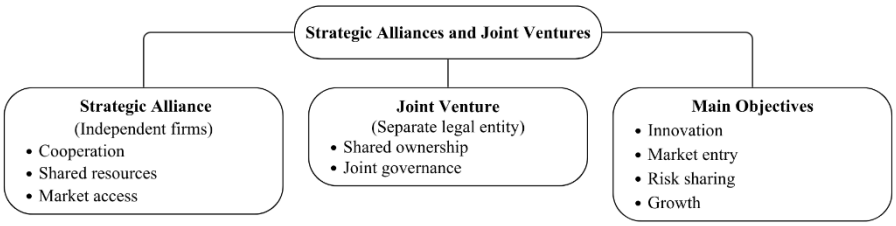

Figure 9.1 Strategic Alliances and Joint Ventures

Source: Adapted from Zahoor, N., et al. (2023). Vertical alliances and innovation: A systematic review of the literature and a future research agenda. *Technovation*, 122, 102588.

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Figure 9.1 illustrates the conceptual distinction and strategic purpose of Strategic Alliances and Joint Ventures as cooperative arrangements between firms designed to enhance competitiveness and growth. A strategic alliance involves legally independent firms collaborating through cooperation, shared resources, and market access while maintaining separate ownership structures. In contrast, a joint venture entails the creation of a separate legal entity jointly owned and governed by partner firms, enabling deeper integration and coordinated decision-making. The figure also highlights the main objectives of both arrangements, including fostering innovation, facilitating market entry, sharing risks and costs, and supporting long-term business growth. Overall, the diagram demonstrates that firms choose between these collaborative forms depending on the desired level of control, commitment, and strategic integration.

In conclusion, strategic alliances and joint ventures are indispensable strategic mechanisms that enable firms to pursue growth, innovation, international expansion, and sustainable competitiveness through collaboration. Their success depends not only on resource complementarity and strategic intent, but also on adaptive governance, mutual trust, institutional compatibility, and effective management of learning and knowledge risks. As global markets become increasingly interconnected and uncertain, these cooperative arrangements are likely to remain central to organizational strategy and long-term value creation.

The integrated collaborative innovation ecosystem framework conceptualizes strategic alliances, joint ventures, franchising, branding, licensing, and cooperation not as isolated growth mechanisms, but as mutually reinforcing and interconnected innovation strategies that collectively enhance organizational competitiveness and long-term value creation. Within this framework, cooperation serves as the governance foundation that builds trust, coordination, and shared objectives among partners; strategic alliances and joint ventures leverage complementary resources, capabilities, and market access to accelerate innovation; franchising enables rapid network scaling through standardized replication and entrepreneurial expansion; branding creates relational value by strengthening stakeholder trust, differentiation, and customer loyalty; while licensing facilitates knowledge commercialization by monetizing intellectual property and diffusing innovation across markets. Together, these mechanisms form an integrated ecosystem in which collaboration, capability sharing, market expansion, and value appropriation interact synergistically to drive sustainable growth and adaptive advantage in dynamic business environments.

Strategic collaboration can be conceptualized as an integrated innovation growth architecture in which multiple mechanisms operate synergistically to generate, commercialize, scale, and sustain competitive value. Strategic alliances provide firms with access to complementary resources, capabilities, technologies, and knowledge that accelerate innovation development. Licensing serves as a commercialization pathway by transforming proprietary innovations into revenue-generating assets through controlled external exploitation. Branding captures and amplifies market value by strengthening customer trust, differentiation, and relational equity derived from innovative offerings. Franchising enables the efficient replication and geographic scaling of proven business models, thereby expanding value creation across wider markets. Underpinning these mechanisms, cooperation functions as the governance foundation that sustains network performance through trust, coordination, mutual commitment, and long-term relational stability. Collectively, these interdependent strategies form a cohesive architecture through which firms can achieve innovation-led growth, market expansion, and sustainable competitive advantage.

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9.2 Franchising

Franchising is a strategic business arrangement in which an independent entrepreneur (the franchisee) is granted the right to operate a business using the trademark, business model, products, and operating systems of an established firm (the franchisor) in exchange for fees, royalties, and compliance with prescribed standards. It has become one of the most influential organizational forms for domestic expansion and international market penetration because it combines centralized brand control with decentralized local ownership. Unlike wholly owned expansion models, franchising enables rapid growth with lower capital requirements for the franchisor while simultaneously motivating franchisees through ownership incentives. As a hybrid governance form positioned between market transactions and hierarchical integration, franchising is particularly relevant in sectors such as retailing, hospitality, education, food services, and personal care.

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Franchising involves an inherent strategic tension between standardization and local autonomy. Standardization enables franchisors to maintain brand consistency, operational efficiency, quality control, and a uniform customer experience across geographically dispersed outlets. It also facilitates economies of scale through centralized training, marketing, and supply chain management. In contrast, local autonomy allows franchisees to adapt products, services, pricing, and promotional strategies to local market preferences, cultural norms, and competitive conditions, thereby enhancing responsiveness and market relevance. Excessive standardization may reduce flexibility and hinder local innovation, whereas too much autonomy can weaken brand identity and create operational inconsistency. Therefore, effective franchise systems typically seek a balanced governance approach that preserves core brand standards while granting selective decision-making discretion to franchisees in areas requiring local market adaptation.

More broadly, franchising is a contractual relationship between two legally independent parties who cooperate through the transfer of brand rights, business systems, and operational know-how in return for initial fees and continuing royalties. Over time, franchising has evolved into a major organizational model with substantial economic and social significance, contributing to employment generation, entrepreneurial development,

modernization of retail and service sectors, and local economic growth, particularly in emerging markets. Contemporary franchising also extends beyond traditional commercial applications to include international franchising and social franchising. International franchising emphasizes market selection, entry modes, governance structures, and franchisor–franchisee relationships in cross-border expansion, whereas social franchising applies franchise principles to improve the delivery of healthcare, family planning, and other development services in underserved communities. Emerging economies such as China, India, Brazil, and South Africa have become important growth markets due to rising incomes, urbanization, and expanding consumer demand. At the same time, franchising can facilitate local capability development, technology transfer, and formal employment, although concerns remain regarding the dominance of foreign brands and the displacement of local small businesses. Accordingly, franchising should be understood as both a commercial expansion mechanism and a developmental instrument whose importance in emerging markets has increased steadily in recent decades (Bretas & Alon, 2021).

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Franchising can also be interpreted as a complex governance structure involving multiple stakeholders, ownership arrangements, and layered control relationships. Traditional franchising research has often focused narrowly on the dyadic relationship between franchisor and franchisee, especially decisions regarding company-owned versus franchised outlets. However, a broader governance perspective recognizes the influence of external equity holders, debt providers, boards of directors, regulators, and franchisee associations. Within this framework, franchisees occupy a distinctive semi-internal position: they are legally independent business owners who invest their own capital and control local assets, yet remain closely tied to the franchisor's brand and strategic system. Simultaneously, franchisors themselves may be governed by families, public shareholders, private equity firms, cooperatives, or foundations, each of which can shape strategic priorities, risk tolerance, reinvestment policies, and growth trajectories. Consequently, understanding franchising requires examining how ownership structures, financing arrangements, contractual relationships, and stakeholder governance interact to influence system-wide performance, conflict management, and long-term sustainability (Ludvigsson-Wallette & Lawrence, 2020).

From a strategic growth perspective, franchising allows firms to license their brand, business model, and operating system to independent franchisees who replicate the concept across new locations. Decisions to franchise are often motivated by the need to mobilize financial resources and achieve economies of scale, particularly among younger firms in developing markets where access to capital may be constrained. Following franchise conversion, additional benefits frequently emerge through franchisees' local market knowledge, entrepreneurial initiative, and reduced monitoring burdens in geographically dispersed operations. Franchising should therefore be viewed not merely as a contractual expansion format, but as a dynamic organizational strategy shaped by both resource constraints and governance considerations across different stages of firm development (Dermonde et al., 2023).

The critical success factors of franchising firms center on three interrelated dimensions: franchisor capability, interconnection with franchisees, and continuous innovation. First, franchisor capability refers to leadership competence, strategic decision-making, resource management, crisis responsiveness, and the ability to build a strong brand identity. Effective franchisors provide clear direction, motivate stakeholders, adapt to environmental change, and manage operations efficiently. Second, interconnection with franchisees highlights the importance of collaborative relationships characterized by trust, open communication, role clarity, regular support, and mutual commitment. Strong franchisor–franchisee relationships enhance coordination, reduce conflict, and improve system-wide performance. Third, continuous innovation reflects the need for ongoing improvements in products, services, business processes, and digital technologies to remain competitive and responsive to changing customer preferences. Collectively, these factors indicate that franchising success depends not only on standardized operating systems, but also on capable leadership, relational governance, and sustained innovation (Hizam-Hanafiah et al., 2023).

Franchising also contributes to broader national development. As an entrepreneurial governance form, it enables network expansion while reducing coordination and control costs for the franchisor, while franchisees benefit from established brand recognition and proven business systems.

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Beyond commercial outcomes, franchising can generate positive spillovers in social, institutional, and infrastructural development. Countries with earlier and more intensive franchise sector development tend to realize stronger developmental benefits, suggesting that franchising can function as a catalyst for broader national progress, particularly in emerging and developing economies (Lanchimba et al., 2024).

More recently, digital transformation has increased the importance of omnichannel reconfiguration capabilities in franchise systems. These capabilities refer to the dynamic ability to redesign structures, routines, and governance mechanisms in order to integrate digital and physical channels effectively. In franchise networks, this transformation is particularly complex because franchisors must maintain system-wide consistency while preserving franchisee autonomy and minimizing intra-brand conflict. Based on evidence from seven French franchise networks, three interrelated capability classes have been identified. First, learning capabilities support knowledge acquisition, experimentation, and the sharing of market and technological insights between franchisors and franchisees. Second, change management capabilities help prioritize initiatives, reduce resistance, pace implementation, and secure stakeholder commitment. Third, governance capabilities involve restructuring decision-making systems, establishing collaborative committees, redesigning contracts, and creating equitable value-sharing mechanisms across online and offline channels. Together, these capabilities enable franchise systems to sense opportunities, seize them through coordinated action, and transform into more agile, digitally integrated networks. Consequently, omnichannel reconfiguration capabilities represent an increasingly important source of competitive advantage in the digital era (Ghantous et al., 2025).

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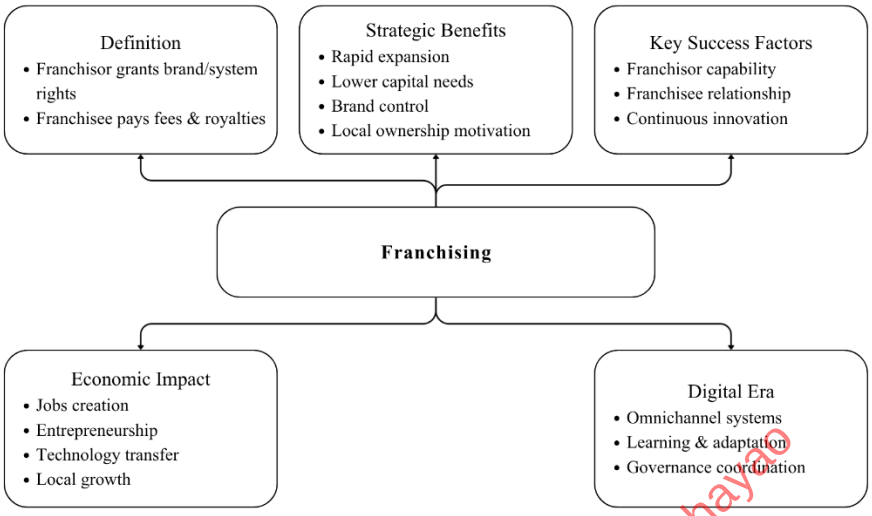

Figure 9.2 Franchising

Source: Adapted from Phina, P., Zámborský, P., & Kruesi, M. A. (2022). Achieving institutional isomorphism in international franchising through knowledge transfer: Evidence from the food and beverage industry in Cambodia. *International Journal of Hospitality & Tourism Administration*, 24(5), 845–876.

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Figure 9.2 illustrates that franchising is a strategic business model centered on a collaborative relationship between the franchisor and franchisee, where the franchisor grants rights to use its brand and operating system, while the franchisee pays fees and royalties in return. The framework highlights major strategic benefits, including rapid market expansion, lower capital requirements, stronger brand control, and the motivational advantages of local ownership. It also identifies key success factors such as franchisor capability, effective franchisee relationships, and continuous innovation to sustain competitiveness. Beyond firm-level advantages, franchising generates broader economic impacts through job creation, entrepreneurship development, technology transfer, and local economic growth. In the digital era, the model further evolves through omnichannel systems, organizational learning and adaptation, and stronger governance coordination, making franchising an increasingly resilient and scalable growth strategy.

In conclusion, franchising is a multifaceted organizational form that combines strategic expansion, entrepreneurial incentives, and governance efficiency. Its significance extends beyond firm growth to include innovation, employment generation, institutional development, and digital transformation. As markets become increasingly competitive and technology-driven, the long-term success of franchise systems will depend on their ability to balance standardization with local responsiveness, maintain productive stakeholder relationships, and continuously adapt to changing consumer and environmental conditions.

9.3 Branding

Branding is a strategic managerial process through which organizations create, communicate, and sustain a distinctive identity, set of associations, and perceived value in the minds of stakeholders. It extends far beyond logos, names, and visual symbols, encompassing the total meaning system attached to a firm, product, service, destination, or institution. A strong brand reduces customer uncertainty, enhances recognition, supports premium pricing, strengthens loyalty, and functions as an intangible asset that contributes to long-term competitive advantage. In increasingly saturated and information-intensive markets, branding serves as a mechanism for differentiation by helping consumers simplify choices while signaling quality, trustworthiness, relevance, and emotional resonance. Contemporary branding theory further recognizes that brands are co-created through interactions among firms, customers, employees, partners, and digital communities rather than being controlled solely by managers. Consequently, branding requires coordinated management of identity, positioning, experience, communications, and stakeholder relationships across both physical and digital touchpoints.

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Co-branding strategies developed through strategic alliances can generate substantial synergies in brand equity, market access, and customer reach; however, they also carry significant risks of alliance instability. Differences in strategic objectives, resource commitments, managerial priorities, and organizational cultures may create coordination problems that weaken collaboration over time. Brand reputation asymmetry can further intensify tensions, particularly when one partner perceives unequal value

capture or faces reputational spillover from the other partner's failures. In addition, disagreements over governance, intellectual property usage, quality standards, and marketing execution may reduce trust and increase opportunistic behavior. Consequently, while co-branding alliances offer opportunities for mutual growth and competitive advantage, their long-term success depends on strong relational governance, strategic alignment, transparent communication, and effective conflict resolution mechanisms.

A foundational dimension of branding is brand identity, which refers to the internally intended meaning of the brand as expressed through visual, verbal, and symbolic elements. These may include the brand name, logo, typography, colors, slogans, packaging cues, heritage narratives, and personality traits. However, not all identity elements contribute equally to branding strength. Evaluations should not rely solely on managerial intuition, as marketers' perceptions of effective brand identity elements often diverge from actual consumer responses. Research shows that managers frequently misjudge the strength of brand elements, commonly overestimating fame (the extent to which an element cues the brand) while underestimating uniqueness (the extent to which it is associated exclusively with one brand). This suggests that firms should complement internal judgment with consumer-based evidence to determine which logos, colors, taglines, packaging cues, or other identity assets are most salient, memorable, and distinctive in consumers' minds. Effective brand identity management therefore depends on maintaining consistency in core brand elements to reinforce memory structures while selectively refining executions in response to changing market conditions and consumer expectations (Brus et al., 2026).

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From a strategic management perspective, branding can also be understood through the lens of resource orchestration. Brands should not be viewed as isolated communication assets but as strategic resources embedded within broader organizational systems and capabilities. The Brand Resource Orchestration (BRO) framework integrates branding theory with Resource-Based Theory and resource orchestration logic to explain how firms create and sustain brand value. Rather than treating branding as a purely promotional activity, the framework emphasizes that managers must strategically structure resources, bundle complementary capabilities, and leverage them across market opportunities. This implies that effective branding depends on

aligning internal competencies—such as organizational culture, managerial expertise, innovation, employee development, service quality, and marketing capabilities—with external market positioning and brand identity. The BRO model specifically links organizational factors, brand identity, market positioning, environmental conditions, and brand outcomes into an interconnected system. Consequently, superior branding emerges through cross-functional coordination and continuous reconfiguration of resources in response to market feedback rather than through the isolated efforts of the marketing department alone (Costa Alves & Rodrigues, 2025).

Digital transformation has significantly expanded the scope of branding. In mobile and platform-based markets, user interface design, personalization systems, and embedded commerce functions increasingly shape brand perceptions. Research found that mobile application design quality, branding, AI-driven personalization, and social commerce integration positively influence Generation Z purchase intention, while mobile app marketing also plays a significant mediating role in strengthening these relationships. Among these predictors, AI-driven personalization demonstrated the strongest effect, followed by social commerce integration, branding, and mobile app design. These findings indicate that digitally native younger consumers evaluate brands not only through promotional messages but also through the functional quality of app experiences, the relevance of personalized recommendations, social interaction features, and transactional convenience. Consequently, firms should ensure that mobile applications themselves embody the brand promise by delivering intuitive interfaces, customized content, seamless purchasing processes, and socially connected engagement mechanisms that convert user interaction into purchase behavior (Hasim & Nazri, 2025).

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Branding principles also vary across market contexts, particularly in business-to-business (B2B) environments. In their systematic review of B2B branding research, scholars argue that branding in business markets has become increasingly strategic, although the field remains comparatively fragmented and underdeveloped. Rather than emphasizing symbolic appeal alone, B2B branding is primarily associated with creating a differentiated and credible market presence aligned with a firm's value proposition and target audience. Dominant research themes include strategic brand management,

brand equity and value, brand identity and perception, stakeholder relationships, internal branding, and sustainability. Across these areas, B2B brands are especially valued for reducing perceived risk, signaling competence, supporting trust in long-term relationships, and strengthening organizational reputation. At the same time, emotional and reputational dimensions remain relevant, particularly in complex, high-stakes, or solution-oriented purchases where uncertainty is high. Effective B2B branding therefore extends beyond marketing communications to include sales interactions, customer experience, employee behavior, service delivery, and cross-functional coordination. Accordingly, strong B2B brands are built through the integration of corporate strategy, relationship management, and consistent value delivery across stakeholder touchpoints rather than through promotional messaging alone (Kowalkowski et al., 2026).

