

Linking Cognition, Learning, and Action in Opportunity Development through an Integrative Model of Entrepreneurial Knowledge*

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Abstract

Entrepreneurial success depends heavily on the knowledge that individuals draw upon when identifying and exploiting opportunities. Despite extensive research on entrepreneurial cognition, learning and competence, existing typologies remain fragmented and often treat knowledge domains as isolated categories. This study is motivated by the need to clarify how different forms of knowledge collectively enable opportunity-focused entrepreneurial action. The literature lacks an integrative perspective that positions opportunity-related knowledge as the central mechanism through which technological, managerial, experiential, and personal knowledge become meaningful in the entrepreneurial process.

To address this gap, the study adopts a conceptual, literature-based methodology, synthesizing theoretical and empirical contributions published between 2000 and 2025 across entrepreneurship, innovation and management research. Through thematic analysis, the review identifies the dominant knowledge constructs used in prior studies and examines how they relate to opportunity recognition, opportunity exploitation, and entrepreneurial behavior.

The study proposes an Integrative Model of Entrepreneurial Knowledge that places knowledge about opportunity recognition and exploitation at its core. Surrounding this core are seven interdependent knowledge domains: technological, industry, organizational, marketing, financial, operational, and self-knowledge, each contributing to the entrepreneur's cognitive and behavioral capacity to transform ideas into value-creating ventures. The model shows that entrepreneurial knowledge functions as a dynamic, interconnected system shaped by learning loops linking cognition, experience, and action. This framework advances theoretical understanding of entrepreneurial knowledge integration and offers practical implications for designing opportunity-centered entrepreneurship education and future empirical research.

Keywords: entrepreneurial knowledge, opportunity recognition, opportunity exploitation, entrepreneurship education

Introduction

Entrepreneurship continues to be a driver of innovation, competitiveness and sustainable growth. However, the determinants of entrepreneurial success are multidimensional - spanning individual cognition, social networks and organizational capabilities. Among these, the knowledge base of the entrepreneur has emerged as a key factor determining the ability to recognize and exploit opportunities in uncertain contexts (Liao et al., 2022; Mitchell et al., 2002). A central question therefore persists: *What kinds of knowledge underpin entrepreneurial behavior and how are they structured and applied?*

Over two decades of research have identified a broad spectrum of knowledge categories: market and technological (Shane, 2000), experiential and reflective (Politis, 2005), cognitive (Mitchell et al., 2002) and behavioral or competence-based (Mitchellmore and Rowley, 2010). These typologies largely treat domains as discrete or additive rather than as a systemic configuration with internal hierarchy and interaction.

Therefore, this paper develops an integrative model positioning *knowledge about opportunity recognition and exploitation* at the center of entrepreneurial cognition. Surrounding this core are six interdependent domains: technological, industry, organizational, marketing, financial, operational, and self-knowledge, that provide the resources for entrepreneurial judgement and action. The objectives are to review dominant conceptualizations of entrepreneurial knowledge, identify theoretical and empirical gaps in current frameworks, present the integrative model and discuss implications for entrepreneurship research, education, and policy.

Literature Review: Typologies of Entrepreneurial Knowledge

Foundations of Entrepreneurial Knowledge

The cognitive turn in entrepreneurship research emphasized that entrepreneurs differ from non-entrepreneurs in the way they acquire, organize, and apply knowledge (Mitchell et al., 2002). This perspective shifted the analytical focus from personality traits and external conditions toward the mental processes and knowledge structures underlying entrepreneurial behavior. Entrepreneurial cognition refers to the “knowledge structures that people use to make assessments, judgments, or decisions involving opportunity evaluation and venture creation,” highlighting that decision-making in entrepreneurship is deeply rooted in how individuals encode and process information. In this view, entrepreneurial knowledge is not merely informational but also structural and configurational - a set of mental schemas and heuristics that enable pattern recognition and opportunity identification. It represents an adaptive cognitive system allowing entrepreneurs to simplify complexity, learn from prior experiences, and apply analogical reasoning to new situations (Mitchell et al., 2002).

