

Limitations in Exploration and Exploitation Processes during the Emergence of Strategic Decision-Making: A Literature Review

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JEL CODES
L10, L20, C44

RECEIVED
24/03/2023

APPROVED
31/1/2025

PUBLISHED
01/04/2025

SECTION
Strategy and organizations

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Disclosures: Author declare no institutional or personal conflicts of interest.

Abstract: Decision problems and their relationship with the moments in time is a theme to be explored in the strategy studies field. In fact, several scholars conceptualize strategy from a decision-making perspective, framing it as a sequence of interconnected decisions that involve the allocation of resources necessary for implementation. One way to understand the timing of strategic decisions is through the lens of deliberate versus emergent strategies. Within this framework, organizational ambidexterity—defined as the dynamic balance between exploration and exploitation processes—has been proposed as a key cognitive dimension influencing managerial decision-making. These processes, grounded in organizational learning theory, are subject to constraints such as temporal myopia, which can hinder the ability to appropriately weigh short-term outcomes against long-term implications. In this context, the present study aims to identify the limitations inherent in exploration and exploitation processes that may influence strategy formulation, as discussed in the existing literature. This objective was pursued through a systematic literature review using the Scopus database. The review focused on scholarly contributions addressing decision-making in relation to exploration and exploitation, and the results were categorized into substantial, applied, and complementary contributions. As a result, this study reveals a set of thematic categories—including resources, term, type of activity, background, structure, knowledge, and strategy—that differentiate exploration from exploitation processes. These categories also help illuminate the limitations of each process and their potential influence on the timing and nature of strategic decisions.

Keywords: Ambidexterity, decision making, exploitation, exploration, strategy

Suggested citation: Hernández-Betancur, J., García-Valdecasas, J., Zuluaga, A., & Montoya-Restrepo, I. (2025). Limitations in Exploration and Exploitation Processes during the Emergence of Strategic Decision-Making: A Literature Review. *Innovar*, 35(96). e107110. <https://doi.org/10.15446/innovar.v35n96.107110>

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Limitaciones de los procesos de exploración y explotación en la toma de decisiones estratégicas: una revisión de la literatura

Resumen: Los problemas en la toma de decisiones y su relación con el momento temporal en el que se presentan constituyen una línea de investigación relevante y aún en desarrollo en el campo de los estudios sobre estrategia. Diversos autores han conceptualizado la estrategia desde una perspectiva basada en la toma de decisiones, entendiéndola como una secuencia de decisiones interconectadas que implican la asignación de recursos necesarios para su implementación. Una forma de comprender el momento oportuno de las decisiones estratégicas es a través del enfoque de estrategias deliberadas versus emergentes. En este marco, la ambidestreza organizacional, entendida como el equilibrio dinámico entre los procesos de exploración y explotación, ha sido propuesta como una dimensión cognitiva clave que influye en la toma de decisiones gerenciales. Estos procesos, fundamentados en la teoría del aprendizaje organizacional, están sujetos a limitaciones como la miopía temporal, la cual puede dificultar la capacidad de valorar adecuadamente los resultados a corto plazo frente a las implicaciones futuras. En este contexto, el presente estudio tiene como objetivo identificar las limitaciones inherentes a los procesos de exploración y explotación que pueden influir en la formulación de estrategias. Este objetivo se abordó mediante una revisión sistemática de literatura en la base de datos Scopus, la cual se centró en contribuciones académicas que abordan la toma de decisiones en relación con los procesos de exploración y explotación. Los resultados se clasificaron en contribuciones sustanciales, aplicadas y complementarias. Con base en los hallazgos, se identifica un conjunto de categorías temáticas—recursos, horizonte temporal, tipo de actividad, antecedentes, estructura, conocimiento y estrategia—que permiten diferenciar los procesos de exploración y explotación. Estas categorías también permiten señalar las limitaciones de cada proceso y su posible efecto en el momento y la naturaleza de las decisiones estratégicas.