Another major development in branding scholarship is the concept of value co-creation. Brand meaning increasingly emerges through participatory interactions among consumers, firms, employees, communities, and digital platforms rather than being created solely through managerial control. Research indicates that brand value and meaning are shaped through engagement processes in which multiple stakeholders exchange resources, experiences, and interpretations across both online and offline contexts. Consumers contribute reviews, stories, social media content, and experiential feedback that influence how others perceive the brand in real time, while virtual brand communities and digital platforms function as important engagement spaces for collaborative value creation. Although this perspective has been applied extensively in tourism destination branding, its implications extend broadly to industries in which customers act as advocates, critics, co-designers, and relational partners in shaping brand outcomes. Accordingly, firms should move beyond one-way promotional communication and instead cultivate participatory brand ecosystems through communities, loyalty programs, interactive platforms, and collaborative innovation initiatives that strengthen authenticity, engagement, and shared ownership of brand meaning (Pham et al., 2022).

Advances in consumer neuroscience further deepen understanding of how branding operates at subconscious levels. Branding and packaging research increasingly employs methods such as eye tracking, EEG, fMRI,

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facial coding, skin conductance, and other biometric tools to examine how consumers process marketing stimuli beyond conscious self-report. Traditional surveys and focus groups often fail to capture deep emotional reactions, implicit preferences, and rapid subconscious processes involved in purchase decisions. Existing studies identify three major domains through which branding and packaging influence consumers: attention and memory, emotions and motivation, and reward and decision-making systems. For example, eye-tracking studies show that package color, shape, brightness, imagery, and visual hierarchy strongly affect gaze patterns and shelf attention, while branded visual cues enhance recognition and recall. Neuroscientific evidence also suggests that familiar or attractive brands can activate emotional and reward-related brain regions, thereby increasing trust, preference, and purchase inclination. Consequently, effective branding depends not only on stated attitudes but also on automatic perceptual and affective mechanisms. Firms therefore increasingly integrate conventional market research with neuroscience-based insights to optimize packaging design, communications, and retail experiences (Rodríguez et al., 2023).

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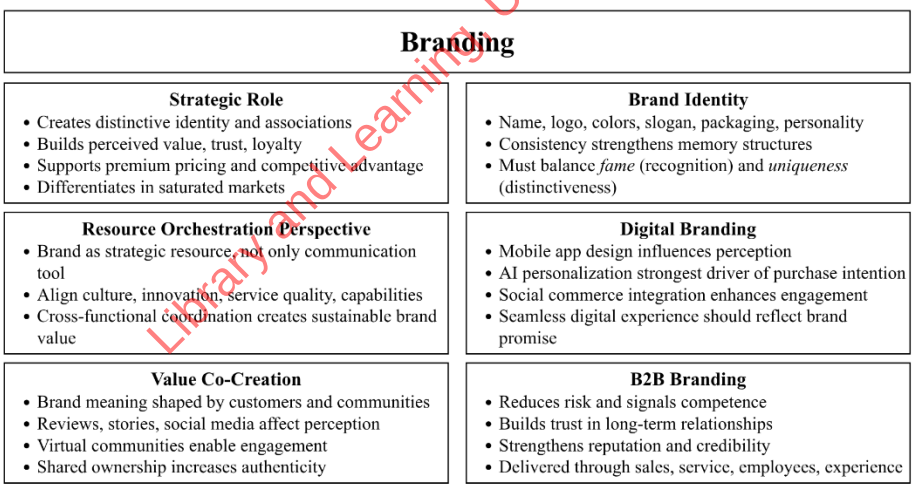

Figure 9.3 Branding

Source: Adapted from Aaker, D. (2025). The 5Bs of Modern Branding. *Management and Business Review*, 5(1), 7-13.

Figure 9.3 illustrates that branding is a multidimensional strategic asset that extends beyond visual symbols to shape market positioning,

stakeholder perceptions, and long-term competitive advantage. Strategically, branding creates distinctive identity, trust, loyalty, and supports premium pricing in competitive markets. Effective brand identity requires consistent use of elements such as name, logo, colors, slogan, packaging, and personality while balancing recognition with uniqueness. From a resource orchestration perspective, brands must align organizational culture, innovation, service quality, and internal capabilities to sustain value creation. In the digital environment, mobile applications, AI personalization, and social commerce significantly influence customer engagement and purchase intention, requiring seamless experiences that reflect the brand promise. The figure also emphasizes value co-creation, where customers, communities, reviews, and social media actively shape brand meaning, while in B2B markets branding reduces perceived risk, signals competence, and strengthens trust, credibility, and long-term relationships.

In conclusion, branding has evolved from a narrow communication function into a multidimensional strategic capability that integrates identity management, resource orchestration, digital experience design, stakeholder engagement, and behavioral insight generation. Strong brands are created not only through consistent symbols and messages but also through coordinated organizational capabilities, credible value delivery, participatory relationships, and psychologically resonant experiences. As markets become more dynamic, digitalized, and competitive, branding will remain a critical mechanism through which organizations build trust, sustain differentiation, and generate long-term value.

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9.4 Licensing

Licensing is a strategic commercialization mechanism through which the owner of intellectual property (IP) including patents, trademarks, copyrights, software, trade secrets, or proprietary know-how grants another party the contractual right to use, produce, market, or integrate that asset in exchange for compensation such as royalties, upfront fees, milestone payments, equity stakes, or hybrid revenue-sharing arrangements. Rather than requiring the IP owner to undertake full-scale production, foreign expansion, or direct market operations, licensing enables the monetization of intangible assets while reducing capital commitments, managerial burden,

and operational risk. This makes licensing particularly valuable when innovators possess strong technological capabilities but lack manufacturing capacity, downstream commercialization resources, regulatory access, or established distribution channels. Contemporary research further emphasizes that licensing is not merely a legal transfer mechanism, but also a strategic governance and collaboration instrument that can support innovation, interfirm learning, and long-term value creation. In the case of publicly funded inventions, licensing may additionally function as a policy tool for increasing societal returns by stimulating follow-on innovation and broader technology diffusion. This is illustrated by NASA's technology transfer program, where exclusive licensing announcements were associated with higher subsequent technological development and spillover effects. Likewise, in private-sector contexts, licensing networks can enhance firms' innovation performance by providing access to high-quality external technological resources and complementary knowledge bases. Accordingly, licensing is best understood as a mechanism that links invention, commercialization, and broader economic utilization across firms, sectors, and geographies (Giebel & Rösner, 2025; Sime et al., 2023).

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Licensing involves a fundamental diffusion–appropriation trade-off, whereby firms seek to disseminate their technologies, intellectual property, or business models to external partners while simultaneously preserving sufficient economic returns and strategic control. On one hand, diffusion through licensing accelerates market expansion, increases adoption rates, generates royalty income, and leverages licensees' local capabilities, distribution channels, and complementary assets. On the other hand, excessive diffusion may weaken exclusivity, reduce competitive advantage, and heighten risks of imitation, opportunistic behavior, or unintended knowledge spillovers that enable future competitors. Consequently, effective licensing strategy requires balancing openness with protection through carefully designed contracts, territorial restrictions, monitoring mechanisms, and intellectual property safeguards to maximize value capture while still benefiting from broader commercialization.

From a strategic management perspective, licensing offers several core advantages. First, it enables firms to generate scalable revenue streams from underutilized or non-core intellectual assets. Organizations frequently

possess patents, proprietary technologies, or know-how that exceed their own commercialization capacity; licensing converts these dormant assets into recurring income while allowing the original owner to retain ownership rights and strategic control. Second, licensing can accelerate market entry by leveraging the licensee's established manufacturing capabilities, customer access, distribution networks, and local market knowledge, thereby reducing the time and cost required for independent expansion. Third, licensing facilitates risk-sharing, which is particularly valuable in capital-intensive or uncertain industries where direct commercialization would require substantial investment and expose firms to considerable operational or market risk. Fourth, licensing may serve as an entry point to broader strategic collaboration, often evolving into co-development partnerships, joint ventures, or long-term innovation networks. These advantages are especially relevant for small and medium-sized enterprises (SMEs), which often possess specialized innovations but face constraints in finance, scale, infrastructure, and international reach. Evidence from a comparative case study of international licensing alliances among SMEs indicates that successful outcomes depend not only on the quality of the technology itself, but also on relational and organizational capabilities. In particular, trust, prior collaborative ties, open communication, cultural compatibility, dedicated human resources, adequate resource commitment, governance clarity, and alignment between licensing activities and corporate strategy were identified as decisive success factors. Firms lacking these capabilities were more likely to experience commercialization failure despite access to the same technology. Thus, licensing performance is shaped as much by strategic partner management and absorptive capacity as by the intrinsic value of the licensed innovation (Lysaridis et al., 2024).

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The economics of licensing also involve important competitive trade-offs because royalty design influences adoption incentives, pricing behavior, diffusion speed, and market structure. The conventional assumption of full adoption under royalty licensing does not always hold when downstream firms differ in production efficiency. In such settings, the licensor faces a strategic tension between the price effect and the market share effect. The price effect arises because less efficient firms gain more from adopting a superior cost-reducing technology and are therefore willing to pay higher royalties. By contrast, the market share effect reflects the licensor's incentive

to lower royalty rates in order to attract more adopters, expand technology penetration, and increase total royalty income through larger aggregate output. When the price effect dominates, licensors optimally charge higher royalties and license fewer, less efficient firms. When the market share effect dominates, lower royalties and broader diffusion become optimal. Consequently, excessively high royalties may delay or prevent adoption even of superior technologies, leading to incomplete diffusion and welfare losses, whereas lower royalties may reduce per-unit margins but expand market coverage and consumer surplus. Optimal licensing contracts should therefore account for firm heterogeneity, competitive intensity, and long-term diffusion incentives rather than rely on uniform royalty formulas (Sandrini, 2024).

Licensing has become increasingly complex in digital infrastructure markets where interoperability standards are essential, particularly in the Internet of Things (IoT). Many IoT products rely on standard-essential patents (SEPs), meaning patents that must be practiced to comply with standards such as LTE or Wi-Fi. A critical but often overlooked issue concerns the licensing level within the value chain that is, whether patents are licensed upstream to component or module manufacturers, or downstream to final device makers. In IoT ecosystems, where value creation is distributed across chipset suppliers, module producers, platform providers, and diverse device manufacturers, downstream device-level licensing can generate substantial transaction costs, uncertainty, and inefficiencies. Unlike mobile phone markets dominated by a limited number of large firms, IoT markets consist of thousands of heterogeneous producers, many of them SMEs and startups with limited legal and technical resources. This fragmentation intensifies disputes over royalty bases, cumulative royalty stacking, patent validity, and compliance burdens. Henkel therefore argues that conventional one-dimensional patent licensing models are poorly suited to IoT environments and that SEP governance requires a value-chain perspective. In this context, FRAND principles fair, reasonable, and non-discriminatory licensing terms remain central to balancing incentives for patent holders with broad technology diffusion, ecosystem participation, and continued innovation (Henkel, 2022).

Emerging technologies such as artificial intelligence (AI) further broaden the governance function of licensing. Prevailing AI regulation has

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relied excessively on ex post remedies such as fines, litigation, or post-deployment enforcement which often fail to prevent foreseeable harms before they occur. In response, scholars propose licensing as an ex ante regulatory instrument, particularly for high-risk AI systems whose use may significantly affect employment, healthcare, finance, law enforcement, critical infrastructure, privacy, equality, and other fundamental rights. Under such a model, AI developers or providers would need to demonstrate compliance prior to commercialization or deployment by showing that their systems satisfy requirements of security, non-discrimination, accuracy, appropriateness, transparency, and correctability. Licensing therefore functions not merely as permission to market technology, but as a preconditioned governance mechanism that shifts the burden of proof onto providers to justify that their systems are lawful, fair, and socially acceptable before they generate harm. This transforms licensing from a passive method of IP monetization into an active form of technological stewardship, particularly where statutory frameworks remain incomplete or slow to adapt to rapid innovation (Malgieri & Pasquale, 2024).

At the macroeconomic level, institutional quality materially shapes the attractiveness and effectiveness of technology licensing. Heavier regulatory burdens associated with tax compliance measured through the number of tax payments required, hours spent preparing taxes, and overall tax rates generally reduce the likelihood that firms will obtain technology licenses from foreign companies. Burdensome and complex administrative systems increase transaction costs, consume managerial resources, and heighten uncertainty, thereby discouraging cross-border licensing activity. By contrast, countries with more efficient tax administration, simpler compliance procedures, and stronger business environments tend to provide conditions more conducive to technology transfer and firm competitiveness. Foreign ownership has also been consistently associated with higher licensing propensity and stronger firm performance, suggesting that institutional openness and governance quality reinforce licensing ecosystems. Therefore, governments seeking to attract international technology inflows should complement intellectual property protection with broader reforms that improve bureaucratic efficiency, streamline taxation, strengthen regulatory predictability, and enhance the overall ease of doing business (Troilo et al., 2017).

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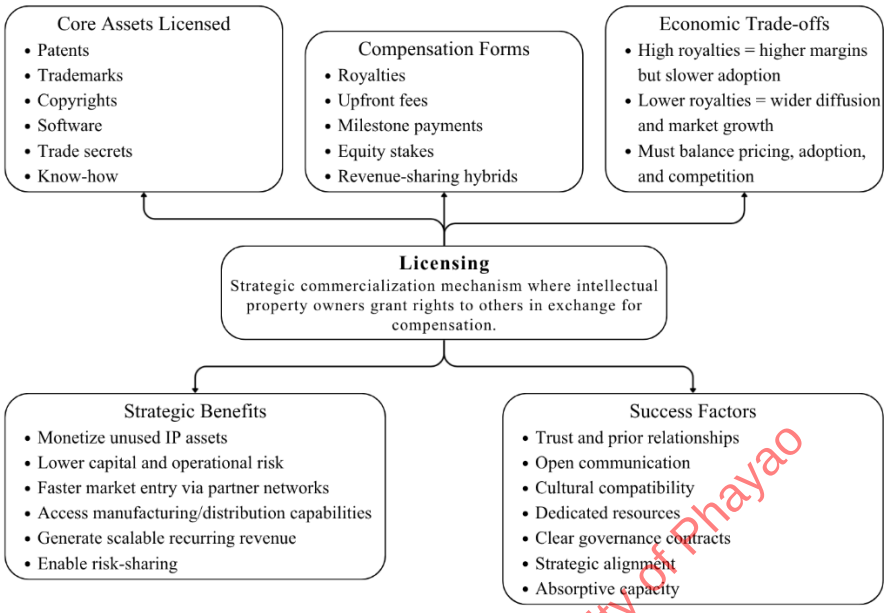

Figure 9.4 Licensing

Source: Adapted from Song, S., & Lee, J. (2023). Licensing early-versus late-stage technologies: The licensee perspective. *Technology in Society*, 72, 102199

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Figure 9.4 illustrates that licensing is a strategic commercialization mechanism through which intellectual property owners grant usage rights to external parties in exchange for compensation. The model shows that a wide range of core assets including patents, trademarks, copyrights, software, trade secrets, and know-how can be licensed through multiple compensation forms such as royalties, upfront fees, milestone payments, equity stakes, or hybrid revenue-sharing arrangements. It further emphasizes key strategic benefits, including monetizing underutilized intellectual property, reducing capital requirements and operational risk, accelerating market entry through partner networks, accessing manufacturing and distribution capabilities, generating scalable recurring income, and sharing risk with partners. At the same time, the figure highlights critical success factors such as trust, communication, cultural compatibility, governance clarity, strategic alignment, and absorptive capacity. Finally, it recognizes economic trade-offs, where higher royalties

may improve margins but slow adoption, whereas lower royalties can stimulate broader diffusion and market growth, requiring firms to balance pricing, competitiveness, and long-term strategic objectives.

In conclusion, licensing is far more than a contractual method for exploiting intellectual property. It is a multifaceted strategic mechanism that supports revenue generation, market expansion, risk-sharing, innovation collaboration, and technology diffusion. Its effectiveness, however, depends on contract design, partner capabilities, industry structure, and institutional quality. As economies become increasingly knowledge-driven and technologically interconnected, licensing will remain a critical instrument linking innovation with commercial and societal value creation.

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9.5 Cooperation

Cooperation refers to the voluntary alignment of actions, resources, and intentions among two or more actors to pursue shared or interdependent objectives. It is a fundamental mechanism in economic systems, organizations, and societies because many valuable outcomes cannot be achieved efficiently through isolated action alone. Through cooperation, participants combine complementary capabilities, reduce duplication, share risks, and address collective-action problems that exceed the capacity of any single actor. In organizational settings, cooperation becomes particularly important when tasks are interdependent, uncertainty is high, and performance depends on coordinated responses across units or partners. Experimental evidence from multiplayer dilemmas further indicates that cooperation is shaped not only by incentives but also by strategic uncertainty, as individuals must judge whether others will also cooperate. Such cooperation tends to decline as group size increases (Martínez-Martínez & Normann, 2025). In innovation contexts, cooperation enables firms to access external knowledge, technologies, and networks unavailable internally, thereby strengthening innovation performance and adaptive capacity. However, cooperation is not costless; expanding the number of partners or objectives may create managerial complexity, coordination burdens, conflict, and diminishing returns. Cooperation should therefore be understood not as purely altruistic behavior, but as a strategic governance choice in which

actors engage when the expected mutual gains from coordination exceed the benefits of unilateral competition or defection (Temel et al., 2023).