Building on this cognitive foundation, Politis contributed a complementary learning-based framework, conceptualizing entrepreneurial knowledge as accumulated experience transformed through reflection. His model positions learning as a continuous cycle in which action and feedback shape cognitive understanding. Politis identified three major domains: technical, market, and entrepreneurial knowledge, derived from prior ventures and practical exposure. Importantly, he emphasized that entrepreneurial learning is often experiential and iterative, where both success and failure act as sources of insight. Reflection on failed ventures enhances adaptive knowledge, enabling entrepreneurs to refine their judgment and reduce uncertainty in future decisions (Politis, 2005).

Mitchelmore and Rowley advanced this discussion by introducing a competence-based view, linking knowledge to observable performance outcomes (Mitchelmore and Rowley, 2010). They defined entrepreneurial competencies as combinations of knowledge, skills, and behaviors that collectively enable opportunity recognition, innovation and venture growth. Their work provided a bridge between cognitive theories and capability development by showing that knowledge must be activated through behavioral expression and contextual application. Competencies therefore represent not only what entrepreneurs know, but also how effectively they use that knowledge within dynamic environments.

Similarly, Rae underscored the developmental and leadership dimension of entrepreneurial knowledge, highlighting that sustainable entrepreneurship requires more than technical proficiency or cognitive skill. It involves an integration of cognitive, emotional, and ethical learning, where entrepreneurs cultivate self-awareness, social understanding, and moral responsibility (Rae, 2017). Rae’s perspective adds a relational and values-based layer to the cognitive view, suggesting that entrepreneurial leadership knowledge is co-created through interaction, reflection, and engagement with communities of practice.

Taken together, these perspectives portray entrepreneurial knowledge as a multi-level construct encompassing cognitive structures (Mitchell et al., 2002), experiential learning (Politis, 2005), competence development (Mitchelmore and Rowley, 2010) and leadership transformation (Rae, 2017). This evolution in theory reflects a broader movement toward viewing entrepreneurship as a learning-centered, knowledge-integrative process, where cognition, experience, and context jointly shape the entrepreneur’s ability to discover and exploit opportunities.

Recent Developments and Empirical Evidence

Recent empirical studies confirm, refine, and extend these foundational perspectives by demonstrating how entrepreneurial knowledge functions as both a cognitive and behavioral mechanism linking education, intention and action. Liao et al. conducted a comprehensive meta-analysis showing that entrepreneurial knowledge and

cognition significantly predict entrepreneurial intention and opportunity recognition, underlining their mediating role between entrepreneurship education and entrepreneurial behavior (Liao et al., 2022). Their results reinforce the notion that opportunity identification is not a purely spontaneous process but one shaped by prior learning and structured cognitive processing.

Similarly, Alves et al. provided empirical evidence that cognitive flexibility and self-efficacy enhance entrepreneurial competence, revealing the psychological mechanisms through which knowledge becomes actionable (Alves and Yang, 2022). Their study highlights how cognitive adaptability allows entrepreneurs to reorganize mental models and respond effectively to uncertainty, while self-efficacy converts perceived knowledge into confident entrepreneurial behavior.

In parallel, Suanpong investigated the cognitive and motivational drivers of opportunity recognition and entrepreneurial intention, identifying risk-taking, creativity, and alertness as mediating processes (Suanpong et al., 2025). These findings support the view that entrepreneurial knowledge interacts with motivation and emotion, forming a multidimensional construct that drives opportunity discovery. They also align with evidence presented by Li et al., who demonstrated that the three dimensions of entrepreneurial alertness of scanning, association and evaluation positively influence opportunity recognition in new ventures (Li et al., 2022). Together, these studies suggest that cognitive mechanisms such as flexibility and alertness serve as bridges between stored knowledge and entrepreneurial action, transforming latent competence into observable entrepreneurial behavior.