Palabras clave: ambidestreza, toma de decisiones, explotación, exploración, estrategia.

Limitações nos processos de exploração e aproveitamento durante o surgimento da tomada de decisões estratégicas: uma revisão de literatura

Resumo: Os problemas de decisão e sua relação com os momentos no tempo é um tema a ser explorado no campo dos estudos de estratégia. De fato, vários estudiosos conceituam a estratégia com base em uma perspectiva de tomada de decisão, enquadrando-a como uma sequência de decisões interconectadas que envolvem a alocação dos recursos necessários para a implementação. Uma maneira de entender o momento das decisões estratégicas é por meio das lentes das estratégias deliberadas *versus* emergentes. Dentro dessa estrutura, a ambidestria organizacional — definida como o equilíbrio dinâmico entre os processos de exploração e aproveitamento — foi proposta como uma dimensão cognitiva fundamental que influencia a tomada de decisões gerenciais. Esses processos, baseados na teoria da aprendizagem organizacional, estão sujeitos a restrições como a miopia temporal, que pode prejudicar a capacidade de ponderar adequadamente os resultados de curto prazo em relação às implicações de longo prazo. Nesse contexto, o presente estudo tem como objetivo identificar as limitações inerentes aos processos de exploração e aproveitamento que podem influenciar a formulação de estratégias, conforme discutido na literatura existente. Esse objetivo foi alcançado por meio de uma revisão sistemática da literatura utilizando o banco de dados Scopus. A revisão se concentrou nas contribuições acadêmicas que abordam a tomada de decisões em relação à exploração e ao aproveitamento, e os resultados foram categorizados em contribuições substanciais, aplicadas e complementares. Como resultado, este estudo revela um conjunto de categorias temáticas — incluindo recursos, prazo, tipo de atividade, histórico, estrutura, conhecimento e estratégia — que diferenciam os processos de exploração dos processos de aproveitamento. Essas categorias também ajudam a esclarecer as limitações de cada processo e sua possível influência sobre o momento e a natureza das decisões estratégicas.

Palavras-chave: ambidestria, tomada de decisão, aproveitamento, exploração, estratégia.

Introduction

Smida (2006) identifies two critical aspects of decision-making processes. The first is the content of the decision, which involves evaluating and selecting the most appropriate alternative to address a given problem. The second concerns the emergence of the right moment to make the decision. According to Sanabria (2003) and Smida (2006), the latter aspect has been largely overlooked by management scholars. These authors, along with Saavedra (2006), argue that the timing of the decision should be considered as important as the decision content itself, since success is not solely determined by the substance of the decision.

Some contributions in the literature addressing the moment of decision focus on how information gathering and analysis influence the temporal dimension of decision-making processes within work teams (Paul *et al.*, 2005). Similarly, Greenstein (2015) frames the problem of the decision moment around the information collection process, emphasizing how information gains precision over time while simultaneously diminishing in utility. These contributions clearly illustrate the impact of information on temporal aspects of decision-making.