The cooperation–opportunism paradox refers to the tension whereby firms must collaborate closely with partners to generate mutual value, access complementary resources, and improve collective performance, while simultaneously guarding against self-interested behaviors such as free-riding, knowledge appropriation, shirking responsibilities, or contract manipulation. Greater cooperation often requires openness, trust, and information sharing, yet these same conditions can increase vulnerability to opportunism. Conversely, excessive monitoring and rigid controls may reduce opportunistic risk but can undermine trust, flexibility, and relational commitment. Therefore, effective interorganizational governance requires balancing relational mechanisms (e.g., trust, norms, reciprocity) with formal safeguards (e.g., contracts, incentives, monitoring) to sustain cooperation while minimizing opportunistic behavior.

Within firms and interorganizational networks, cooperation is strongly conditioned by relational and behavioral antecedents rather than by formal incentives alone. Peer control, trust, and humility each exert significant positive effects on cooperative behavior. Peer control refers to informal monitoring and visibility of colleagues' performance among employees at the same hierarchical level, enabling mutual comparison, accountability, and shared learning. Rather than functioning as coercive surveillance, such control can stimulate reciprocal assistance because individuals recognize interdependence and anticipate future mutual support. Trust similarly reduces uncertainty and vulnerability in social exchange, making employees more willing to share information, coordinate tasks, and engage in helping behaviors without excessive safeguards. Humility in performance evaluation defined as realistic self-assessment, openness to feedback, and recognition of others' contributions also promotes cooperation by encouraging individuals to seek input, acknowledge limitations, and value collective rather than purely individual achievement. Importantly, peer control has also been shown to strengthen humility, suggesting that transparent peer comparison can foster self-awareness and receptiveness to others. Sustainable cooperation therefore emerges not merely from contracts or hierarchical authority, but from

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workplace climates characterized by interpersonal trust, constructive peer accountability, and balanced self-evaluation (Oyadomari et al., 2022).

At the interorganizational level, cooperation becomes more complex because participating entities often possess distinct goals, governance systems, and power positions. Large project networks, strategic alliances, and supply chains require collaboration among legally independent organizations that may simultaneously cooperate and compete. Effective cooperation in such networks depends not merely on goodwill, but on governance and coordination architectures capable of reconciling organizational autonomy with system-wide integration. Large project networks remain effective when roles and functions are clearly differentiated across subsystems such as operations, coordination, control, strategy, and policy while being linked through robust communication and feedback channels. Governance mechanisms, including contracts, decision structures, leadership arrangements, and resource allocation systems, often cascade across project levels and shape lower-tier interactions and performance outcomes. By contrast, cooperation frequently remains bounded within specific relational interfaces rather than diffusing automatically throughout the network. Where governance is weak or poorly aligned, networks may experience fragmentation, duplicated effort, delays, design conflicts, and misaligned incentives. This is especially critical in infrastructure delivery, logistics systems, and innovation consortia, where no single organization possesses sufficient authority or resources to manage the entire value-creation process independently. Accordingly, cooperation in such settings should be viewed as an outcome of deliberate institutional design, continual coordination, and adaptive governance capacity rather than as a spontaneous relational condition (Tannir et al., 2024).

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Beyond organizations, cooperation is equally fundamental to broader social cohesion and collective resilience. Research using public goods games demonstrates that inequality and group identity shape cooperative behavior in ways that challenge the common assumption that inequality necessarily weakens cooperation. Unequal resource distributions did not automatically reduce cooperative contributions. Instead, groups exposed to inequality often cooperated more than fully equal groups, particularly when members were able to reduce disparities early in the interaction. Early efforts to lessen

inequality served as strong signals of fairness and mutual commitment, strengthening group identity and increasing cooperation over time. Conversely, when inequality remained unaddressed, cooperation stayed low and group performance resembled that of equal-baseline groups. These findings suggest that cooperation depends not only on material incentives or formal institutions, but also on whether participants perceive the system as fair and develop a shared sense of belonging. Where stakeholders feel excluded, disadvantaged, or disconnected from the collective, cooperative norms may deteriorate; where fairness and group identity are reinforced, cooperation becomes more sustainable and resilient. These insights are particularly relevant for policymakers and organizational leaders designing systems that rely on voluntary contributions to common goals, such as climate action, public health, and collaborative governance (Senn et al., 2025).

In sustainability and tourism development, cooperation is equally indispensable, particularly in destination systems where economic, environmental, and cultural objectives must be managed simultaneously. In sustainable food festival tourism in Thailand, the Bio-Circular-Green (BCG) model depends on collaborative participation among local communities, farmers, artisans, event organizers, businesses, and public institutions. Sustainable festival tourism requires coordinated action in local sourcing, waste reduction, resource efficiency, cultural preservation, and community engagement. Food festivals function not merely as tourism events, but as platforms through which stakeholders collectively create economic value while safeguarding ecological resources and regional identity. Community involvement in planning and implementation enhances social equity, strengthens local pride, and channels tourism revenues back into the area. This demonstrates that cooperation is not confined to corporate or diplomatic contexts; it is also a foundational mechanism for place-based development, community resilience, and sustainable destination competitiveness (Suvittawat et al., 2025).

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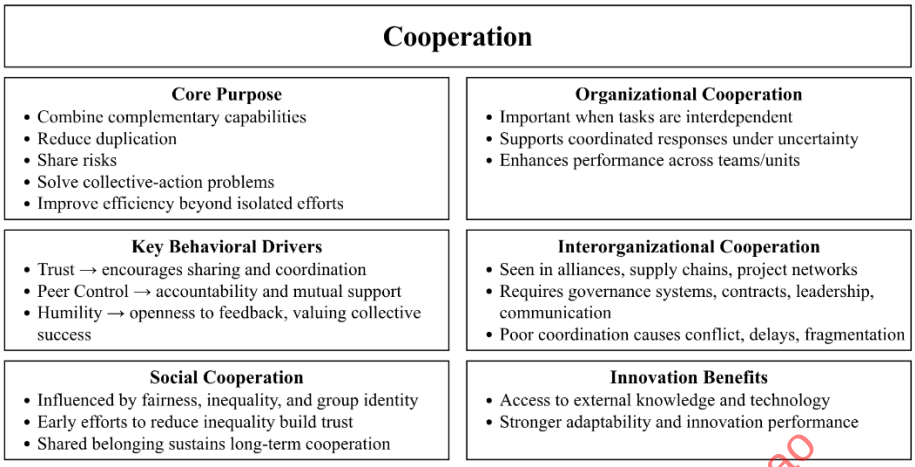

Figure 9.5 Cooperation

Source: Adapted from Suchek, N., & Franco, M. (2024). Inter-organisational cooperation oriented towards sustainability involving SMEs: A systematic literature review. *Journal of the Knowledge Economy*, 15, 1952–1972.

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Figure 9.5 illustrates that cooperation functions as a foundational mechanism for achieving outcomes that exceed the capacity of isolated actors by combining complementary capabilities, reducing duplication, sharing risks, and solving collective-action problems. Within organizations, cooperation is particularly critical when tasks are interdependent, as it enables coordinated responses under uncertainty and improves performance across teams and functional units. At the interorganizational level, cooperation appears in alliances, supply chains, and project networks, where effective governance systems, contracts, leadership, and communication are necessary to prevent conflict, delays, and fragmentation. The figure also highlights that cooperative behavior is strengthened by trust, peer control, humility, fairness, and shared identity, while sustained cooperation generates broader benefits such as access to external knowledge, technological capabilities, stronger adaptability, and enhanced innovation performance.

In conclusion, cooperation is a multidimensional mechanism that underpins effectiveness across organizations, networks, societies, and regional development systems. Whether in firms, project alliances, public

institutions, or tourism ecosystems, successful cooperation depends not only on aligned incentives but also on trust, fairness, governance quality, and shared identity. Although cooperation entails coordination costs and managerial challenges, it remains essential whenever interdependent actors seek outcomes that cannot be achieved efficiently through isolated action.

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Case Study

Sustainable Food Festival Tourism in Thailand: Applying the Bio-Circular-Green (BCG) Model for Cultural and Environmental Resilience

Adapted Reprint from:

Suvittawat, A., Janchai, N., Seepho, S., Nonthachai, J., & Nonthachai, I. (2025). Sustainable Food Festival Tourism: Integrating the Bio-Circular-Green (BCG) Model for Cultural and Environmental Resilience in Thailand. Sustainability, 17(5), 1969. https://doi.org/10.3390/su17051969

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1. Introduction

The Bio-Circular-Green (BCG) model has emerged as a transformative strategic framework for promoting sustainable food festival tourism in Thailand. By combining the principles of the bioeconomy, circular economy, and green economy, the model emphasizes efficient resource management, waste reduction, and mitigation of environmental impacts while simultaneously supporting economic development. Food festivals constitute an appropriate context for BCG implementation because they serve as venues for presenting local agricultural produce, culinary traditions, and community involvement. Practices such as procuring locally sourced ingredients, minimizing single-use plastics, composting organic waste, and reducing carbon emissions enable festivals to generate economic value while preserving ecological resources and cultural heritage, thereby supporting Thailand's long-term sustainable tourism agenda.

Despite its strategic importance, empirical studies investigating the comprehensive effects of the BCG model within Thailand's food festival sector remain limited. Prior research has frequently concentrated on separate economic or environmental dimensions, resulting in insufficient understanding of the model's integrated ecological, socio-cultural, and economic outcomes. In addition, challenges associated with infrastructure preparedness, stakeholder collaboration, and community participation require systematic examination. Addressing these issues is essential for improving implementation effectiveness and strengthening the evidence base for the BCG model as a scalable sustainability framework for tourism development.

From a theoretical perspective, the BCG model is grounded in sustainable tourism theory, environmental economics, circular economy principles, and perspectives related to cultural and community-based tourism. Its application within food festivals involves encouraging organic and biodiversity-oriented agricultural practices under the bioeconomy dimension, establishing reuse and waste minimization systems through circular economy principles, and promoting renewable energy adoption alongside low-carbon operations within the green economy dimension. Through this integrated mechanism, the BCG model contributes to environmental resilience, enhances community engagement, and supports long-term economic sustainability, thereby positioning Thailand's food festival tourism as a regenerative and internationally competitive model of sustainable development.

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2. National Context: Sustainable Food Festival Tourism in Thailand

Sustainable food festival tourism in Thailand is conceptually anchored in cultural tourism theory and destination image theory. Cultural tourism theory recognizes that tourists exhibit varying motivations and degrees of cultural involvement, ranging from purposeful travelers seeking deep and authentic heritage engagement to incidental visitors whose encounters with culture are more spontaneous or secondary. Memorable cultural tourism experiences are influenced by several determinants, including perceived authenticity, pre-travel expectations, active participation, interaction with local culture, gastronomic experiences, and service quality. Destination image theory complements this perspective by explaining how cognitive evaluations of tangible attributes, affective responses, and overall destination impressions shape tourist decision-making across the pre-visit, on-site, and post-visit stages. In this context, food festivals serve as strategic mechanisms for strengthening and communicating Thailand's culinary identity and cultural distinctiveness.

The effectiveness of food festivals is further determined by multidimensional key success factors (KSFs), such as high food quality, superior service delivery, attractive festival programming, convenient accessibility, authentic cultural presentation, and efficient event management. These dimensions contribute significantly to visitor satisfaction, foster emotional attachment to place, enhance destination branding, and increase the likelihood of repeat visitation. At the same time, food festivals play an

important role in reinforcing community identity through the preservation of local traditions, promotion of social cohesion, transmission of intergenerational knowledge, and cultivation of community pride. Community-based festival approaches additionally emphasize inclusiveness, stakeholder collaboration, and equitable sharing of socio-economic benefits, thereby ensuring that festival development remains aligned with long-term community welfare.

The incorporation of the Bio-Circular-Green (BCG) model adds a sustainability-driven perspective to food festival tourism development. The BCG framework advocates efficient resource utilization, waste minimization, renewable resource application, local procurement, and circular bio-economy practices. When integrated into festival operations, these principles strengthen environmental responsibility, improve managerial efficiency, and increase the appeal of festivals to environmentally conscious travelers. The combination of cultural heritage promotion and sustainable management practices therefore enhances the competitive advantage of Thai food festivals within the expanding global sustainable tourism market.

Existing literature also identifies dynamic and mediating relationships among KSFs, community-based food festival models, community identity, and the BCG model. Community identity functions not only as an outcome of successful festival development but also as a driving force that encourages stakeholder participation and sustained local support. Similarly, the BCG model operates as a mediating mechanism by embedding sustainability principles into both operational processes and strategic planning, thereby ensuring economic viability while safeguarding cultural heritage and environmental resources. Collectively, these interrelated constructs form a comprehensive theoretical framework for advancing sustainable food festival tourism in Thailand through the balanced integration of cultural authenticity, community empowerment, and green economic transformation.

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3. Methodology and Research Framework

The empirical foundation of this case study is based on a quantitative survey administered to 503 festival attendees. Data were collected through structured questionnaires and analyzed using structural equation modeling (SEM) to test the proposed hypotheses. The survey includes measures capturing four key constructs:

Key Success Factors for Food Festival - event planning and management, marketing and promotion, stakeholder engagement, and visitor experience and satisfaction.

Community Identity – cultural practices and traditions, sense of belonging, shared values and beliefs, and geographic and historical significance.

Bio-Circular-Green Model – bio-based resources, circularity, green innovation, and social and environmental awareness.

Model for Community Food Festival – community engagement, event marketing and promotion, vendor and sponsorship relations, and logistics and infrastructure.

Reliability and validity assessments reveal strong factor loadings ranging from 0.680 to 0.910 and Cronbach's alpha coefficients exceeding 0.80, indicating high internal consistency. The model fit indices (RMSEA = 0.023, GFI = 0.976, CFI = 0.996) further confirms an excellent model fit.

Eight hypotheses examine the direct and mediating effects among the variables, providing a comprehensive understanding of how key success factors for food festival, community identity, bio-circular-green model, and model for community food festival interact within Thailand's food festival tourism context.

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4. Findings and Discussion

4.1 Key Success Factors for Food Festival: event planning and management, marketing and promotion, stakeholder engagement, and visitor experience and satisfaction

Among all variables, Key Success Factors for Food Festival exhibits the strongest and broadest influence. Key Success Factors for Food Festival significantly affects:

- Community Identity ($\beta = 0.646$)
- Bio-Circular-Green Model ($\beta = 0.370$)
- Model for Community Food Festival ($\beta = 0.465$)

The findings confirm that key success factors (KSFs) of food festivals generate strong and statistically significant positive effects across the principal constructs of the model. Specifically, KSFs exhibit the greatest

influence on community identity, indicating that effective event planning, strategic marketing, stakeholder collaboration, and visitor satisfaction play a critical role in strengthening cultural pride, shared values, and a collective sense of belonging. Moreover, KSFs significantly affect the community food festival model, suggesting that operational excellence directly improves community participation, vendor relationships, and festival infrastructure. In addition, KSFs positively influence the Bio-Circular-Green (BCG) model, implying that well-organized festivals are more likely to adopt sustainable practices, including local sourcing, circular resource management, and environmental consciousness. Taken together, these findings demonstrate that managerial and experiential success factors serve as fundamental drivers that simultaneously enhance socio-cultural identity, sustainability integration, and the institutional strength of community-based food festival models.

4.2 Community Identity: cultural practices and traditions, sense of belonging, shared values and beliefs, and geographic and historical significance

Community Identity does not significantly influence Model for Community Food Festival ($\beta = 0.066$).

Community Identity significantly influences Bio-Circular-Green Model ($\beta = 0.498$).

The findings reveal a differentiated influence of community identity across the model constructs. Specifically, community identity does not demonstrate a statistically significant direct effect on the community food festival model, indicating that shared traditions, collective values, and a sense of belonging are, by themselves, insufficient to directly determine the operational and structural components of festival development. In contrast, community identity shows a strong and statistically significant positive effect on the Bio-Circular-Green (BCG) model, suggesting that a firmly rooted local identity substantially facilitates the adoption of sustainability-oriented practices, such as bio-based resource utilization, circular economy principles, green innovation, and heightened social environmental consciousness. These results suggest that community identity operates more effectively as a strategic cultural catalyst for sustainability transformation rather than as an immediate structural determinant of the community food festival model. This further implies that sustainable development mechanisms play a mediating role in converting local identity into tangible festival outcomes.

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4.3 Bio-Circular-Green Model: bio-based resources, circularity, green innovation, and social and environmental awareness

Bio-Circular-Green Model significantly influences Model for Community Food Festival ($\beta = 0.324$).

These results indicate that the integration of Bio-Circular-Green (BCG) model principles including bio-based resource utilization, circular economy practices, green innovation, and heightened social and environmental consciousness significantly strengthens the structural and operational dimensions of community food festivals. Such dimensions include community participation, event marketing effectiveness, vendor relationships, and logistical infrastructure. The moderate effect size suggests that sustainability-oriented practices should not be viewed as peripheral components, but rather as strategic determinants of festival model development. From a practical perspective, this implies that embedding circular economy mechanisms, responsible resource management, and green innovation into festival planning can enhance long-term sustainability, improve environmental outcomes, and generate greater community-centered value within Thailand's food festival tourism sector.

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4.4 The Mediating Roles of Community Identity and Bio-Circular-Green Model in the Relationship between Key Success Factors for Food Festival and Model for Community Food Festival

The findings reveal that community identity did not serve as a significant mediating variable in the relationship between key success factors for food festivals and the community food festival model. While key success factors such as effective event planning, marketing activities, stakeholder engagement, and visitor satisfaction were found to positively influence both community identity and the festival model directly, the indirect effect operating through community identity was not statistically significant. This suggests that contemporary festival participants may place greater emphasis on experiential quality and sustainability-related attributes than on traditional identity-based dimensions.

Conversely, the results confirm that the Bio-Circular-Green (BCG) model significantly mediated the relationship between key success factors and the community food festival model. Specifically, the integration of sustainability-oriented practices, including circular resource use, green innovation, bio-based resource utilization, and social-environmental responsibility, strengthened the connection between managerial success

factors and the overall festival model. Therefore, the BCG framework operates as an essential mechanism through which managerial effectiveness is transformed into sustainable community festival development, underscoring the strategic importance of embedding sustainability principles within food festival tourism.