Finally, Schlichte and Junge, in their conceptual review of entrepreneurial opportunities, highlight the continuing fragmentation and conceptual dispersion within the literature (Schlichte and Junge, 2024). Despite an expanding body of empirical research, they argue that integrating cognitive, behavioral and contextual perspectives into a unified theoretical framework remains a challenge. Their conclusions reinforce the need for holistic models that interpret entrepreneurial knowledge as an integrative system - one connecting cognition, experience, and opportunity exploitation - an approach that the present study seeks to advance.

Competence and Knowledge Integration

Modern frameworks (Alves and Yang, 2022; Rae, 2017) increasingly view entrepreneurial knowledge as integrative and dynamic rather than static or domain-specific. Knowledge is created through iterative cycles of sensing, acting, and reflecting, linking cognition and practice. In line with this model, Molasy et al. emphasize that entrepreneurial knowledge emerges at the intersection of technological, managerial, and experiential learning (Molasy et al., 2024). They demonstrate that integrating open-innovation principles into higher education fosters a synthesis of these knowledge types, enabling future engineers and researchers to transform scientific results into market opportunities more effectively. Yet, few models explicitly describe how diverse knowledge domains interrelate in opportunity processes. Hence, there is a growing need to reconceptualize entrepreneurial knowledge not as a list of competences but as a system of interdependent knowledge domains, centered on opportunity cognition as the organizing logic of entrepreneurship.

Identification of Research Gaps and methodological approach

Although research has significantly advanced, three key gaps persist:

1. Lack of centrality for opportunity-related knowledge. Most models treat opportunity recognition as a sub-category rather than the integrative core linking technological, managerial, and reflective knowledge (Liao et al., 2022).
2. Limited understanding of interdependence. Existing typologies often segment knowledge (for example financial vs marketing) and overlook feedback loops between them. Cognitive frameworks (Mitchell et al., 2002) hint at structure but rarely operationalize systemic interrelations.
3. Weak connection to entrepreneurship education and practice. Studies on educational interventions show that opportunity-centered learning fosters intention, but theoretical models seldom reflect how entrepreneurial knowledge dynamically evolves through experiential learning.

Addressing these gaps, the present study proposes a systemic model of entrepreneurial knowledge that highlights opportunity cognition as the central integrating mechanism.

This study adopts a conceptual and literature-based research design. Its objective is not empirical validation, but theoretical integration, to synthesize and extend existing knowledge on entrepreneurial cognition and knowledge typologies. The methodology follows a structured review of peer-reviewed literature published

between 2000 and 2025 in journals in the fields of entrepreneurship, innovation, and management. The review is focused on works addressing the cognitive foundations of entrepreneurship, learning and competence-based views of entrepreneurial knowledge and recent empirical studies linking knowledge, cognition, and opportunity recognition. Sources were selected through targeted searches using academic databases such as Scopus, Web of Science and SpringerLink, ensuring representation of both classical contributions and contemporary evidence. Through qualitative synthesis and thematic analysis, the reviewed literature was categorized into major conceptual dimensions: cognitive, experiential, competence-based and integrative, forming the foundation for the proposed conceptual model of entrepreneurial knowledge. The resulting framework aims to bridge theoretical fragmentation by positioning opportunity-related knowledge as the central construct connecting various domains of entrepreneurial learning.

Results: The Integrative Model of Entrepreneurial Knowledge

Understanding the structure of entrepreneurial knowledge requires revisiting the entrepreneurial process itself and the critical point where a market opportunity arises. Within this process, knowledge plays an essential role only in certain phases, specifically, in the ability to identify an opportunity and the ability to exploit it. These two capabilities fundamentally distinguish entrepreneurs from their environment and determine whether an individual merely observes change or transforms it into value creation.

It can therefore be concluded that entrepreneurs must possess two interrelated kinds of knowledge:

1. Knowledge of where and how to search for information that may lead to opportunity recognition, and
2. Knowledge of how to effectively exploit those opportunities once identified.

This dual competence - search and exploitation - forms the core of entrepreneurial knowledge. It represents the dynamic link between cognition (recognition) and execution (action).