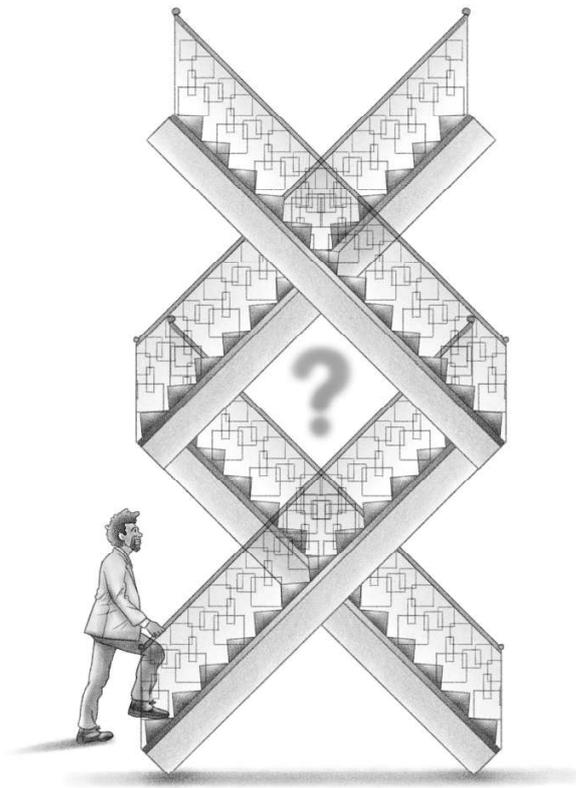
In this sense, Hernández *et al.* (2016) state that beyond information, various factors influence the moment of decision, including the type of decision (exploratory or exploitative), the expected reward, the complexity of the decision, perceptions of the decision-maker, the decision-maker's self-perception, the supporting team, the consequences (such as the irreversibility of decisions), and the emotional responses involved, such as grief associated with the decision-making process.

Among other contributions, Hernández (2020) proposes an agent-based simulation model to explore the moment of decision within new product development processes through cross-functional integration, building upon simulations developed by García-Valdecasas (2011, 2016). From this perspective, Hernández (2020) conceptualizes the moment of decision as a collective agreement among members of a work team, constructed through prior technological knowledge and structured meetings.

Within the simulation model developed by Hernández (2020), exploration and exploitation decisions are included as key variables. Based on virtual experiments, the study concludes that, in turbulent environments, the emergence of a decision requires that teams collectively explore alternative courses of action. This contrasts with decision-making in stable environments, where the implementation of known alternatives via exploitation processes yields more effective outcomes. Pertuz *et al.* (2019), in their analysis of exploration and exploitation processes in medium-sized enterprises as mechanisms of organizational learning, offer a synthesis of definitions related to these two concepts.

Exploration refers to the experimentation with new alternatives in decision-making processes, often without a clear understanding of the potential outcomes—some of which may be negative. It is

associated with the generation of new knowledge, innovation, the development of new capabilities, and increased flexibility in decision-making alternatives (Nicolau-Juliá *et al.*, 2015; Oviedo-García *et al.*, 2014).



Conversely, exploitation involves the consolidation and application of existing knowledge to address problems through known alternatives. The outcomes of such decisions are generally predictable and intended to enhance productivity and resource efficiency. In essence, exploitation entails the selection and implementation of established routines to improve productivity and resource efficiency (Nicolau-Juliá *et al.*, 2015). It is oriented toward the incremental generation of knowledge to adapt to prevailing environmental condition (Oviedo-García *et al.*, 2014).

Regarding the relationship between exploration and exploitation processes with the dynamism of the environment, Tzovara *et al.* (2012) assert that exploitation decisions are more prevalent in stable environments, where familiar alternatives yield anticipated results. In contrast, exploration tends to occur in uncertain or volatile environments, where decision-makers are more likely to search for novel alternatives. These findings are consistent with those reported by Hernández (2020) in relation to the moment of decision.

In Hernández's (2020) simulation model, exploration and exploitation processes depend on the availability of environmental data, which prompts interactive decision-making between two agents. These agents co-construct the decision based on situational dynamics, thereby enhancing their decision-making intelligence and agency. This interaction contributes to the development of a technological quasi-background and facilitates collaborative engagements that enable the emergence of the moment of decision.

However, as noted by Oviedo-García *et al.* (2014) and Pertuz *et al.* (2019), basic organizational learning processes—rooted in exploration and exploitation—can be constrained by specific limitations. For example, García (2005) identifies *temporal myopia* as a significant learning barrier that impedes the ability to adequately assess short-term results in exploitation processes and long-term outcomes in exploration processes. In this regard, incorporating Hernández's (2020) model of limitations in exploration and exploitation processes can deepen our understanding of how such constraints influence the emergence and construction of the moment of decision. This includes examining how these limitations affect the development of a technological quasi-background, the necessary agent interactions, and ultimately, the decision-making process itself.