5. Synthesis

The case study illustrates that sustainable food festival tourism can be significantly strengthened through strategic alliances and joint ventures as mechanisms for integrating diverse stakeholders into a unified value creation system. In the context of Thailand's food festivals, alliances among local governments, tourism authorities, SMEs, farmers, hospitality providers, and environmental organizations enable the sharing of resources, expertise, technology, and promotional capabilities. These partnerships reduce operational constraints faced by individual organizers while improving event quality, market reach, and financial resilience. Joint ventures between public and private sectors can further facilitate investments in infrastructure, digital ticketing systems, waste management technologies, and sustainable logistics. The study demonstrates that when multiple actors collaborate strategically, festivals become more competitive, innovative, and capable of delivering memorable tourist experiences while preserving local identity and generating community income.

From a broader cooperation perspective, the case confirms that long-term festival sustainability depends not only on formal business arrangements but also on trust-based collaboration among community members and institutional stakeholders. Cooperation enhances stakeholder engagement, strengthens local participation, and creates collective ownership of festival outcomes. Farmers supply local ingredients, artisans contribute cultural products, residents participate as volunteers, and public agencies provide policy support and destination marketing. Such coordinated action aligns with the Bio-Circular-Green (BCG) model by promoting local sourcing, circular resource use, and environmental awareness. Cooperative governance transforms food festivals from temporary events into sustainable development platforms that generate economic benefits, reinforce social cohesion, and support environmental stewardship. Therefore, strategic partnerships and cooperative networks are central to building resilient and future-oriented food festival destinations.

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6. Conclusion

This case study positions the Bio-Circular-Green (BCG) model as a transformative and holistic framework for promoting sustainability within Thailand's food festival tourism sector. From a theoretical perspective, it extends the sustainable tourism literature by providing empirical evidence that BCG principles through the integration of bio-economy, circular economy, and green economy dimensions strengthen the linkage between key success factors and sustainable festival outcomes. The results verify the mediating function of the BCG model in simultaneously enhancing economic, environmental, and social performance. Notably, the study also challenges the traditional assumption that community identity is invariably a primary driver of festival success, indicating that contemporary tourists may place greater value on sustainability attributes and service quality than on strong local identity signals.

From a practical standpoint, the findings offer important implications for policymakers, festival organizers, and host communities. The study recommends the adoption of BCG-oriented practices such as waste minimization, local resource sourcing, green innovation, and sustainability-centered event planning. In addition, educational initiatives, efficient logistics systems, and environmentally responsible infrastructure are identified as critical elements for improving visitor satisfaction and ensuring long-term sustainability. Although community identity demonstrates limited direct influence, cultural authenticity remains strategically valuable when reinforced through active community participation and collaborative governance structures.

Furthermore, the study highlights the necessity of targeted policy measures, including incentives for environmentally responsible vendors, standardized operational frameworks for event management, and mechanisms that promote community-based economic participation. Overall, the integration of the BCG model into food festival tourism represents a strategic pathway toward sustainable development, cultural continuity, and enhanced economic resilience.

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Case Study Questions

1. How do event planning, marketing, stakeholder engagement, and visitor satisfaction enhance community identity in Thai food festivals?
2. To what extent do operational success factors encourage the implementation of Bio-Circular-Green (BCG) practices in food festivals?
3. How does the integration of BCG principles improve sustainability, logistics, vendor relations, and engagement in community food festivals?
4. How do local traditions, shared values, and sense of belonging contribute to the success of community food festivals?
5. Do Community Identity and the BCG Model serve as mediating variables between Key Success Factors and the Community Food Festival Model?

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Chapter Summary

This chapter advances innovation management by conceptualizing alliances, franchising, branding, licensing, and cooperation as an integrated collaborative capability system for value creation, innovation diffusion, and sustainable competitive advantage.

Strategic alliances and joint ventures are collaborative arrangements that allow firms to combine selected resources, capabilities, and market access to pursue goals more efficiently than acting alone. Strategic alliances typically involve cooperation between legally independent firms, while joint ventures create a jointly owned separate entity. These strategies are widely used to accelerate innovation, share risks, enter new markets, and strengthen competitiveness. Their success depends on partner compatibility, trust, governance quality, knowledge sharing, and the ability to manage both cooperative and competitive tensions. In increasingly uncertain and interconnected markets, alliances and joint ventures remain essential tools for growth, learning, and long-term value creation.

Franchising is a business model in which a franchisor grants a franchisee the right to use its brand, systems, and operating methods in exchange for fees and royalties. It enables rapid expansion with lower capital investment for the franchisor while motivating franchisees through ownership incentives. Franchising has significant economic importance because it promotes entrepreneurship, job creation, technology transfer, and service-sector development, especially in emerging markets. Its long-term success depends on balancing standardized control with local responsiveness, maintaining strong franchisor–franchisee relationships, and continuously innovating in response to changing markets and digital transformation.

Branding is the strategic process of creating and sustaining a distinctive identity and perceived value in the minds of stakeholders. It goes beyond logos or names to include the full meaning, trust, and emotional associations connected to a firm, product, or service. Strong brands reduce customer uncertainty, support premium pricing, build loyalty, and create lasting competitive advantage. Modern branding also emphasizes co-creation through customer interactions, digital experiences, internal capabilities, and stakeholder engagement. As markets become more crowded and technology-

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driven, branding remains a critical strategic capability for differentiation and long-term success.

Licensing is a strategic arrangement in which the owner of intellectual property such as patents, trademarks, copyrights, or proprietary know-how grants another party the right to use it in exchange for royalties or other compensation. It allows firms to monetize intangible assets without directly undertaking production or market expansion, thereby reducing cost and risk. Licensing is especially valuable for firms with strong innovations but limited commercialization resources. Its effectiveness depends on contract design, partner capabilities, industry conditions, and institutional quality. In knowledge-based economies, licensing plays a major role in revenue generation, innovation diffusion, and cross-border technology transfer.

Cooperation refers to the voluntary alignment of actions, resources, and intentions among multiple actors to achieve shared or interdependent objectives. It is fundamental in organizations, markets, and societies because many important outcomes cannot be achieved efficiently through isolated action. Cooperation helps participants combine capabilities, reduce duplication, share risks, and solve collective problems. Successful cooperation depends not only on incentives, but also on trust, fairness, governance quality, communication, and shared identity. Although it creates coordination costs and managerial complexity, cooperation remains essential wherever actors must work together to achieve sustainable and mutually beneficial results.

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Chapter Review Questions

Review Question 1:

How do strategic alliances differ from joint ventures in terms of structure, ownership, and strategic purpose?

Review Question 2:

Why is franchising considered an effective strategy for rapid business expansion while maintaining brand consistency?

Review Question 3:

How does strong branding create long-term competitive advantage for organizations in modern markets?

Review Question 4:

What are the major benefits and risks of licensing as a strategy for commercializing intellectual property?

Review Question 5:

Why is cooperation considered essential for achieving shared objectives in organizations, networks, and society?

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Chapter Exercises

Exercise 1:

A Thai food manufacturing company wants to expand into the Japanese market but lacks local market knowledge and distribution channels. It is considering either a strategic alliance or a joint venture with a Japanese firm.

1. Define strategic alliance and joint venture.
2. Compare the advantages and disadvantages of each option.
3. Recommend which strategy the company should choose and justify your answer.
4. Identify three critical success factors for the partnership.

Exercise 2:

A successful Thai bubble tea brand plans to expand rapidly across Southeast Asia using franchising. However, the founder is concerned about maintaining product quality and brand reputation.

1. Explain the concept of franchising.
2. Identify benefits of franchising for the franchisor and franchisee.
3. Discuss three risks associated with franchising expansion.
4. Propose strategies to maintain quality consistency across franchise outlets.

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Exercise 3:

A new eco-friendly skincare startup enters a highly competitive market with many established brands. The company wants to build strong brand awareness and customer loyalty among Generation Z consumers.

1. Define branding and explain why it is important.
2. Suggest key brand identity elements (name, logo, slogan, packaging, etc.).
3. Explain how digital channels and social media can strengthen the brand.
4. Recommend two strategies to build long-term brand loyalty.

Exercise 4:

A university research laboratory has developed a new water purification technology but does not have the resources to manufacture and market it globally.

1. Explain the concept of licensing.
2. Identify benefits of licensing for the university.
3. Discuss potential risks of licensing intellectual property to another company.
4. Recommend key terms that should be included in the licensing agreement.

Exercise 5:

A sustainable tourism festival in Thailand requires collaboration among local farmers, restaurants, government agencies, and community groups. Some stakeholders disagree about profit sharing and responsibilities.

1. Define cooperation in an organizational context.
2. Explain why cooperation is important for sustainable tourism development.
3. Identify barriers that may reduce cooperation among stakeholders.
4. Propose solutions to improve trust, fairness, and long-term collaboration.

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References

Aaker, D. (2025). The 5Bs of Modern Branding. *Management and Business Review*, 5(1), 7-13. https://doi.org/10.1177/2694104X251349027

Aib, H. (2024). Stability of international joint ventures: When experience and age overshadow host country risk. *Journal of International Management*, 30(6), 101205. https://doi.org/10.1016/j.intman.2024.101205

Bretas, V. P. G., & Alon, I. (2021). Franchising research on emerging markets: Bibliometric and content analyses. *Journal of Business Research,* 133, 51-65. https://doi.org/10.1016/j.jbusres.2021.04.067

Brus, R., Hartnett, N., Faulkner, M., & Driesener, C. (2026). Assessing branding strength: comparing marketer judgement and consumer data for brand identity elements. *Journal of Brand Management,* 33(1), 1-17. https://doi.org/10.1057/s41262-025-00395-y

Costa Alves, A. P. C., & Rodrigues, F. (2025). Brand resource orchestration: a strategic framework for managing brands. *Revista Brasileira de Marketing,* 24(3), Article e26007. https://doi.org/10.5585/2025.26007

Dai, Q., & Wang, L. L. (2024). Does responsibility breed stability? An institutional framework on the link between partner corporate social responsibility and joint venture termination. *Journal of Business Research,* 183, 114814. https://doi.org/10.1016/j.jbusres.2024.114814

Dermonde, M., Gomes, S. C., & de Castro Garcia, R. (2023). FRANCHISING THEORIES: A CASE STUDY OF PRE AND POST FRANCHISING DECISION. *Revista Brasileira de Marketing,* 22(2), 655-701. https://doi.org/10.5585/remark.v22i2.23443

Dhaundiyal, M., & Coughlan, J. (2020). Understanding strategic alliance life cycle: A 30 year literature review of leading management journals.

Library and Learning University of Phayao

Business: Theory and Practice, 21(2), 519-530. https://doi.org/10.3846/btp.2020.11530

Ghantous, N., Chaney, D., Chameroy, F., Jeanpert, S., & Schultz, M. (2025). Omnichannel Reconfiguration Capabilities in Franchising: A Meso-Foundations Analysis. *Managerial and Decision Economics,* 46(4), 2431-2447. https://doi.org/10.1002/mde.4474

Giebel, M., & Rösner, A. (2025). Reaching for the society: The commercialization effects of NASA technology licensing. *Research Policy,* 54(10), 105337. https://doi.org/10.1016/j.respol.2025.105337

Hasim, M. A., & Nazri, S. N. A. M. (2025). The Role of Mobile Application Design, Branding, AI-Driven Personalization, and Social Commerce Integration on Purchase Intention Among Generation Z: The Mediating Role of Mobile App Marketing. *Paper Asia,* 41(1), 317-329. https://doi.org/10.59953/paperasia.v41i1b.371

Henkel, J. (2022). Licensing standard-essential patents in the IoT – A value chain perspective on the markets for technology. *Research Policy,* 51(10), 104600. https://doi.org/10.1016/j.respol.2022.104600

Hizam-Hanafiah, M., Abdul Ghani, M. F., Mat Isa, R., & Abd Hamid, H. (2023). Critical Success Factors of Franchising Firms: A Study on Franchisors and Franchisees. *Administrative Sciences,* 13(1), 8. https://doi.org/10.3390/admsci13010008

Kamalrulzaman, N. I., Ahmad, A., Ariff, A. M., & Muda, M. S. (2021). Innovation capabilities and performance of Malaysian agricultural smes: The moderating role of strategic alliance. *International Journal of Business and Society,* 22(2), 675-695. https://doi.org/10.33736/ijbs.3751.2021

Kim, H., Park, B. I., Al-Tabbaa, O., & Khan, Z. (2024). Knowledge transfer and protection in international joint ventures: An integrative review. *International Business Review,* 33(5), 102300. https://doi.org/10.1016/j.ibusrev.2024.102300

Library and Learning, University of Phayao

Kohtamäki, M., Rabetino, R., & Huikkola, T. (2023). Learning in strategic alliances: Reviewing the literature streams and crafting the agenda for future research. *Industrial Marketing Management,* 110, 68-84. https://doi.org/10.1016/j.indmarman.2023.02.011

Kowalkowski, C., Keränen, J., & Nijssen, E. J. (2026). How B2B branding research measures up: A systematic review of key themes, theories, and methods. *Industrial Marketing Management,* 134, 381-394. https://doi.org/10.1016/j.indmarman.2026.03.010

Lanchimba, C., Porras, H., Salazar, Y., & Windsperger, J. (2024). Franchising and country development: evidence from 49 countries. *International Journal of Emerging Markets,* 19(1), 7-32. https://doi.org/10.1108/IJOEM-07-2020-0779

Ludvigsson-Wallette, M., & Lawrence, B. (2020). Expanding the conceptual domain of governance in franchising. *Industrial Marketing Management,* 90, 314-323. https://doi.org/10.1016/j.indmarman.2020.07.023

Lysaridis, I., Chountalas, P. T., & Magoutas, A. I. (2024). Critical Success Factors in the Technology Commercialization Process: A Comparative Case Study of International Licensing Alliances among Small and Medium-Sized Enterprises. *Administrative Sciences,* 14(1), 9. https://doi.org/10.3390/admsci14010009

Malgieri, G., & Pasquale, F. (2024). Licensing high-risk artificial intelligence: Toward ex ante justification for a disruptive technology. *Computer Law & Security Review,* 52, 105899. https://doi.org/10.1016/j.clsr.2023.105899

Martínez-Martínez, I., & Normann, H.-T. (2025). Cooperation in multiplayer dilemmas. *Journal of Economic Behavior & Organization,* 239, 107262. https://doi.org/10.1016/j.jebo.2025.107262

Oyadomari, J. C. T., Nisiyama, E. K., de Souza Bido, D., & Bordin, M. Z. (2022). Peer control, trust, and humility as antecedents of cooperation: an exploratory study. *Revista de Contabilidade e Organizacoes,* 16,

Library and Learning, University of Phayao

Article e194008. https://doi.org/10.11606/issn.1982-6486.rco.2022.194008

Phina, P., Zámborský, P., & Kruesi, M. A. (2022). Achieving institutional isomorphism in international franchising through knowledge transfer: Evidence from the food and beverage industry in Cambodia. *International Journal of Hospitality & Tourism Administration*, 24(5), 845–876. https://doi.org/10.1080/15256480.2022.2055696

Pham, H. L., Pham, H. T., & Nguyen, T. T. (2022). Value co-creation in branding: A systematic review from a tourism perspective. *European Journal of Tourism Research,* 32, Article 3203. https://doi.org/10.54055/ejtr.v32i.2597

Rodríguez, V. J. C., Antonovica, A., & Martín, D. L. S. (2023). Consumer neuroscience on branding and packaging: A review and future research agenda. *International Journal of Consumer Studies,* 47(6), 2790-2815. https://doi.org/10.1111/ijcs.12936

Sandrini, L. (2024). Price Versus Market Share with Royalty Licensing: Incomplete Adoption of a Superior Technology with Heterogeneous Firms. *Review of Industrial Organization,* 64(2), 243-265. https://doi.org/10.1007/s11151-023-09935-9

Senn, S., Mutzner, N., Oberhauser, V., & Rauhut, H. (2025). Individualism: the end of social cohesion? The effects of inequality and group identity on cooperation [Article]. *Frontiers in Behavioral Economics,* 4, Article 1494271. https://doi.org/10.3389/frbhe.2025.1494271

Sime, S., Hagedoorn, J., & Tan, H. (2023). Innovation performance and licensing: The effect of the compositional quality of direct and indirect network ties. *Technovation,* 127, 102826. https://doi.org/10.1016/j.technovation.2023.102826

Song, S., & Lee, J. (2023). Licensing early-versus late-stage technologies: The licensee perspective. *Technology in Society*, 72, 102199. https://doi.org/ 10.1016/j.techsoc.2023.102199

Library and Learning, University of Phayao

Suchek, N., & Franco, M. (2024). Inter-organisational cooperation oriented towards sustainability involving SMEs: A systematic literature review. *Journal of the Knowledge Economy*, 15, 1952–1972. https://doi.org/10.1007/s13132-023-01196-x

Suvittawat, A., Janchai, N., Seepho, S., Nonthachai, J., & Nonthachai, I. (2025). Sustainable Food Festival Tourism: Integrating the Bio-Circular-Green (BCG) Model for Cultural and Environmental Resilience in Thailand. *Sustainability,* 17(5), 1969. https://doi.org/10.3390/su17051969

Tannir, M., Mills, G., Krystallis, I., & Kalra, J. (2024). Governance, cooperation and coordination in large inter-organisational project networks: a viable system perspective. *International Journal of Operations and Production Management,* 44(3), 617-642. https://doi.org/10.1108/IJOPM-08-2022-0485

Temel, S., Mention, A. L., & Yurtseven, A. E. (2023). Cooperation for innovation: more is not necessarily merrier. *European Journal of Innovation Management,* 26(2), 446-474. https://doi.org/10.1108/EJIM-10-2020-0392

Troilo, M., Zdziarski, M., & Collins, J. M. (2017). Competitiveness, technology licensing, and ease of paying taxes: A 30-country study. *Entrepreneurial Business and Economics Review,* 5(4), 11-34. https://doi.org/10.15678/EBER.2017.050401

Wei, X., Fang, G., & Yu, X. (2025). From collaboration to green transformation: How strategic alliances drive green total factor productivity through dynamic capabilities? *Journal of Innovation & Knowledge,* 10(5), 100783. https://doi.org/10.1016/j.jik.2025.100783

Zahoor, N., Khan, Z., Wu, J., Tarba, S. Y., Donbesuur, F., & Khan, H. (2023). Vertical alliances and innovation: A systematic review of the literature and a future research agenda. *Technovation*, 122, 102588.https://doi.org/ 10.1016/j.technovation.2022.102588

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Chapter 10: Strategic Green Innovation Management for Sustainable Competitive Advantage

Course Learning Outcomes (CLO):

1. Explain the concept and importance of green innovation management.
2. Analyze the management of green product innovation.
3. Evaluate green service innovation strategies.
4. Apply green process innovation practices.
5. Assess green business innovation for growth.