Therefore, at the center of the proposed model lies *knowledge about opportunity recognition and exploitation*. This knowledge encompasses the cognitive, informational and experiential capacities that enable entrepreneurs to notice patterns, gaps, and possibilities in the market and to mobilize resources to act upon them. It involves not only recognizing an unmet need or inefficiency but also understanding the mechanisms through which that opportunity can be transformed into a viable business model. In this sense, opportunity-related knowledge serves as the integrating hub connecting all other knowledge domains within the entrepreneurial cognition system.

Surrounding the core are seven complementary and interdependent domains of knowledge. Each domain contributes to the entrepreneur's overall capacity to discover, evaluate, and act upon opportunities, as follows:

- *Technological Knowledge*. This knowledge is fundamental in engineering and technology-oriented entrepreneurship. It includes understanding production processes, materials, digital and information technologies, automation tools, and artificial intelligence. Technological knowledge allows entrepreneurs to assess the potential and limitations of technologies within a commercialization context - how technical innovations can be transformed into products, services, or process improvements that create market value.
- *Industry (Sectoral) Knowledge*. Industry knowledge refers to familiarity with how a specific economic sector operates, including its standards, norms, regulations, value chains, and dominant business models. It enables the entrepreneur to interpret sectoral dynamics, forecast trends, and anticipate how technological or regulatory changes may generate new opportunities. This knowledge also supports strategic positioning and competitive differentiation.
- *Organizational Knowledge*. This type of knowledge concerns understanding how enterprises function as systems; how decision-making, communication, and project management are structured. Organizational knowledge includes insight into building effective teams, designing internal processes and developing scalable and adaptable structures. It translates the entrepreneur's vision into efficient operational mechanisms.
- *Marketing Knowledge*. Marketing knowledge extends beyond promotion or sales. It refers to understanding customer needs, behaviors and values, and to designing compelling value propositions. It encompasses customer segmentation, trend analysis, and product-market fit evaluation. Entrepreneurs use this knowledge to create, communicate and deliver customer value effectively, ensuring that opportunities recognized in the market can generate sustainable demand.

- *Financial Knowledge.* It includes the ability to interpret and manage costs, revenues, liquidity, profitability thresholds and sources of financing. It allows entrepreneurs to evaluate the economic feasibility of opportunities, manage risk, and maintain financial stability during growth. Competence in reading financial statements and constructing budgets also informs strategic decision-making regarding investments and scaling.
- *Operational Knowledge.* Operational knowledge concerns the practical functioning of a business - from production and logistics to procurement, supplier relations and customer service. It ensures that the daily activities of the enterprise are efficient, coherent, and aligned with strategic objectives. This knowledge transforms conceptual opportunities into tangible results by grounding them in executable processes.
- *Self-Knowledge.* Self-knowledge is a reflective and often underestimated dimension of entrepreneurial knowledge. It refers to awareness of one's strengths and weaknesses, personal motivations and life goals. Understanding one's risk tolerance, decision-making style and preferred modes of collaboration supports more sustainable entrepreneurial action. In a broader sense, self-knowledge enables resilience, ethical awareness and alignment between personal values and venture objectives.



Fig 1. Integrative Model of Entrepreneurial Knowledge (own development)

The proposed *Integrative Model of Entrepreneurial Knowledge* (Figure 1) visualizes entrepreneurial knowledge as a networked and interdependent system. At its core, *knowledge about opportunity recognition and exploitation* functions as a cognitive integrator, linking abstract understanding with practical execution. Each peripheral knowledge domain provides input to this central process: technological and industry knowledge feed the entrepreneur with factual insights about feasibility and market conditions; marketing and financial knowledge transform these insights into commercial logic; organizational and operational knowledge enable implementation; and self-knowledge ensures reflective and value-aligned decision-making.

The dynamic interaction between these domains supports learning loops within entrepreneurship. As entrepreneurs act upon opportunities, they generate feedback that continuously refines their knowledge structures - strengthening alertness, improving decision heuristics, and deepening their capacity for opportunity recognition.