Nevertheless, it is first necessary to ask: what are the primary limitations of exploration and exploitation processes? Consequently, this research aims to identify the main limitations associated with these processes as reported in the existing literature.

To this end, the document is structured as follows. The first section outlines the theoretical research problem and defines the study's objective. The second section reviews the general literature on the moment of decision and the limitations of exploration and exploitation. The third section presents the methodology, focusing on a literature review conducted through the Scopus database. The fourth section discusses the findings, contextualized by the contributions of Marín-Idarrága (2017) regarding the comparative characteristics and boundaries between exploration and exploitation. Finally, the article concludes with a summary of key insights.

Literature review

The concept of exploration and exploitation in organizational learning originates from the seminal work of March (1991), who defines *exploration* as the pursuit of innovative alternatives and *exploitation* as the efficient refinement and implementation of existing options. These definitions serve as a foundation for understanding how organizations adapt in pursuit of superior performance within dynamic environments.

The literature offers a range of definitions for exploration and exploitation. The review conducted by Pertuz *et al.* (2019) highlights conceptualizations of exploration as the search for organizational flexibility and novelty. This is achieved through knowledge generation with long-

term rewards and radical innovation, often resulting from organizational experimentation with novel alternatives whose outcomes remain uncertain (Nicolau-Juliá *et al.*, 2015; Oviedo-García *et al.*, 2014).

Understanding these distinctions is grounded in the recognition that the resources required for exploration differ significantly from those needed for exploitation. Given resource constraints, organizations often focus their efforts on one process over the other. However, some scholars argue that exploration without subsequent exploitation lacks practical value, emphasizing the complementary—yet sometimes mutually exclusive—relationship between the two (Marín-Idarrága, 2017).

One notable study linking exploration and exploitation to the moment of decision is that of Tzovara *et al.* (2012), who designed an experiment involving sequential choice alternatives, allowing decision-makers to opt for either exploitation or exploration based on the outcomes of prior decisions, with the goal of maximizing returns.

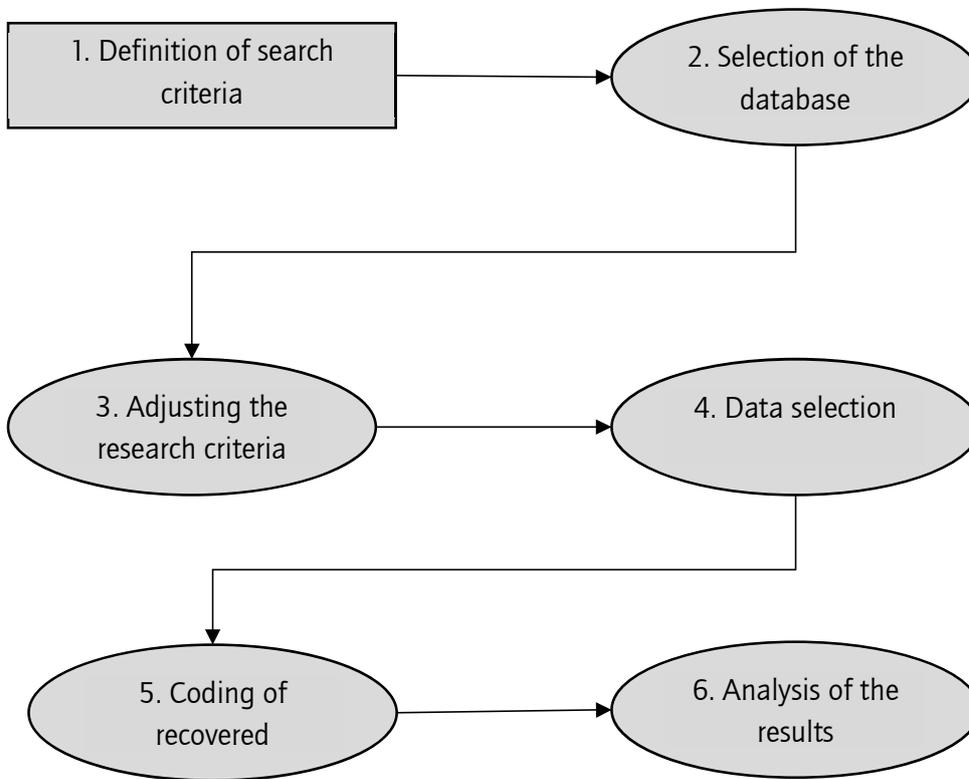
In the context of the oil industry, Lin (2012) identifies several externalities associated with both exploration and exploitation. For instance, information can act as a positive externality in exploration, as companies can leverage data from competitors who have conducted exploratory activities in nearby geographical areas. However, it may also become a negative externality if firms choose not to cooperate, leading to delays in exploration and the subsequent exploitation of resources. Lin (2012) also notes an externality related to exploitation: when multiple companies extract from a shared resource, the drive for operational efficiency can result in rapid but suboptimal processes—such as pipeline failures or reduced oil output—due to overuse or coordination failures; that is, they carry out a fast but inefficient process.