Contents and Concepts of This Chapter:

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10.2 Green Product Innovation Management

10.3 Green Service Innovation Management

10.4 Green Process Innovation Management

10.5 Green Business Innovation Management

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Chapter Review Questions

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10.1 Introduction to Green Innovation Management

Green innovation management refers to the systematic planning, coordination, implementation, and control of innovation activities designed to reduce environmental harm while simultaneously enhancing organizational competitiveness, operational efficiency, and long-term sustainability. It extends traditional innovation management by embedding ecological objectives into product development, process improvement, organizational systems, and strategic decision-making. Rather than treating environmental responsibility as a peripheral compliance issue, green innovation management positions sustainability as a central driver of value creation, technological advancement, and strategic renewal.

Green innovation management can be further understood through the lens of dynamic capability theory, where firms integrate, build, and reconfigure internal and external competencies to address rapidly changing environmental conditions.

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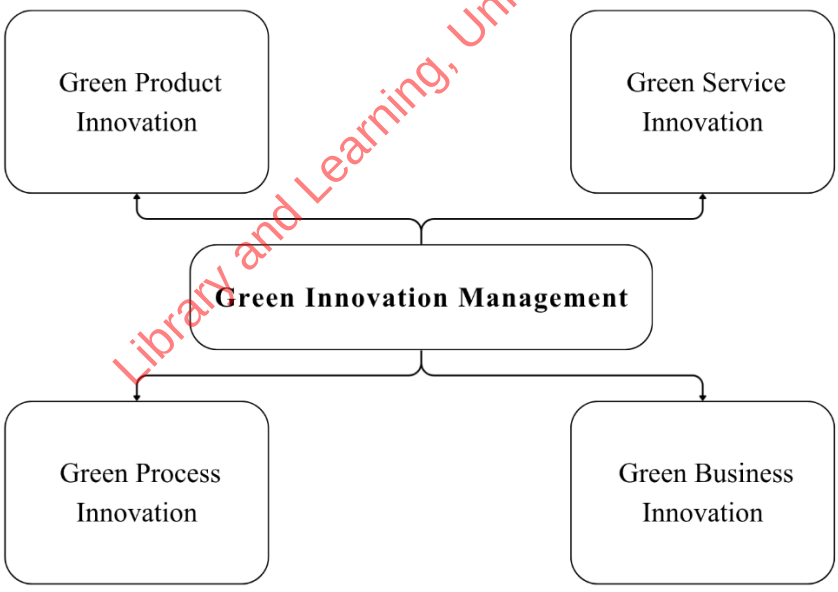

Figure 10.1 Green Innovation Management

Source: Adapted from Qin, X., et al. (2025). Green Innovation Implementation: A Systematic Review and Research Directions. *Journal of Management*, 52(1), 255-282.

As illustrated in Figure 10.1, green innovation management functions as an integrative framework that encompasses four interrelated domains of environmentally oriented innovation: green product innovation, green service innovation, green process innovation, and green business innovation.

At the core, green innovation management acts as the central coordinating mechanism that aligns these domains with organizational strategy, sustainability objectives, and competitive positioning. Rather than operating in isolation, each dimension contributes synergistically to the overall environmental and economic performance of the firm.

- Green product innovation focuses on the design and development of environmentally friendly products, emphasizing reduced resource consumption, eco-friendly materials, and lifecycle sustainability.
- Green service innovation involves the creation or modification of services to minimize environmental impact, often through digitalization, efficiency improvements, or sustainable service delivery models.
- Green process innovation refers to improvements in production or operational processes that enhance resource efficiency, reduce emissions, and minimize waste.
- Green business innovation encompasses broader changes in business models, organizational structures, and strategic approaches that embed sustainability into value creation and capture mechanisms.

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Collectively, these four components are interconnected and jointly guided by green innovation management, which ensures coherence, coordination, and continuous improvement across organizational innovation activities. This integrated structure demonstrates that sustainability is not confined to a single organizational function but is embedded throughout products, services, processes, and broader business systems. The four dimensions represent interconnected micro-to-macro levels of green innovation that collectively enable organizations to achieve environmental sustainability, operational efficiency, and long-term competitive advantage. At the product level, green product innovation emphasizes the development of environmentally friendly goods and tangible value offerings. Green service innovation extends sustainability into customer experiences, service delivery

systems, and value co-creation processes. Building on these outputs and interactions, green process innovation focuses on transforming internal operations through cleaner technologies, resource efficiency, waste reduction, and environmentally responsible production systems. At the broadest organizational level, green business innovation integrates sustainability into strategic management, organizational structures, business models, stakeholder collaboration, and long-term corporate transformation. Together, these four dimensions form a comprehensive framework through which sustainability evolves from individual products and services into organization-wide innovation capabilities and systemic green business transformation.

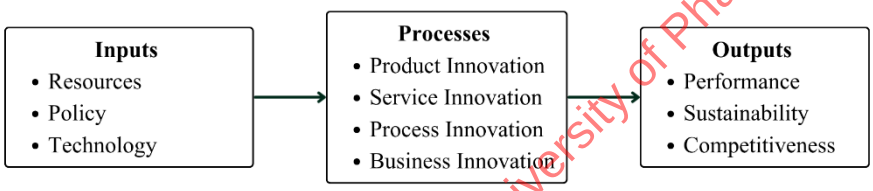

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Figure 10.2 The Input–Process–Output Framework of Green Innovation Management

Source: Adapted from Ren, X., & Mia, M. A. (2025). The determinants of green innovations in manufacturing industries: A systematic literature review. *Future Business Journal*, 11, 42

As illustrated in Figure 10.2, the input–process–output framework of green innovation management explains how organizations transform strategic inputs into sustainable organizational outcomes through integrated innovation activities. The input dimension consists of critical enabling factors, including resources, policy support, and technological capabilities, which provide the foundation for green innovation initiatives. These inputs are subsequently translated into organizational processes encompassing green product innovation, green service innovation, green process innovation, and green business innovation. Collectively, these interconnected innovation processes facilitate the development of environmentally responsible products, services, operational systems, and business models. The framework ultimately generates key outputs, including improved organizational performance,

enhanced sustainability, and strengthened competitiveness, thereby demonstrating how green innovation management contributes to both environmental and strategic organizational objectives.

Green innovation broadly refers to the development or adoption of new products, processes, and managerial practices that minimize environmental harm while generating economic value and supporting sustainable growth. It enables firms to reconcile competitiveness with ecological responsibility through improved resource efficiency, reduced emissions, waste minimization, and responsiveness to stakeholder expectations. Green innovation through two principal dimensions: green process innovation and green product innovation. Green process innovation emphasizes cleaner production technologies, pollution prevention, recycling systems, and efficient resource utilization, whereas green product innovation focuses on environmentally friendly product design, energy-efficient usage, safer materials, and sustainable packaging. Green innovation serves as a strategic mechanism through which firms respond to environmental regulation and market turbulence, thereby improving financial performance and organizational sustainability (Qiu et al., 2020).

From a managerial perspective, green innovation management is not merely a fixed set of technological and administrative practices, but an organizational capability for coordinating environmentally sustainable innovation under conditions of complexity and uncertainty. Green innovation as the development of environmentally sustainable products and processes through eco-friendly materials, ecological product design, reduced material usage, lower emissions, and decreased consumption of water and energy. Technological elements therefore include cleaner production systems, energy-efficient operations, renewable inputs, and innovations that enhance resource productivity. However, the central challenge lies in managing the complexity of these initiatives, as green innovation often spans multiple functions, organizational levels, and external stakeholders. Effective management consequently requires coordination mechanisms, strategic planning, environmental management accounting practices (EMAP), decision-support systems, cross-organizational collaboration, and the integration of financial and non-financial environmental information into managerial decisions. EMAP, in particular, assists firms in identifying

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environmental costs, evaluating resource flows, supporting sustainability-oriented planning, and improving decision quality, thereby strengthening strategic resilience (Huy & Phuc, 2025).

The field of green innovation management has evolved into a multidimensional and rapidly developing domain across industries. Major streams identified in the literature include eco-product innovation, green process innovation, sustainability-oriented business models, policy-supported innovation, digital transformation, and collaborative networks. This evolution indicates a shift from isolated environmental initiatives toward a systems-oriented perspective in which firms align internal capabilities with external actors such as governments, supply chain partners, research institutions, and technology ecosystems. In sectors such as construction and manufacturing, digitalization has become especially significant for improving resource efficiency, environmental monitoring, smart production systems, and sustainable decision-making (Thirakulwanich, 2024).

Digital green innovation management further integrates sustainability objectives with digital technologies such as data analytics, smart platforms, and advanced information systems to enhance innovation outcomes and strategic decision quality. This trend in prefabricated construction enterprises, where digital tools are used to improve partner selection, coordinate joint ventures, optimize resource allocation, and support low-carbon urban development. Effective digital green innovation management requires interdisciplinary capabilities spanning environmental management, operations management, information systems, and strategic collaboration in order to balance ecological and competitive objectives simultaneously (Yin et al., 2022).

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Measurement and efficiency evaluation are also central to green innovation management because organizations require robust tools to determine whether environmental innovation initiatives generate meaningful economic and ecological outcomes. A major challenge lies in assessing performance when firms operate with asymmetric input-output data, multiple outputs, and undesirable outputs such as greenhouse gas emissions. Traditional efficiency assessments may underestimate or distort actual performance when environmental conditions and random factors are excluded. Accordingly, effective evaluation systems should extend beyond

conventional financial indicators to incorporate technical efficiency, managerial efficiency, scale efficiency, resource allocation quality, innovation outputs, and pollution reduction performance. Green innovation management therefore requires multidimensional performance frameworks capable of capturing environmental impact reduction, operational productivity, strategic resource utilization, and long-term sustainable competitiveness under complex decision environments (Chen et al., 2024).

Green innovation is particularly relevant for small and medium enterprises (SMEs), where it represents a strategic approach to balancing environmental responsibility with operational effectiveness and long-term sustainability. Green innovation involves the development and implementation of products, processes, and services that minimize environmental harm while improving resource efficiency and reducing waste. This may include green product innovation, such as recyclable or non-toxic materials, and green process innovation, such as redesigned operations that lower energy, water, and raw material consumption. For SMEs operating under increasing ecological and regulatory pressures, green innovation enables the adoption of cleaner technologies, improved environmental efficiency, and more sustainable business practices (Wirda et al., 2025).

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In conclusion, green innovation management has emerged as a strategic and interdisciplinary capability that integrates environmental sustainability with innovation strategy, technological advancement, and organizational competitiveness. Its effectiveness depends not only on the development of green products and processes, but also on managerial capabilities related to coordination, data-driven decision-making, stakeholder collaboration, and performance evaluation. As environmental pressures intensify and digital transformation accelerates, green innovation management will become increasingly important for organizations seeking resilience, long-term value creation, and sustainable competitive advantage.

10.2 Green Product Innovation Management

Green product innovation management refers to the systematic planning, development, commercialization, and continuous improvement of products that minimize environmental harm across their life cycle while

simultaneously generating economic value, market competitiveness, and long-term organizational resilience. It involves the strategic coordination of organizational resources, technologies, and sustainability initiatives to design, develop, and market environmentally friendly products that create long-term value. This process requires the integration of ecological objectives into product development, research and development investment, and innovation strategy so that firms can reduce environmental impacts while responding effectively to evolving customer expectations and regulatory requirements. Accordingly, green product innovation should be viewed not merely as a compliance activity, but as a strategic capability that enhances customer loyalty, strengthens brand reputation, improves operational efficiency, and positions firms advantageously within sustainability-oriented markets. Its effectiveness is further reinforced when organizations combine green innovation efforts with advanced technologies such as artificial intelligence, strong intellectual capital, and supportive public policies, indicating that environmental innovation is most effective when managed as part of an integrated competitiveness strategy rather than as an isolated environmental program (Abdelfattah et al., 2024).

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Green product innovation may also be understood as the development of new or significantly improved products that reduce ecological burdens while simultaneously creating business value. Compared with conventional product development, this form of innovation is more complex because it requires firms to manage multiple interdependent stakeholders, including customers, suppliers, regulators, employees, non-governmental organizations, and strategic partners, whose interests may differ or conflict. Therefore, successful green product innovation depends not only on technical improvements in environmental performance, but also on the firm's ability to understand stakeholder expectations comprehensively and align those interests throughout the innovation process. In this context, green product innovation includes products that are environmentally responsible, positively perceived by consumers, and capable of generating market success while strengthening organizational innovativeness (Otto et al., 2023).

From a strategic perspective, green product innovation refers to the creation or substantial improvement of products designed to reduce negative environmental impacts throughout their life cycle while maintaining market

value and commercial viability. It is often supported by organizational capabilities, green entrepreneurial orientation, and leadership commitment to sustainability. This includes eco-conscious product design, the use of cleaner materials, lower resource consumption, and responsiveness to increasing consumer demand for sustainable products. Hence, green product innovation extends beyond technical modification and represents a broader organizational commitment to delivering products that satisfy both market needs and environmental responsibilities (Asad et al., 2024).

Similarly, green product innovation can be conceptualized as an organizational capability to design, develop, and introduce products that reduce environmental harm while meeting competitive market requirements. It reflects the integration of sustainability principles into product development through eco-friendly materials, waste reduction, energy-efficient designs, and cleaner production methods. This perspective emphasizes that environmentally responsible innovation depends not only on product attributes, but also on the firm's dynamic capabilities to reconfigure resources, adopt green technologies, improve transaction efficiency, and respond proactively to changing environmental and market conditions (Borah et al., 2025).

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Green product innovation has also been described as the development or modification of products to improve quality, safety, and design while simultaneously reducing environmental impacts throughout the product life cycle. Practical manifestations include biodegradable packaging, lower toxic emissions, efficient resource utilization, and the production of reusable or recyclable products. Moreover, such innovation enables firms to respond to changing customer preferences and regulatory pressures through the application of new knowledge, technologies, and environmentally responsible production practices. In this sense, green product innovation functions not only as an ecological initiative but also as a strategic mechanism for enhancing competitiveness and supporting long-term sustainable development, particularly among small and medium-sized enterprises (Radjenovic et al., 2026).

Beyond manufacturing contexts, green product innovation also encompasses the development and modification of products or services intended to reduce environmental harm, minimize resource consumption,

lower pollution risks, and prevent waste generation throughout their life cycle. It may be regarded as an advanced form of green technological innovation because it addresses environmental problems directly at the source through cleaner materials, eco-friendly packaging, recycled inputs, and service processes that prioritize environmental health and energy efficiency. In transportation and logistics industries, for example, green product innovation includes setting clear sustainability objectives, measuring environmental outcomes, utilizing environmentally friendly materials, and providing customers with information regarding sustainability and occupational health impacts. This demonstrates that green product innovation extends beyond physical products to include service redesign, operational sustainability standards, and customer communication mechanisms that embed environmental responsibility into organizational offerings (Sulistyowati et al., 2025).

In addition, green product innovation has been defined as the development and commercialization of products that minimize environmental harm while improving resource efficiency, reducing energy consumption, and limiting pollutant emissions. It goes beyond conventional product improvement by incorporating eco-friendly materials, cleaner design principles, recyclability, durability, and reduced use of hazardous substances. Such innovation is particularly important in high-pollution industries, where it enables firms to respond to environmental regulations, enhance corporate reputation, and contribute to long-term sustainable development through environmentally responsible market offerings (Tao, 2026).

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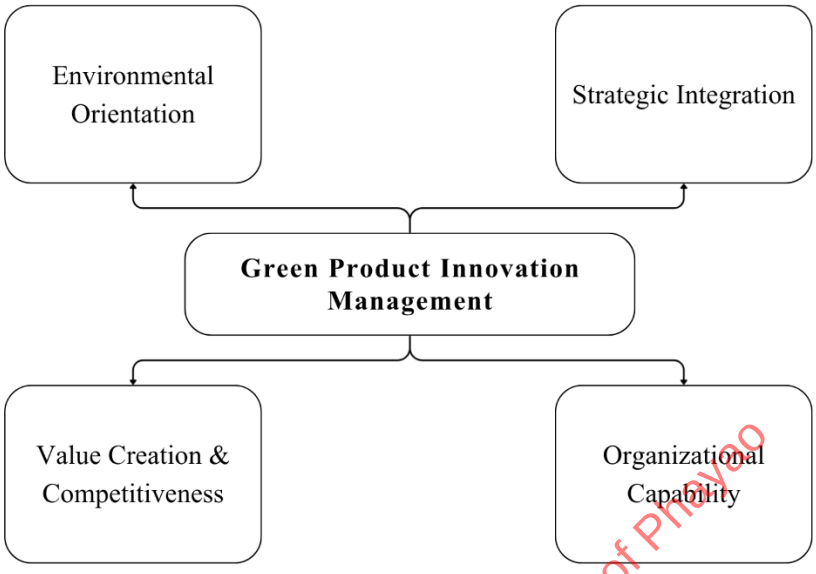

Figure 10.3 Green Product Innovation Management

Source: Adapted from Serrano-García, J., et al. (2022). Capabilities and organisational dimensions conducive to green product innovation: Evidence from Croatian and Spanish manufacturing firms. *Business Strategy and the Environment*, 31(7), 2767–2785.

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As illustrated in Figure 10.3, green product innovation management is conceptualized as a multidimensional construct integrating environmental, strategic, competitive, and organizational dimensions. Environmental orientation emphasizes the systematic reduction of ecological harm through minimizing resource consumption, emissions, and waste across the entire product life cycle. Strategic integration reflects the embedding of sustainability principles into innovation strategies, product development processes, and broader organizational systems, ensuring alignment between environmental objectives and long-term business goals. Simultaneously, value creation and competitiveness highlight the dual pursuit of economic performance and environmental responsibility, enabling firms to achieve market success, differentiation, and enhanced brand equity. Underpinning these dimensions is organizational capability, which involves the effective deployment of dynamic capabilities, stakeholder coordination, and

technological innovation to support continuous adaptation and sustainable product development.