In summary, the Integrative Model of Entrepreneurial Knowledge positions opportunity-related knowledge not as a separate category but as the axis around which all other domains revolve. It reflects the holistic, multi-dimensional nature of entrepreneurship as a process of connecting technological potential, market needs, organizational capacity, and personal motivation into a coherent system of value creation.

Discussion

The proposed model contributes to entrepreneurship theory and practice by providing a systemic understanding of how different knowledge domains interact in the entrepreneurial process. It reframes entrepreneurial knowledge

as an integrative architecture in which opportunity-related knowledge serves as both a cognitive and operational hub connecting perception, decision-making, and action.

First, the model re-centers opportunity knowledge as the organizing principle of entrepreneurial cognition, extending previous frameworks that treated it as a secondary element. By synthesizing insights from cognitive entrepreneurship theory (Mitchell et al., 2002) and experiential learning (Politis, 2005), the model explains why some individuals are more capable of transforming ideas into viable ventures - because they can dynamically integrate knowledge about opportunities with technological, market, and managerial understanding (Liao et al., 2022).

Second, the model advances the competence-based approach (Mitchelmore and Rowley, 2010) by conceptualizing knowledge domains as mutually reinforcing components of a learning system rather than isolated skill sets. This systemic view suggests that entrepreneurial competence evolves through feedback loops linking knowledge acquisition, reflection, and action. In doing so, it responds to Schlichte and Junge's call for a unified framework bridging cognitive, behavioral, and contextual perspectives (Schlichte and Junge, 2024).

Third, the inclusion of self-knowledge as a distinct yet integrative domain expands the theoretical boundary of entrepreneurial cognition. Following Rae and Alves & Yang, the model recognizes that awareness of personal values, motivations, and limitations shapes opportunity perception and decision-making (Alves and Yang, 2022; Rae, 2017). Entrepreneurs who understand their cognitive biases and emotional drivers are more capable of aligning opportunities with long-term purpose, leading to more sustainable and ethically grounded entrepreneurship.

From a practical standpoint, the model has strong implications for entrepreneurship education and training. It provides a structure for designing opportunity-centered learning environments that integrate technological, financial, and reflective components. Curricula can use this model to ensure that entrepreneurial courses develop not only knowledge about business but also knowledge for action, bridging theory, self-awareness and practice. Such integration aligns with the direction proposed by author in other paper (with co-authors), demonstrating that open-innovation approaches in higher education enhance students' ability to connect technological knowledge with market opportunities (Molasy et al., 2024). This interpretation is consistent with empirical observations from recent initiatives regarding higher education institutions. Rosienkiewicz et al. demonstrated that integrating open-innovation frameworks into university ecosystems enhances students' ability to connect technological and market knowledge, reinforcing the opportunity-centered learning logic proposed in this paper (Rosienkiewicz et al., 2024).

Finally, the model lays a foundation for future empirical research. It offers testable propositions regarding the relationships between knowledge domains and opportunity-related performance. Quantitative studies could measure how the strength of interconnections between specific knowledge domains predicts entrepreneurial outcomes, while qualitative research might explore how these domains evolve over time through experiential learning or incubation programs.

Conclusions

Entrepreneurship is fundamentally a knowledge-driven process - a continual reconfiguration of understanding, interpretation, and action. The present study contributes to this field by developing an Integrative Model of Entrepreneurial Knowledge, which positions opportunity recognition and exploitation at the core of entrepreneurial cognition. The model extends existing theories by bridging cognitive, experiential, and competence-based perspectives, offering a unified structure that captures the multi-dimensional nature of entrepreneurial knowledge. It conceptualizes entrepreneurship not as a linear accumulation of skills but as a dynamic network of interdependent knowledge domains, where technological, market, organizational, and personal insights converge around opportunity realization.

This conceptual framework provides both theoretical and practical value. Theoretically, it clarifies how knowledge operates as an integrative mechanism in entrepreneurial processes. Practically, it informs educational design and policy by highlighting the importance of opportunity-centered, interdisciplinary learning. Future empirical studies should seek to operationalize and validate this model across different contexts, exploring how the interplay among knowledge domains influences entrepreneurial performance and innovation outcomes.

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