Finally, Hernández (2020) incorporates exploration and exploitation decisions into the analysis of the decision moment within cross-functional integration processes for new product development. In his simulation model, the inclusion of these decision types aims to enhance the intelligence of agents engaged in joint decision-making. Based on prior information, agents choose whether to explore or exploit in their interactions with others. This process is mediated by the environmental context, with stable environments favoring exploitation, turbulent environments encouraging exploration, and adaptive environments promoting a balance between the two.

Materials and methods

To guide the methodological process of document review, the authors considered the contributions generated by Milán-García *et al.* (2019), who proposed the six steps described in figure 1.

Figure 1. Methodological steps adopted by this study.



Source: Milán-García *et al.* (2019).

Step 1: To define the search criteria for studies addressing limitations in exploration and exploitation processes, the following keywords were selected, and the corresponding search query was constructed: TITLE-ABS-KEY (limitations AND (decision-making OR processes) AND (exploration AND exploitation OR ambidextrous) AND (decision-moment OR strategy)).

Step 2: A literature review was conducted using the Scopus database, which is recognized as a multidisciplinary platform with broad coverage of peer-reviewed literature (Caputo & Kargina, 2022) and one of the most widely used databases in academic and scientific research (Zhu & Liu, 2020).

Step 3: All document types retrieved through the search query were included in the review, with no additional inclusion or exclusion criteria applied.

Step 4: When processing the search equation into the database, the search yielded a total of 63 documents, of which 62 were accessible for full review.

Step 5: The bibliographic information of the documents identified in Scopus was downloaded, and a new database was created for analysis.

Step 6: The analysis phase began with a review and classification of the documents into three categories: substantial contributions, applied studies, and non-contributory works.

Papers with substantial contributions are those that offer direct theoretical advancements or conceptual developments related to exploration and exploitation. In contrast, applied studies refer to papers that utilize the concepts of exploration and exploitation in their research context but do not contribute to their theoretical refinement or conceptual evolution. Finally, non-contributors are those articles retrieved through the search query that, despite matching the search terms, do not address the concepts of exploration and exploitation in any meaningful way.

Subsequently, the contributing papers were further classified based on the comparison framework proposed by Marín-Idarrága (2017). This author reviews the literature on exploration and exploitation within the context of organizational learning and discusses the key distinctions between the two concepts. This comparative framework provides a general lens through which potential limitations and tensions between exploration and exploitation can be identified. Similarly, the contributions resulting from this research were categorized according to thematic patterns and recurring elements observed across the literature, enabling a structured synthesis of the findings.