In conclusion, green product innovation management represents a comprehensive strategic approach through which organizations design, develop, and commercialize environmentally responsible products that simultaneously generate economic and competitive benefits. It requires the integration of sustainability principles, stakeholder alignment, technological capability, and managerial commitment across the product development process. Rather than serving solely as an environmental compliance mechanism, green product innovation management functions as a core strategic capability that strengthens resilience, enhances market performance, and supports sustainable long-term growth.

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10.3 Green Service Innovation Management

Green service innovation management refers to the systematic planning, development, implementation, and continuous improvement of environmentally sustainable services that reduce ecological impacts while enhancing customer value, operational efficiency, and competitive performance. Unlike traditional innovation, which often prioritizes economic gains and customer convenience, green service innovation embeds environmental responsibility into service design, delivery processes, stakeholder relationships, and organizational strategy. It is particularly significant in service-intensive industries such as hospitality, tourism, transportation, retail, healthcare, and finance, where intangible service encounters, human interaction, and operational systems strongly influence environmental outcomes. Effective management of green service innovation therefore requires organizations to align environmental objectives with innovation capabilities, market expectations, employee behavior, and long-term strategic positioning. As global sustainability concerns intensify, firms increasingly recognize that green innovation is no longer optional but a strategic necessity for resilience, legitimacy, and sustained competitiveness.

At the strategic level, green service innovation management begins with the development of internal capabilities that enable firms to monitor environmental changes continuously, acquire and integrate green knowledge,

and reconfigure organizational resources to create environmentally responsive service offerings. These capabilities allow organizations to identify emerging opportunities, coordinate specialized expertise, and allocate resources efficiently for the development and refinement of sustainable services. In this sense, strategic green service innovation extends beyond the introduction of isolated eco-friendly initiatives; rather, it represents a dynamic managerial process through which firms renew competencies and adapt service systems to changing market and environmental conditions (Lin & Chen, 2017).

Knowledge management is also recognized as a strategic organizational asset encompassing the systematic acquisition, storage, sharing, and utilization of knowledge resources. From a resource-based view, it constitutes a valuable intangible capability that enables firms to generate new ideas, support informed environmental decision-making, and respond effectively to sustainability-related challenges. Effective knowledge management further strengthens organizational learning and facilitates the productive use of intellectual capital in support of green initiatives and innovation development (Sadiq et al., 2025).

Human resource management plays an equally important role because employees are central to the generation and implementation of environmentally oriented service ideas in daily operations. In hotel settings, green human resource management involves embedding environmental values into recruitment, training, performance appraisal, and reward systems. These practices equip employees with the competencies, motivation, and organizational support necessary to engage in sustainable behaviors. Frontline employees, who interact directly with guests and service processes, are especially well positioned to propose environmentally friendly service improvements, enhance resource efficiency, and implement sustainable practices when supported by appropriate HR systems (Li et al., 2026).

Creativity and entrepreneurial orientation are additional drivers of green service innovation. Green entrepreneurial orientation, characterized by proactiveness, innovativeness, and willingness to pursue environmentally oriented opportunities, encourages firms to recognize emerging sustainability demands and invest in new green services. Employee green creativity defined as the generation of original and useful ideas related to environmental

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preservation further contributes to the development of practical services, processes, and solutions. Customer involvement also provides an important mechanism through which firms obtain market knowledge, service design preferences, and feedback regarding green technologies. Accordingly, managers should foster a culture that supports experimentation, rewards creative environmental ideas, and actively involves customers in service development through surveys, pilot programs, workshops, and co-design activities. Such practices help ensure that green service innovations are both environmentally meaningful and responsive to customer expectations (Luu, 2022).

Customer perception represents another critical dimension because environmental initiatives create strategic value only when customers recognize them as meaningful and beneficial. In the luxury hotel context, green practices may include energy and water conservation, waste reduction, environmentally certified products, local sourcing, and eco-friendly guest services. These initiatives are most effective when customers perceive them as innovative enhancements to the service experience rather than merely cost-saving measures. Perceived green service innovation reflects customers' perceptions of novelty in services and service processes that reduce environmental impacts, highlighting the importance of visible and experience-enhancing sustainability efforts. For luxury hotels, this may involve integrating environmental responsibility with premium quality, comfort, and exclusivity through smart room technologies, sustainable wellness amenities, refined green dining concepts, and seamless digital resource-saving services. Managers should therefore communicate green initiatives clearly and position them as value-added experiences that strengthen guest satisfaction, authenticity, and brand prestige (Dang-Van et al., 2023).

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In tourism SMEs, green service innovation involves the development and improvement of environmentally responsible service offerings, operational practices, and customer experiences that align sustainability objectives with commercial competitiveness. In the context of Bali's tour and travel SMEs, this may include eco-friendly tour packages, paperless reservation systems, resource-efficient service processes, low-emission transport coordination, and sustainability-oriented promotional practices.

Such innovations enable firms to respond to changing traveler preferences, reduce operational waste, differentiate market positioning, and strengthen long-term business viability. Green service innovation therefore serves as a practical pathway through which tourism SMEs translate sustainability commitments into measurable market and financial outcomes, making it a critical component of sustainable tourism management in emerging destinations (Elizabeth, Prabowo, Bandur, et al., 2025).

Green dynamic capabilities further reflect a firm's ability to reconfigure resources, adapt operations, and respond proactively to environmental change in support of sustainable tourism development. These capabilities are essential for redesigning services, integrating environmentally responsible practices, and maintaining long-term competitiveness in markets increasingly shaped by ecological concerns. Conventional managerial routines are often insufficient in rapidly changing environments; instead, firms require adaptive capabilities that enable the continuous renewal of service offerings, the adoption of greener operational systems, and the alignment of business strategies with evolving stakeholder expectations. Such capabilities help tourism enterprises remain resilient while pursuing both economic viability and environmental stewardship (Elizabeth, Prabowo, Setiowati, et al., 2025).

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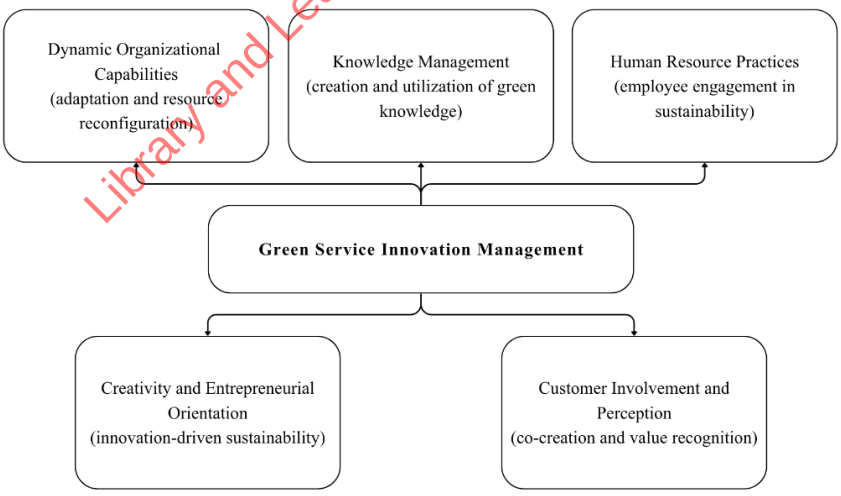

Figure 10.4 Green Service Innovation Management

Source: Adapted from Tseng, S.-M., & Octavyaputri, S. (2024). Enhancing green service innovation behavior through green involvement: The role of

information technology adoption. *Aslib Journal of Information Management*, 77(4), 760–779.

As illustrated in Figure 10.4, green service innovation management is conceptualized as an integrative framework driven by multiple interrelated organizational dimensions that collectively enable sustainable value creation. At its core, dynamic organizational capabilities facilitate continuous adaptation and resource reconfiguration, allowing firms to respond effectively to environmental and market changes. This is complemented by knowledge management, which emphasizes the creation, dissemination, and utilization of green knowledge to support environmentally responsible service development. Human resource practices further reinforce this process by fostering employee engagement and embedding sustainability-oriented behaviors within organizational culture. Additionally, creativity and entrepreneurial orientation play a critical role in promoting innovation-driven sustainability by encouraging proactive opportunity recognition and novel solution development. Finally, customer involvement and perception contribute through co-creation processes and value recognition, ensuring that green service innovations align with customer expectations and enhance perceived value. Collectively, these elements form a comprehensive system that supports the effective management and implementation of green service innovation.

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In conclusion, green service innovation management is a multidimensional strategic process that integrates environmental responsibility with service excellence, organizational capability development, and market competitiveness. Its successful implementation depends on dynamic capabilities, effective knowledge management, supportive human resource systems, entrepreneurial orientation, employee creativity, customer engagement, and positive customer perceptions. Across industries particularly hospitality, tourism, and SMEs green service innovation enables firms to reduce environmental impacts while enhancing customer experiences, operational performance, and long-term resilience. As sustainability becomes a defining condition of modern competition, organizations that systematically manage green service innovation will be better positioned to create enduring economic, social, and environmental value.

10.4 Green Process Innovation Management

Green process innovation management refers to the systematic planning, coordination, implementation, and continuous improvement of operational processes that reduce environmental harm while enhancing productivity, quality, and long-term competitiveness. It focuses on transforming how organizations produce goods or deliver services through cleaner technologies, resource-efficient workflows, waste minimization systems, energy conservation practices, low-emission operations, circular resource utilization, and environmentally responsible managerial routines. Unlike green product innovation, which emphasizes eco-friendly outputs, green process innovation concentrates on the internal methods and procedures through which value is created. As a strategic management discipline, it integrates environmental objectives into operations management, supply chain systems, production engineering, quality control, and organizational learning.

Despite its strategic importance, green process innovation may generate short-term financial strain, creating tensions between sustainability goals and profitability.

Green process innovation has emerged as a rapidly expanding field that connects sustainability objectives with operational excellence, reflecting how firms increasingly redesign production systems to address environmental degradation, regulatory requirements, stakeholder expectations, and competitive pressures. It can be understood as the adoption and implementation of technologies and production methods that reduce energy consumption, pollution, waste, and greenhouse gas emissions throughout operational processes. The concept generally encompasses two major categories: clean technologies, which improve resource efficiency and prevent pollution during production, and end-of-pipe solutions, which capture, treat, or control emissions after production activities. This indicates that green process innovation extends beyond simple regulatory compliance and requires strategic transformation of manufacturing routines, process flows, and technological infrastructures to achieve ecological improvement while maintaining productivity and economic viability. Consequently, organizations increasingly regard green process innovation as a critical

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mechanism for improving environmental performance, operational efficiency, and long-term competitiveness (Khan et al., 2021).

Stakeholder engagement is another critical dimension of green process innovation management because environmental process improvements often depend on coordination with actors beyond the firm's internal boundaries. It refers to the extent to which an organization recognizes and involves stakeholders in environmental decision-making, including inviting input on solving environmental problems, improving management practices, defining performance indicators, and shaping environmental policies and programs. In this context, green process innovation is strengthened when firms systematically consult suppliers, customers, regulators, communities, and other relevant stakeholders to obtain external knowledge, technical expertise, and broader perspectives that support cleaner and more efficient production processes. Effective stakeholder engagement also enables organizations to better understand environmental expectations, enhance legitimacy, and align operational changes with social and regulatory demands. Therefore, managers should establish formal communication mechanisms, collaborative problem-solving initiatives, and participative environmental planning processes so that green process innovation becomes a strategically coordinated and knowledge-driven managerial practice rather than a purely internal technical activity (Appiah, 2023).

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Learning networks and collaborative problem-solving are also important managerial elements in green process innovation because environmental process improvements frequently require expertise, experimentation, and coordination beyond a single firm's internal capabilities. Green process innovation is a complex activity that benefits from inter-organizational collaboration across disciplinary, industry, and university boundaries, where network action learning enables participants to co-direct, co-develop, and co-deploy solutions while generating actionable knowledge. Through shared experiences, critical questioning, and continuous reflection, organizations can exchange practical insights on cleaner technologies, resource efficiency, waste reduction, and sustainable operations. This approach is particularly valuable for SMEs that may face constraints in research capacity, technical knowledge, or access to environmental specialists. Managers can therefore strengthen green process innovation by

engaging in industry associations, university partnerships, cross-sector alliances, and collaborative learning networks that facilitate the continuous co-creation and transfer of environmental knowledge (Wu et al., 2022).

Resource orchestration is a further critical managerial perspective because environmental improvement depends not only on possessing resources but also on how those resources are strategically structured, combined, and deployed. Green process innovations should be viewed as resources embedded within broader organizational systems, where their value emerges through effective orchestration rather than simple acquisition. Drawing on Resource Orchestration Theory, firms achieve stronger environmental outcomes when managers align technological assets, financial investments, human capabilities, and operational routines in coordinated ways. In logistics settings, this may involve integrating renewable energy systems, energy-efficient lighting, automated warehouse controls, data monitoring tools, and employee expertise into unified sustainability processes. This perspective also highlights the importance of post-adoption reconfiguration, meaning that firms must continuously adapt and refine resource combinations after implementation to maximize long-term ecological and competitive value. Therefore, green process innovation is best understood as an ongoing orchestration challenge requiring sequencing, integration, and dynamic capability development rather than isolated spending on green technologies alone (Stanisławski & Morgan-Thomas, 2025).

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Financial outcomes are highly relevant in green process innovation because firms often evaluate sustainability initiatives through their economic consequences. However, the financial effects of green process innovation are not automatically positive at every stage. Initial implementation may create short-term pressure due to investments in cleaner technologies, process redesign, employee training, and operational adjustments. As green process innovation becomes more advanced and systematically embedded, firms may achieve stronger financial returns through greater resource efficiency, lower waste-management costs, energy savings, regulatory compliance benefits, improved operational productivity, and enhanced competitive positioning. The economic value of green process innovation therefore tends to emerge when firms sustain and deepen their environmental process improvements

rather than expecting immediate gains from limited or early-stage initiatives. Accordingly, managers should approach green process innovation as a long-term strategic investment capable of strengthening both environmental and financial performance when implemented at sufficient scale and maturity (Xie et al., 2022).

Environmental management accounting further strengthens managerial decision-making by translating environmental objectives into measurable operational information. It systematically identifies and tracks environmental costs, resource inefficiencies, waste generation, and potential improvement opportunities, thereby enabling managers to make more informed strategic and operational decisions. Through the integration of financial and non-financial data, the system supports planning, performance monitoring, cost allocation, compliance oversight, and continuous improvement initiatives. It also provides information on materials, water, carbon, energy, and waste in both physical and monetary terms, allowing organizations to improve efficiency, reduce unnecessary losses, and enhance accountability. For firms operating in resource-intensive industries, integrating environmental accounting information into daily management processes can substantially improve transparency and support more effective environmental governance (Metwally & Hasanein, 2026).

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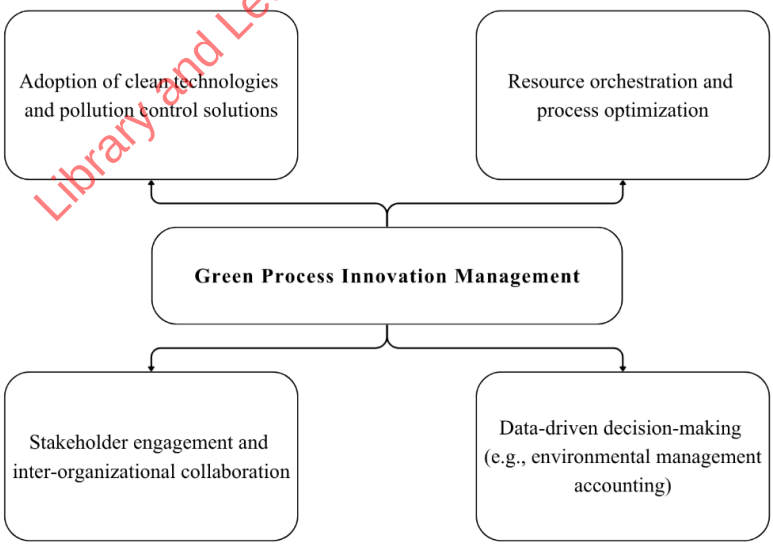

Figure 10.5 Green Process Innovation Management

Source: Adapted from Bhatia, M. S. (2021). Green process innovation and operational performance: The role of proactive environment strategy, technological capabilities, and organizational learning. Business Strategy and the Environment, 30(7), 2845–2857.

As illustrated in Figure 10.5, green process innovation management encompasses a set of interrelated managerial and operational practices aimed at enhancing environmental performance while maintaining organizational efficiency and competitiveness. It involves the adoption of clean technologies and pollution control solutions to minimize ecological impact, alongside resource orchestration and process optimization to improve the efficiency of inputs, energy use, and production systems. Furthermore, it emphasizes stakeholder engagement and inter-organizational collaboration, enabling firms to leverage external knowledge, align sustainability goals across the value chain, and co-create environmentally responsible solutions. Central to this approach is data-driven decision-making, such as the use of environmental management accounting, which supports informed strategic and operational choices through accurate measurement and analysis of environmental costs and impacts. Collectively, these elements reflect a systematic and integrated approach to redesigning organizational processes in ways that simultaneously advance sustainability objectives and long-term competitive advantage.

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In conclusion, green process innovation management represents a strategic approach through which organizations integrate environmental sustainability into operational systems and managerial decision-making. Its effectiveness depends not only on technological adoption but also on stakeholder collaboration, inter-organizational learning, resource orchestration, financial commitment, and data-driven governance. When systematically implemented, green process innovation enables firms to reduce ecological impacts, improve operational efficiency, and strengthen long-term competitiveness. As environmental and competitive pressures continue to intensify, effective management of green process innovation will become increasingly essential for sustainable organizational success.