Analysis and discussion of results

Upon reviewing the 63 articles retrieved through the search query in the Scopus database, it was determined that 22 documents offer substantial contributions regarding the limitations of exploration and exploitation processes. Additionally, 24 documents were classified as applications, as they incorporate the concepts without contributing to their theoretical development. A further 16 documents were categorized as non-contributors, as they do not address the concepts of exploration and exploitation despite being retrieved by the search criteria. Lastly, one document could not be accessed and was therefore excluded from the analysis.

Substantial contributions

A classification of the contributions was conducted with respect to the limitations of exploration and exploitation processes, based on the comparative framework proposed by Marín-Idarrága (2017). This framework primarily focuses on distinctions between exploration and exploitation in terms of resources and capabilities, time horizon, type of activity, structure, knowledge dynamics, and strategic orientation.

Resources and capabilities

Among the comparisons proposed by Marín-Idarrága (2017) regarding exploration and exploitation, one key dimension is framed in terms of resources and capabilities. Exploitation is characterized by the optimization of existing resources, typically linked to production processes. In contrast, exploration involves the search for new resources to develop novel capabilities.

From this perspective, several scholarly contributions can be identified. Ju and Gao (2022) examine firms operating in emerging markets—contexts characterized by turbulence and rapid transitions—and find that both exploration and exploitation positively influence performance. They emphasize that exploitation draws primarily from organizational experience and past performance, producing predictable outcomes and carrying low risk, as it focuses on improving the use of existing resources and capabilities in current products or services. In contrast, exploration is framed as a mechanism for collecting market intelligence, allowing firms to respond innovatively to new opportunities.

Ju and Gao (2022) also discuss operational flexibility, arguing that it is not exclusive to exploration. In emerging markets, flexibility is equally vital for exploitation processes, enabling firms to adapt and reallocate resources effectively. However, they note that marketing resources and capabilities have a stronger effect on exploration than exploitation, suggesting that exploitation is more closely tied to internal knowledge and past experiences.

Eide *et al.* (2021) analyze managerial aspirations linked to organizational growth strategies, distinguishing between innovation and internationalization. Innovation, aligned with exploration, involves more organizational change and greater uncertainty than internationalization, which is associated with the exploitation of existing products in foreign markets and offers more control over ambiguity and risk. Their findings suggest that while exploration and exploitation may be complementary and mutually reinforcing over time, they can also be contradictory due to the distinct and often scarce resources required for each. Radical innovation and internationalization, for example, not only demand different capabilities but also necessitate divergent strategic approaches to ensure success (Eide *et al.*, 2021).

Specifically, Eide *et al.* (2021) highlight that managerial experience is often linked to high-growth aspirations aligned with exploration strategies such as radical innovation. However, these aspirations may negatively impact employee well-being, resulting in increased stress and frustration. By contrast, aspirations associated with exploitation are more closely related to export activities, reflecting a reliance on established knowledge and reducing pressure on employees. Their study shows that when exploiting known products in new markets, employees exhibit higher levels of confidence in their existing skills and knowledge. In contrast, exploring novel opportunities and innovative ideas creates greater psychological demands.

Vrontis *et al.* (2019) also contribute to this category through their study of entrepreneurship and ambidextrous business strategy. They argue that successful strategies combine exploration—focused on discovering new skills, relationships, and business opportunities—with exploitation—centered on optimizing existing strategies and enhancing the efficient use of resources from known strategies.

Another result classified within this category is the research by Fayos *et al.* (2017), which investigates whether belonging to a cluster enables agri-food organizations to develop dynamic capabilities, and whether these, in turn, facilitate the development of dynamic internationalization capabilities. As theoretical grounding for analyzing internationalization capabilities, Fayos *et al.* (2017) draw on the framework proposed by Prange and Verdier (2011), who categorize these capabilities into two types: exploitation and exploration.

Exploitation capabilities relate to control, risk reduction, and security. They include two specific types: (i) threshold capabilities, which refer to having achieved the minimum conditions required to establish an international presence; and (ii) consolidation capabilities, which involve developing an optimal configuration to identify and capitalize on opportunities through learning and knowledge accumulation from international experience. The second type, exploration capabilities, is oriented toward external knowledge and further divided into value-added capabilities and disruptive capabilities. According to Prange and Verdier (2011), value-added capabilities are associated with intangible improvements, while disruptive capabilities involve strategic change—both of which are essential in internationalization processes (Fayos *et al.*, 2017).

As a result, Fayos *et al.* (2017) conclude that companies within a cluster develop dynamic exploitation capabilities associated with resource acquisition, enabling access to specific clients and markets. While exploration capabilities are also identified, they tend to have a limited transformative effect, primarily reflecting value-added dynamics rather than disruptive change. The authors propose that agri-food companies operating within clusters generate dynamic capabilities that support international marketing processes. In this context, capabilities focused on resource acquisition enhance international exploitation capacities, as the cluster facilitates the identification of obsolete resources and promotes their replacement or improvement through access to new or more efficient alternatives.

This category of comparison, contextualized in resources and capabilities, is continued by Chi-Han and Hung-Che (2016), who examine the role of external knowledge and its relationship with both commercial and non-commercial interdependence in shaping exploration and exploitation activities. Commercial interdependence is defined as technical and business cooperation among firms within a cluster, while non-commercial interdependence refers to relationships grounded in shared beliefs, culture, and customs. Their findings suggest that transnational connections enhance a firm's capacity for exploration. Specifically, commercial

interdependence serves as a stimulus for exploration, whereas non-commercial interdependence facilitates the exploitation of a firm's innovation capabilities.

With regard to networks, Pellegrini *et al.* (2018) argue that firms engage in exploitative relationships to strengthen ties with existing partners, thereby increasing the efficient use of current resources and reinforcing existing knowledge assets. In contrast, explorative relationships are oriented towards accessing new markets, developing novel products, and leveraging emerging technological opportunities, primarily through the expansion of the firm's partner network.

Regarding the technology domain, Cabrera and González (2019), building on March (1991), identify two distinct modes of technology acquisition: the acquisition of new manufacturing technologies, aligned with exploration, and the acquisition of established technologies, associated with exploitation. These supply mechanisms may be internal or external, leading to four strategic configurations: internal exploration, external exploration, internal exploitation, and external exploitation—depending on the origin of the technological input.

Finally, Asif (2019), drawing on the work by Klas and Johan (2017), underscores the strategic importance of exploration for identifying new resources and developing capabilities that enable innovation and prepare organizations to meet future challenges. Alternatively, the concept of exploitation—grounded in the work of Blome *et al.* (2013) and Turner *et al.* (2013)—is framed as the pursuit of operational efficiencies, enhanced resource utilization, and sustained competitiveness.

In general terms, based on the classified contributions regarding the resources and capabilities associated with exploration and exploitation, it can be observed that, in relation to exploitation, there are processes of adaptation to current conditions (Ju & Gao, 2022); a work environment characterized by employee confidence in their existing capabilities (Eide *et al.*, 2021); the leveraging of existing activities and strategies to improve the efficient use of resources (Vrontis *et al.*, 2019); the provision and use of established manufacturing technologies (Cabrera & González, 2019); the pursuit of efficiencies, optimal resource utilization, and competitiveness; the formation of exploitation networks aimed at increasing wealth generation through existing partnerships (Pellegrini *et al.*, 2018); and the influence of non-commercial interdependence, such as shared culture, beliefs, and customs (Chi-Han & Hung-Che, 2016).