10.5 Green Business Innovation Management

Green business innovation management refers to the strategic planning, coordination, implementation, and continuous renewal of organizational innovations that create economic value while simultaneously reducing environmental impact and strengthening long-term sustainability. It goes beyond isolated eco-friendly initiatives by embedding environmental objectives into core business models, managerial systems, organizational capabilities, financing mechanisms, leadership practices, and stakeholder relationships. In contemporary markets, firms are increasingly expected not only to comply with environmental regulations but also to proactively innovate through cleaner production systems, circular business models, sustainable product–service offerings, low-carbon operations, and socially responsible growth strategies. Accordingly, green business innovation management can be understood as the managerial capability to systematically transform sustainability pressures into opportunities for competitiveness, resilience, and value creation.

A foundational driver of green business innovation management is the strategic integration of intellectual capital and sustainable leadership. Intellectual capital is commonly conceptualized through three dimensions: human capital, structural capital, and relational capital. Human capital refers to employees' knowledge, skills, creativity, and adaptability. Structural capital includes organizational systems, routines, processes, and proprietary knowledge. Relational capital reflects the firm's networks and relationships with external stakeholders. Collectively, these intangible assets strengthen a firm's capacity to generate innovation and achieve long-term sustainability outcomes. Sustainable leadership complements these resources by embedding ethical decision-making, long-term orientation, stakeholder responsibility, and environmental commitment into organizational strategy and operations. Sustainable leadership positively enhances the effects of human capital and relational capital on green business innovation, while green business innovation mediates the relationship between intellectual capital and business sustainability. Therefore, effective green business innovation management depends not only on knowledge-based resources but also on leadership capable of mobilizing those resources toward environmental and strategic goals (Ahmad et al., 2025).

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Human resources and leadership capabilities are also central to managing green innovation. Green human capital consists of employees' environmental knowledge, green skills, ecological values, and competencies that enable firms to support sustainable operations and develop environmentally responsible products and processes. Green transformational leadership refers to a leadership approach in which managers articulate a clear environmental vision, inspire employees to pursue sustainability objectives, encourage commitment to ecological improvement, and help overcome environmental challenges within the organization. In addition, green dynamic capabilities represent the organizational capacity to renew resources, integrate knowledge, and reconfigure internal capabilities in response to changing environmental demands and market conditions. From a managerial perspective, effective green innovation management therefore requires firms to invest in employee training, build environmental expertise, cultivate leadership commitment, and strengthen adaptive capabilities so that sustainability initiatives become embedded in daily operations rather than remaining symbolic intentions (Taleb & Phemiqi, 2023).

Financial architecture constitutes another essential dimension of green business innovation management because many sustainability initiatives require substantial upfront investment before long-term benefits are realized. Green technologies, renewable energy systems, waste recovery facilities, digital monitoring platforms, and circular redesign projects often demand capital commitments that exceed routine operating budgets. In this context, financial management becomes a strategic mechanism for mobilizing resources toward environmental transformation rather than merely recording expenditures. Green finance instruments, particularly green bonds, have become increasingly important for funding environmentally oriented projects and supporting transitions to renewable energy systems. These instruments can reduce financing costs, broaden access to environmentally conscious investors, improve transparency in resource allocation, and strengthen a firm's sustainability reputation in capital markets. Green finance also serves as a signaling mechanism that demonstrates credible environmental commitment to investors, regulators, and other stakeholders. Consequently, firms should diversify access to capital through instruments such as green bonds, sustainability-linked loans, ESG-focused funds, impact investment channels, and responsible equity markets. This is especially important for

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SMEs and resource-constrained firms, for which access to innovative financing often determines whether green opportunities remain aspirational plans or become executable strategies embedded in business innovation systems (Leitão et al., 2023).

The integration of circular economy principles has become one of the most practical pathways for green business innovation management because it shifts firms away from linear "take–make–dispose" models toward systems that reduce waste, extend product life cycles, reuse materials, recover resources, and regenerate environmental value. In the context of culinary SMEs, this approach may involve reusable or biodegradable packaging, local sourcing, waste separation, conversion of food residues into secondary products such as compost or animal feed, and more efficient inventory control to minimize spoilage. Green business innovation is further strengthened when circular practices are supported by digital tools such as e-commerce platforms, digital payment systems, and inventory monitoring technologies, together with social protection mechanisms that enhance workforce stability and business resilience. This demonstrates that environmentally oriented innovation is not limited to large manufacturing firms but can also be effectively implemented by small service businesses when managerial systems combine resource efficiency, technological utilization, and supportive institutional frameworks (Megawati et al., 2024).

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Organizational culture and stakeholder pressure are equally important contextual drivers of green business innovation management because they shape how firms interpret environmental expectations and embed sustainability into everyday operations. Green culture refers to shared organizational values, norms, and routines that encourage environmental responsibility, resource efficiency, and long-term ecological awareness across all organizational levels. Such a culture supports employee participation, cross-functional collaboration, and openness to sustainable change, thereby creating favorable internal conditions for continuous innovation. At the same time, stakeholder pressure arises from external groups such as customers, regulators, investors, suppliers, and local communities that increasingly expect firms to demonstrate environmental accountability, comply with sustainability standards, and provide greener products or services. These expectations often motivate organizations to improve environmental

practices, redesign operations, strengthen transparency, and pursue more responsible business models. Managerially, this suggests that green innovation should not rely solely on formal policies or executive directives, but also on cultivating internal environmental values while remaining responsive to evolving stakeholder demands. Firms that integrate sustainability into performance systems, employee behavior, communication practices, and strategic decision-making are better positioned to sustain innovation and enhance long-term business performance (Nuong & Hai, 2026).

Public policy and institutional incentives also serve as important enablers of green business innovation management. Changes in official performance assessment systems, environmental accountability mechanisms, and natural resource asset audits have been designed to align governance priorities with sustainability objectives. These reforms illustrate that when governments embed environmental goals into administrative systems, regulatory enforcement, and development planning, firms receive stronger signals to improve environmental performance and invest in greener operations. For managers, this implies that policy scanning should be treated as a strategic capability. Organizations that actively monitor subsidies, tax incentives, green procurement programs, environmental compliance requirements, carbon governance frameworks, and regional industrial policies are better positioned to anticipate change, allocate resources effectively, and capture early opportunities in sustainable markets. Rather than viewing regulation solely as a constraint, forward-looking firms can interpret evolving policy frameworks as catalysts for innovation, modernization, and long-term competitive advantage (Wang et al., 2022).

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In the context of electric vehicle adoption in Thailand, green business innovation management involves improving technological systems, expanding charging infrastructure, increasing accessibility, and promoting cost-efficient solutions that encourage the transition toward cleaner transportation. The importance of managerial and policy initiatives such as government incentives, infrastructure development, and consumer awareness programs to accelerate sustainable mobility. Thus, green business innovation management can be viewed as the coordinated application of technology, policy support, and operational innovation to create environmentally

responsible value and advance sustainable economic development (Suvittawat et al., 2025).

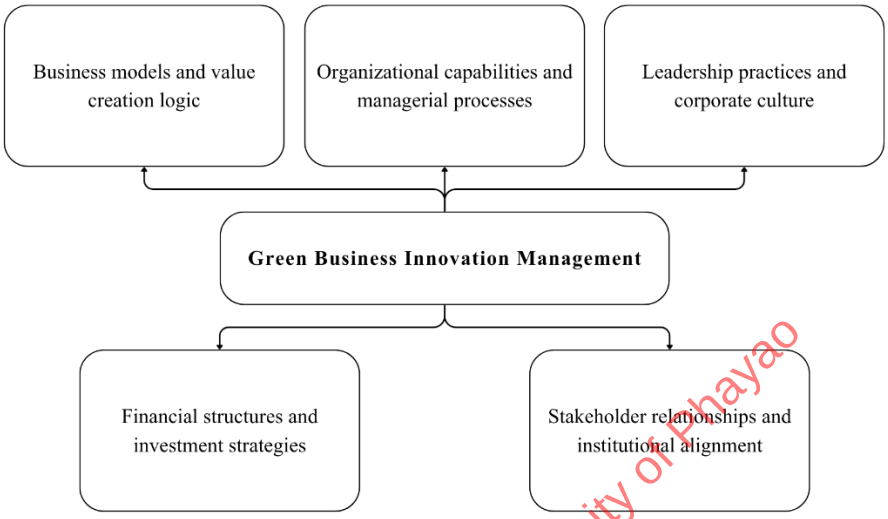

Figure 10.6 Green Business Innovation Management

Source: Adapted from Duh, H. I., Radebe, N., & Chipangamate, N. (2026). Impact of sustainable business model innovation and green competencies on business sustainability in the mining sector: Moderating role of green creativity. *The Extractive Industries and Society*, 25, 101784.

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As illustrated in Figure 10.6, green business innovation management is conceptualized as an integrative, system-level approach that aligns multiple organizational dimensions to simultaneously generate economic value and environmental sustainability. At its core, it requires the redesign of business models and value creation logic to incorporate sustainable principles, supported by strong organizational capabilities and managerial processes that enable continuous innovation and adaptation. This is reinforced by leadership practices and corporate culture that embed sustainability into strategic intent and everyday decision-making. Furthermore, effective implementation depends on financial structures and investment strategies that prioritize long-term sustainable returns, as well as robust stakeholder relationships and institutional alignment to ensure legitimacy, collaboration, and compliance with environmental standards. Collectively, these interconnected elements form a holistic framework that allows firms to move beyond isolated green

initiatives toward sustained, scalable, and strategically embedded green innovation.

In conclusion, green business innovation management is a multidimensional strategic capability through which firms align environmental responsibility with innovation, competitiveness, and sustainable growth. Its effectiveness depends on the integration of intellectual capital, leadership commitment, adaptive capabilities, financial resources, circular economy practices, supportive organizational culture, stakeholder responsiveness, and enabling public policy. Firms that manage these dimensions systematically are better positioned to convert sustainability challenges into long-term sources of resilience, differentiation, and value creation.

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Case Study

Electric Mobility in Transition: An Empirical Case Study of Consumer Behavior and Electric Vehicle Adoption in Thailand

Adapted Reprint from:
Suvittawat, A., Suvittawat, N., & Khampirat, B. (2025). Examining the Influence of Technological Perception, Cost, and Accessibility on Electric Vehicle Consumer Behavior in Thailand. World Electric Vehicle Journal, 16(9), 543. https://doi.org/10.3390/wevj16090543

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1. Introduction

Thailand's transportation sector is undergoing a structural transformation as electric vehicles (EVs) expand alongside the growth of mass rapid transit (MRT) systems, continued infrastructure development, and rising environmental consciousness. National decarbonization objectives and escalating urban congestion have elevated the EV transition as a strategic policy priority. Although EV adoption has progressed rapidly in many global markets supported by dense charging networks and strong governmental incentives, the Thai context remains more heterogeneous. Metropolitan areas such as Bangkok are advancing quickly toward electric mobility, whereas rural and peripheral regions continue to face infrastructural limitations that constrain broader diffusion.

Understanding consumer behavior within this changing mobility landscape is critical, as EV adoption is influenced not only by financial incentives but also by user experience, technological confidence, and everyday travel requirements. This chapter explores these dynamics through an empirical case study designed to clarify the behavioral, infrastructural, and perceptual determinants shaping EV usage in Thailand.

The study is based on a large-scale survey and structural equation modeling (SEM) analysis examining the interrelationships among convenience and accessibility (CA), technological perception and performance (TP), cost of ownership and usage (CU), and travel patterns and

usage behavior (TU). Collectively, these constructs provide a multidimensional perspective on EV adoption, extending beyond narrow explanations centered solely on price sensitivity or environmental concern.

2. National Context: The Rise of Electric Mobility in Thailand

Thailand's policy framework supporting electric vehicle (EV) adoption has intensified substantially in recent years. The transportation sector remains a major source of national carbon emissions, contributing approximately 29 percent of Thailand's total CO_2 output, or nearly 79 million tons in 2023, thereby increasing the urgency for lower-emission mobility alternatives. In response, the government has introduced a range of policy measures, including tax incentives, direct purchase subsidies, reductions in import duties, and strategic support for domestic battery production and EV assembly. Concurrently, the rapid expansion of Bangkok MRT has provided a cleaner and more efficient public transport system that increasingly influences patterns of private mobility demand.

Notwithstanding these advancements, the spatial distribution of EV charging infrastructure remains highly uneven. Urban areas generally benefit from greater charger density, closer proximity to commercial centers, and a higher concentration of early adopters. In contrast, rural provinces continue to experience limited charger access, fewer fast-charging facilities, and comparatively weaker grid reliability. These geographic imbalances generate divergent consumer experiences across regions, influencing perceptions of EV practicality as well as everyday usage behavior.

Moreover, Thailand's built environment introduces additional structural constraints. Many residential communities depend on shared parking facilities or roadside parking, thereby restricting opportunities for home charging, which has been identified globally as a critical determinant of EV adoption. Consequently, public charging networks assume a disproportionately important role in shaping consumer purchase decisions, usage confidence, and the broader diffusion of EV technology.

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3. Methodology and Research Framework

The empirical foundation of this case study is a quantitative survey administered to 398 respondents, combined with structural equation modeling for hypothesis testing. The survey consists of measures capturing four key constructs:

Convenience and Accessibility (CA) – availability and ease of access to charging infrastructure, perceived charging convenience, travel-time efficiency.

Technological Perception and Performance (TP) – perceived reliability, technological innovations, range confidence, ease of use.

Cost of Ownership and Usage (CU) – perceptions of purchase price, maintenance costs, electricity/fuel savings, and long-term financial considerations.

Travel Patterns and Usage Behavior (TU) – frequency of EV use, trip purposes, distance traveled, multimodal integration.

Reliability and validity tests show strong factor loadings (0.677–0.865) and Cronbach's alpha values exceeding 0.8, indicating high internal consistency. Model fit indices (RMSEA = 0.026, CFI = 0.993, GFI = 0.972) confirm an excellent fit.

Eight hypotheses explore direct and mediating effects among variables, offering a comprehensive view of how perceptions, behavior, and infrastructural factors interact within Thailand's EV ecosystem.

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4. Findings and Discussion

4.1 Convenience and Accessibility as the Cornerstone of EV Acceptance

Among all variables, convenience and accessibility exhibit the strongest and broadest influence. CA significantly affects:

- Technological perception and performance (β = 0.342)
- Cost of ownership and usage (β = 0.343)
- Travel patterns and usage behavior (β = 0.179)

These findings indicate that electric vehicle (EV) adoption is fundamentally shaped by infrastructural confidence. Consumers are more inclined to adopt EV technology when charging facilities are perceived as accessible, dependable, and adequately distributed along their regular travel routes. In contrast, limited or unreliable charging availability intensifies range anxiety, discourages trial behavior, and diminishes the perceived benefits of technological innovation.

In Thailand, this relationship is particularly salient due to the uneven spatial distribution of charging infrastructure and restricted access to residential charging solutions. The lack of reliable charging facilities in rural and peri-urban areas places a disproportionate burden on middle-income households, thereby heightening perceptions of risk, inconvenience, and adoption barriers.

4.2 Technological Perception and Performance: Confidence as a Catalyst

Technological perception emerges as a powerful driver of both economic expectations and behavioral outcomes. TP significantly influences:

- Cost perceptions ($\beta = 0.213$)
- Travel usage patterns ($\beta = 0.325$)

Consumers who perceive electric vehicles (EVs) as technologically dependable—particularly in terms of reliability, battery performance, driving range, and operational simplicity—demonstrate a greater willingness to adapt their mobility behaviors, including modifying driving routines, undertaking longer journeys, and integrating EVs into multimodal transportation patterns. Notably, technological confidence partially mediates the relationship between convenience and actual usage, suggesting that charging infrastructure shapes not only behavioral outcomes but also the cognitive frameworks through which consumers evaluate EV capabilities.

Driving experience further contributes to this process. As users become increasingly familiar with features such as regenerative braking, rapid torque delivery, and battery management systems, their confidence in EV technology strengthens. This process of psychological adaptation reinforces favorable perceptions, increases user comfort, and promotes more flexible and sustained travel behavior.

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4.3 Cost of Ownership and Usage: A Dependent Interpretation

Although financial considerations remain important, their influence is more nuanced than often assumed. CU affects usage behavior (β = 0.203), but its role is mediated by infrastructure and technological confidence.

Consumers interpret cost through their day-to-day experience:

- If charging is convenient and technology feels reliable, EVs are seen as economical.
- If charging is difficult or the technology feels uncertain, perceived costs rise even if objective expenses (electricity vs. gasoline) are lower.

The study also finds that CA influences CU indirectly (mediation effect = 0.059), revealing that perceived affordability depends on access and operational ease.

In Thailand, apprehensions regarding battery replacement expenses, unpredictable electricity pricing at public charging stations, and regional inequalities in charging infrastructure significantly influence consumers' perceptions of EV-related costs. These findings suggest that affordability should not be examined as an independent factor, but rather as one that is closely intertwined with infrastructural conditions and psychological preparedness.

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4.4 Travel Patterns and Usage Behavior: The Result of Interacting Influences

Travel behavior represents the culmination of convenience, perception, and cost considerations. TU is directly shaped by:

- Convenience and accessibility
- Technological perception
- Cost perceptions

EV drivers adapt their mobility patterns in several ways:

- Preferring predictable routes with known charging options
- Charging more frequently than necessary ("comfort charging")
- Using EVs for short, routine trips but reserving ICE vehicles for long-distance travel
- Integrating EV use with MRT or park-and-ride systems in Bangkok

These behavioral adaptations are consistent with global trends, yet they also reflect Thailand's distinctive mobility context, characterized by urban traffic congestion, constrained suburban charging infrastructure, and heterogeneous household travel requirements.

5. Synthesis

The case study illustrates that green innovation management extends beyond technological substitution from internal combustion vehicles to electric vehicles; it requires an integrated managerial system that aligns technological perception, cost efficiency, accessibility, and user behavior to accelerate sustainable mobility adoption. From a green innovation management perspective, the findings demonstrate that innovation success depends not only on product-level improvements such as battery performance and vehicle reliability, but also on ecosystem innovation through charging infrastructure, digital support systems, and service accessibility. When consumers perceive EV technology as convenient, reliable, and economically beneficial, adoption intentions and usage behavior increase, indicating that environmental innovations must deliver both ecological value and functional customer value simultaneously.

Furthermore, the study highlights that green innovation management should emphasize systemic collaboration among government agencies, automotive manufacturers, energy providers, and urban planners to reduce adoption barriers and create scalable green ecosystems. Incentive programs, infrastructure investment, and public awareness campaigns act as complementary innovation mechanisms that lower perceived risk and enhance market readiness. This suggests that sustainable innovation is not achieved through isolated technological advancement alone, but through coordinated managerial strategies that integrate policy support, stakeholder collaboration, and consumer-centric value creation. Consequently, Thailand's EV transition reflects how green innovation management can transform environmental objectives into practical economic and social outcomes.

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6. Conclusion

Thailand's EV market reflects both global electrification trends and country-specific structural conditions. Convenience and accessibility emerge as core determinants of adoption, influencing technological trust, cost perceptions, and mobility behavior. Confidence in EV technology promotes trial behavior and strengthens recognition of ownership benefits. Although cost remains relevant, its impact is largely mediated by user experience and charging infrastructure availability. EV usage patterns therefore represent an interaction among everyday routines, psychological readiness, and broader system conditions.

This case study indicates that Thailand's EV transition requires more than subsidies or technological progress alone. Effective adoption depends on an integrated ecosystem that reduces infrastructure gaps, improves consumer awareness, and coordinates public transport with private mobility systems. In a developing-market context, EV adoption should be understood not merely as a technological substitution, but as a behavioral transformation shaped by geography, culture, and public policy.

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Roadmap of the Chapter

The chapter is structured into five sections. Following the introduction, the background section examines historical developments, policy frameworks, and infrastructural challenges affecting Thailand's EV market. The methodology section explains the research design, sampling approach, and analytical procedures. The discussion and analysis section interprets the findings through the case context and relevant theoretical perspectives, particularly behavioral economics and the Technology Acceptance Model (TAM). The final section summarizes key insights, presents policy implications, and identifies directions for future EV adoption research.

Linking the Case to Theory

This case draws on complementary theoretical perspectives to explain consumer behavior. Behavioral economics provides insight into the cognitive and psychological mechanisms underlying transportation decisions, demonstrating why consumers do not always behave in fully rational or

economically optimal ways. The Technology Acceptance Model (TAM) explains how perceived usefulness and ease of use shape acceptance of emerging technologies such as EVs. In addition, transportation planning concepts, particularly accessibility and mobility behavior, clarify how infrastructure quality and travel constraints influence daily mobility patterns.

By integrating these perspectives, the chapter frames EV adoption in Thailand as both a technological transition and a behavioral shift shaped by perceptions, habits, infrastructure, and contextual conditions. This perspective is essential for explaining why some consumers adopt EVs readily, while others remain hesitant despite substantial policy support.

Case Study Questions

1. How does charging convenience and accessibility influence Thai consumers' perceptions of EV technology?
2. To what extent does convenience and accessibility affect the perceived cost of EV ownership and usage?
3. How do technological perception and performance shape EV travel patterns and usage behavior in Thailand?
4. Does perceived cost of ownership influence EV usage behavior among Thai consumers?
5. Do technological perception and cost mediate the relationship between accessibility and EV consumer behavior?

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Chapter Summary

This chapter contributes by integrating green product innovation, green service innovation, green process innovation, and green business innovation into a unified managerial framework. Together, these interconnected dimensions demonstrate how organizations can embed sustainability across products, services, operations, and business systems to achieve environmental sustainability, operational efficiency, and long-term competitive advantage.

Green innovation management is the systematic planning and coordination of innovation activities that reduce environmental harm while improving competitiveness, efficiency, and long-term sustainability. It integrates ecological objectives into products, processes, managerial systems, and strategic decisions rather than treating sustainability as mere compliance. Key dimensions include green product innovation, green process innovation, digital transformation, stakeholder collaboration, and performance measurement. By combining environmental responsibility with innovation capability, organizations can improve resilience, create value, and sustain competitive advantage in increasingly dynamic markets.

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Green product innovation management focuses on designing, developing, commercializing, and continuously improving products that minimize environmental impact throughout their life cycle while maintaining economic value and market competitiveness. It includes eco-friendly materials, recyclable packaging, lower energy consumption, reduced hazardous substances, and sustainable product design. Successful implementation requires stakeholder alignment, technological capability, leadership commitment, and responsiveness to customer and regulatory expectations. As a strategic capability, it enhances brand reputation, customer loyalty, resilience, and long-term business growth.

Green service innovation management refers to the development and improvement of environmentally sustainable services that reduce ecological impact while increasing customer value and operational efficiency. It is particularly relevant in service industries such as hospitality, tourism, healthcare, retail, and finance, where service processes strongly influence

sustainability outcomes. Core drivers include dynamic capabilities, knowledge management, green HR practices, employee creativity, entrepreneurial orientation, and customer involvement. Firms that manage green service innovation effectively can strengthen customer experiences, improve competitiveness, and generate lasting economic, social, and environmental value.

Green process innovation management emphasizes redesigning internal operations and production methods to reduce waste, emissions, and resource consumption while improving productivity and quality. It includes cleaner technologies, energy-efficient workflows, circular resource systems, waste minimization, and environmentally responsible managerial routines. Effective implementation depends on stakeholder engagement, collaborative learning networks, resource orchestration, environmental accounting, and long-term investment commitment. By transforming operational systems, organizations can achieve stronger environmental performance, cost efficiency, and sustainable competitiveness.

Green business innovation management is a broader strategic approach that embeds environmental objectives into business models, leadership systems, organizational capabilities, financing structures, and stakeholder relationships. It moves beyond isolated eco-friendly projects toward sustainable transformation through circular economy models, green finance, sustainable leadership, and adaptive organizational culture. Important enablers include intellectual capital, employee green skills, policy incentives, stakeholder pressure, and innovative funding mechanisms. Firms that systematically manage these elements can convert sustainability challenges into opportunities for resilience, differentiation, and long-term value creation.

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Chapter Review Questions

Review Question 1:

How does green innovation management help organizations achieve both environmental sustainability and competitive advantage?

Review Question 2:

Why is stakeholder alignment important in managing successful green product innovation?

Review Question 3:

How can green service innovation improve customer value and long-term business competitiveness?

Review Question 4:

What are the main benefits of implementing green process innovation in organizational operations?

Review Question 5:

How do leadership, organizational culture, and financing support green business innovation management?

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Chapter Exercises

Exercise 1:

Analyze how green innovation management helps organizations achieve both environmental sustainability and competitive advantage. Provide two real-world examples.

Exercise 2:

Select a product used in daily life and redesign it as a green product. Explain the environmental improvements, customer benefits, and potential market opportunities.

Exercise 3:

Choose a service business (e.g., hotel, restaurant, bank, hospital) and propose three green service innovations that improve customer experience while reducing environmental impact.

Exercise 4:

Examine a manufacturing or service operation and identify two process changes that could reduce waste, energy use, or emissions while improving efficiency.

Exercise 5:

Develop a green business model for an SME. Explain how it creates economic value, reduces environmental impact, and strengthens long-term competitiveness.

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References

Abdelfattah, F., Salah, M., Dahleez, K., Darwazeh, R., & Al Halbusi, H. (2024). The future of competitive advantage in Oman: Integrating green product innovation, AI, and intellectual capital in business strategies. *International Journal of Innovation Studies, 8*(2), 154-171. https://doi.org/10.1016/j.ijis.2024.02.001

Ahmad, N., Khan, W., Elahi, A. R., & Haris, M. (2025). Integrating intellectual capital and sustainable leadership to strengthen green business innovation and sustainability of SMEs. *Journal of Enterprise Information Management*. https://doi.org/10.1108/JEIM-03-2025-0193

Appiah, L. O. (2023). Stakeholder Engagement for Green Process Innovation: Exploring the Link and Boundary Conditions. *Operations and Supply Chain Management, 16*(2), 153-163. https://doi.org/10.31387/oscm0530380

Asad, M., Bait Ali Sulaiman, M. A., Ba Awain, A. M. S., Alsoud, M., Allam, Z., & Asif, M. U. (2024). Green entrepreneurial leadership, and performance of entrepreneurial firms: does green product innovation mediates? *Cogent Business & Management, 11*(1), 2355685. https://doi.org/10.1080/23311975.2024.2355685

Bhatia, M. S. (2021). Green process innovation and operational performance: The role of proactive environment strategy, technological capabilities, and organizational learning. *Business Strategy and the Environment*, 30(7), 2845–2857. https://doi.org/10.1002/bse.2775

Borah, P. S., Dogbe, C. S. K., & Marwa, N. (2025). Green dynamic capability and green product innovation for sustainable development: Role of green operations, green transaction, and green technology development capabilities. *Corporate Social Responsibility and Environmental Management, 32*(1), 911-926. https://doi.org/10.1002/csr.2993

Library and Learning, University of Phayao

Chen, L., Xie, X., & Tao, S. (2024). An Improved Slack Based Measure Model for Evaluating Green Innovation Efficiency Based on Asymmetric Data. *Symmetry, 16*(4), 429. https://doi.org/10.3390/sym16040429

Dang-Van, T., Vo-Thanh, T., Wang, J., & Nguyen, N. (2023). Luxury hotels' green practices and consumer brand identification: The roles of perceived green service innovation and perceived values. *Business Strategy and the Environment, 32*(7), 4568-4583. https://doi.org/10.1002/bse.3381

Duh, H. I., Radebe, N., & Chipangamate, N. (2026). Impact of sustainable business model innovation and green competencies on business sustainability in the mining sector: Moderating role of green creativity. *The Extractive Industries and Society*, 25, 101784. https://doi.org/ 10.1016/j.exis.2025.101784

Elizabeth, E., Prabowo, H., Bandur, A., & Setiowati, R. (2025). Harnessing Green Dynamic Capabilities for Sustainable Tourism Performance: The Mediating Role of Green Service Innovation in Bali's Tour and Travel SMEs. *Tourism and Hospitality, 6*(3), 156. https://doi.org/10.3390/tourhosp6030156

Elizabeth, E., Prabowo, H., Setiowati, R., & Bandur, A. (2025). Sustainable Tourism Strategies: Examining Green Service Innovation as a Mediator Between the Marketing Mix and Business Performance in Bali's Tour and Travel SMEs. *Tourism and Hospitality, 6*(3), 129. https://doi.org/10.3390/tourhosp6030129

Huy, P. Q., & Phuc, V. K. (2025). Insight into how Environmental Management Accounting Practices and Complexity of Green Innovation Management Pave the Way Toward Strategic Resilience. *Journal of the Knowledge Economy, 16*(4), 14146-14179. https://doi.org/10.1007/s13132-024-02461-3

Khan, S. J., Kaur, P., Jabeen, F., & Dhir, A. (2021). Green process innovation: Where we are and where we are going. *Business Strategy and the Environment, 30*(7), 3273-3296. https://doi.org/10.1002/bse.2802

Library and Learning University of Phayao

Leitão, J., Ferreira, J., & Santibanez-González, E. (2023). Green finance sources in Iberian listed firms: A socially responsible investment approach. *Journal of Cleaner Production, 427*, 139259. https://doi.org/10.1016/j.jclepro.2023.139259

Li, Y., Li, T., Ling, Y., Feng, X., Wang, H., & Liao, C. (2026). A multi-method analysis of employee-driven green service innovation in hotels based on the ability-motivation-opportunity framework. *Scientific Reports, 16*(1), 4643. https://doi.org/10.1038/s41598-025-34970-9

Lin, Y. H., & Chen, Y. S. (2017). Determinants of green competitive advantage: the roles of green knowledge sharing, green dynamic capabilities, and green service innovation. *Quality and Quantity, 51*(4), 1663-1685. https://doi.org/10.1007/s11135-016-0358-6

Luu, T. T. (2022). Fostering green service innovation perceptions through green entrepreneurial orientation: the roles of employee green creativity and customer involvement. *International Journal of Contemporary Hospitality Management, 34*(7), 2640-2663. https://doi.org/10.1108/IJCHM-09-2021-1136

Megawati, S., Herdiansyah, H., Machmud, A., Antriyandarti, E., & Sudirman, S. (2024). INTEGRATING CIRCULAR ECONOMY, DIGITAL ECONOMY, AND SOCIAL PROTECTION POLICIES TO DRIVE GREEN BUSINESS INNOVATION: INSIGHTS FROM INDONESIA'S CULINARY SMES. *Problems and Perspectives in Management, 22*(4), 368-381. https://doi.org/10.21511/ppm.22(4).2024.28

Metwally, A. B. M., & Hasanein, A. M. (2026). Unpacking the Role of Green Process Innovation as a Linking Mechanism Between Environmental Management Accounting and Environmental Performance in the Oil Sector. *Administrative Sciences, 16*(3), 125. https://doi.org/10.3390/admsci16030125

Nuong, L. T., & Hai, N. T. T. (2026). Driving sustainable business performance: The roles of circular economy policy, stakeholder

Library and Learning, University of Phayao

pressure, and green culture. *International Journal of Advanced and Applied Sciences, 13*(2), 38-48. https://doi.org/10.21833/ijaas.2026.02.005

Otto, G. A., Driessen, P. H., Hillebrand, B., & Prasad, R. (2023). Antecedents and performance implications of stakeholder understanding in green product innovation. *Journal of Cleaner Production, 420*, 138174. https://doi.org/10.1016/j.jclepro.2023.138174

Qin, X., Muskat, B., Ambrosini, V., Mair, J., & Chih, Y.-Y. (2025). Green Innovation Implementation: A Systematic Review and Research Directions. *Journal of Management*, 52(1), 255-282. https://doi.org/10.1177/01492063241312656

Qiu, L., Hu, D., & Wang, Y. (2020). How do firms achieve sustainability through green innovation under external pressures of environmental regulation and market turbulence? *Business Strategy and the Environment, 29*(6), 2695-2714. https://doi.org/https://doi.org/10.1002/bse.2530

Radjenovic, T., Ivanovic-Djukic, M., & Jankovic Milic, V. (2026). Impact of green product innovation in SMEs on sustainable development. *E a M: Ekonomie a Management, 29*(1), 70-83. https://doi.org/10.15240/tul/001/2026-1-005

Ren, X., & Mia, M. A. (2025). The determinants of green innovations in manufacturing industries: A systematic literature review. *Future Business Journal*, 11, 42. https://doi.org/10.1186/s43093-025-00461-6

Sadiq, M., Leong, M. K., Salim, A. S., & Jiayao, Z. (2025). Fostering entrepreneurial success through the predictive role of knowledge management, green creativity, green social behavior, dynamic capabilities, business environment and green service innovation. *International Entrepreneurship and Management Journal, 21*(1), Article 81. https://doi.org/10.1007/s11365-025-01080-x

Library and Learning, University of Phayao

Serrano-García, J., Bikfalvi, A., Llach, J., & Arbeláez-Toro, J. J. (2022). Capabilities and organisational dimensions conducive to green product innovation: Evidence from Croatian and Spanish manufacturing firms. *Business Strategy and the Environment*, 31(7), 2767–2785. https://doi.org/10.1002/bse.3014

Stanisławski, R., & Morgan-Thomas, A. (2025). Resource orchestration in green process innovation: Evidence from the logistics industry in Poland. *European Management Journal*. https://doi.org/10.1016/j.emj.2025.07.007

Sulistyowati, N., Virgantari, F., Auliarachmah, A., & Emir, S. (2025). The Role of Green Product Innovation and Market Advantage on Performance, Case of Transportation and Logistics Services. *Management and Production Engineering Review, 16*(2). https://doi.org/10.24425/mper.2025.154932

Suvittawat, A., Suvittawat, N., & Khampirat, B. (2025). Examining the Influence of Technological Perception, Cost, and Accessibility on Electric Vehicle Consumer Behavior in Thailand. *World Electric Vehicle Journal, 16*(9), 543. https://doi.org/10.3390/wevj16090543

Taleb, M., & Pheniqi, Y. (2023). Linking Green Human Capital, Green Transformational Leadership, Green Dynamic Capabilities, and Green Innovation: A Moderation Model. *Journal of System and Management Sciences, 13*(3), 102-127. https://doi.org/10.33168/JSMS.2023.0308

Tao, Z. (2026). How environmental corporate social responsibility affects green product innovation in China high-pollution industry: The mediating role of green entrepreneurial orientation. *Innovation and Green Development, 5*(1), 100330. https://doi.org/10.1016/j.igd.2026.100330

Thirakulwanich, A. (2024). Mapping the Evolution of Green Innovation Management: Patterns, Challenges, and Future Directions. *International Journal of Sustainable Development and Planning, 19*(7), 2415-2442. https://doi.org/10.18280/ijsdp.190701

Library and Learning, University of Phayao

Tseng, S.-M., & Octavyaputri, S. (2024). Enhancing green service innovation behavior through green involvement: The role of information technology adoption. *Aslib Journal of Information Management*, 77(4), 760–779. https://doi.org/ 10.1108/AJIM-11-2023-0497

Wang, Y., Feng, J., Yasir, N., & Bai, Y. (2022). The Impact of Political Incentives Received by Key Local Officials on Enterprises' Green Innovations for the Development and Construction of Ecological Civilization in China. *Sustainability, 14*(18), 11347. https://doi.org/10.3390/su141811347

Wirda, F., Azra, T., Jumyetti, J., Herizon, H., & Tanjung, A. (2025). Green innovation on determinants of organizational performance with management commitment as a moderating variable. *Intangible Capital, 21*(2), 359-375. https://doi.org/10.3926/ic.3159

Wu, S.-H., Coughlan, P., Coghlan, D., McNabola, A., & Novara, D. (2022). Developing green process innovation through network action learning. *Creativity and Innovation Management, 31*(2), 248-259. https://doi.org/10.1111/caim.12484

Xie, X., Hoang, T. T., & Zhu, Q. (2022). Green process innovation and financial performance: The role of green social capital and customers' tacit green needs. *Journal of Innovation & Knowledge, 7*(1), 100165. https://doi.org/10.1016/j.jik.2022.100165

Yin, S., Dong, T., Li, B., & Gao, S. (2022). Developing a Conceptual Partner Selection Framework: Digital Green Innovation Management of Prefabricated Construction Enterprises for Sustainable Urban Development. *Buildings, 12*(6), 721. https://doi.org/10.3390/buildings12060721

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