Exploration, on the other hand, emphasizes marketing-related resources and capabilities (Ju & Gao, 2022); resources linked to radical innovation—although these may negatively affect employee well-being (Eide *et al.*, 2021); the development of new skills, business techniques, relationships, and opportunities (Vrontis *et al.*, 2019); the supply of new manufacturing technologies (Cabrera & González, 2019); the search for novel resources and the enhancement of capabilities to foster innovation and address future challenges (Asif, 2019); the establishment of exploration networks to access new markets, technologies, or product (Pellegrini *et al.*, 2018); and

the role of commercial interdependence, defined as technical and business collaboration among organizations, in stimulating exploration (Chi-Han & Hung-Che, 2016)

Type of activity

Another category of comparison between exploration and exploitation, as outlined by Marín-Idarrága (2017), is the type of activity. Drawing on the contributions of Lewin *et al.* (1999), routinization and standardization are characteristic of exploitation activities, while exploration is associated with experimentation. Pellegrini *et al.* (2018) support this view (2018), stating that exploitation strategies aim to refine and improve existing knowledge, skills, and technologies. In contrast, exploration involves processes centered on experimentation, with the objective of generating new knowledge for the organization.

In this context, Peng (2018), within his conceptual framework and in alignment with the principles of organizational ambidexterity, proposes a hybrid approach that combines continuous improvement (aligned with exploitation) and the pursuit of innovative ideas (aligned with exploration).

This distinction is further illustrated in the work of Asif (2019, p. 411), who characterizes exploration as encompassing activities such as search, variation, risk-taking, experimentation, flexibility, discovery, and innovation. In contrast, exploitation includes mapping, tracking, refinement, process improvement, and compliance with established standards.

Binci *et al.* (2020) also emphasize the importance of balancing these practices, warning of the risks associated with a singular focus on continuous improvement of existing knowledge, skills, and technologies. They caution that such a focus may lead organizations into the success trap of exploitation, where short-term gains obscure the long-term benefits of exploration and may result in organizational inertia or resistance to change.

Vrontis *et al.* (2019) contribute to this comparison in the context of family businesses, in terms of new opportunities and coverage of family needs and evolution of the company. The former respond to an exploration perspective, which is fundamentally encouraged by the founders. The latter corresponds to a view of exploitation, which is generally carried out by the successors. Organizations do not incur any risk of disrespecting traditional values when generating exploratory activities and in the same way, these traditional values do not prevent the exploration of new opportunities.

Finally, Wang (2013) investigates the effect of exploration and exploitation on the recovery of the automobile industry in China. He identified a predominance of the automobile industry (foreign companies) to exploitation; that is to say, they are devoted to the reuse and standardization of activities, mainly focused on production. Alternatively, local automobile manufacturers,

particularly those developing their own brands, are more oriented toward exploration, taking advantage of opportunities to experiment with design and branding.

Considering the contributions previously exposed, which are contextualized within the category of type of activity, several patterns emerge. In terms of exploitation, there is evidence of resistance to change in contexts where exploitation outweighs exploration (Binci *et al.*, 2020); activities driven by traditional values (Vrontis *et al.*, 2019); a focus on refinement of existing knowledge, skills, and technologies (Pellegrini *et al.*, 2018); efforts aimed at continuous improvement (Peng, 2018); and a strong emphasis on standardize production activities (Wang, 2013).

Alternatively, exploration is associated with activities aimed at identifying new opportunities (Vrontis *et al.*, 2019), generating new knowledge (Pellegrini *et al.*, 2018), searching for innovative ideas (Peng, 2018), and centered on design and brand (Wang, 2013).

Knowledge

Another comparison proposed by Marín-Idarrága (2017) is that of knowledge, considering the contributions of Geiger and Makri (2006) and Li *et al.* (2008). On the one hand, knowledge implementation, typical of exploitation, is expected to lead to the development of products and services. In contrast, exploration is focused on generating new knowledge through research activities.

Galati *et al.* (2021) support this distinction, affirming that the development of exploration and exploitation capabilities—grounded in both new and existing knowledge—is fundamental to innovation and value creation. They emphasize the need for a proper balance in organizational learning mechanisms associated with exploration and exploitation. Organizations learn through both processes, enabling them to reconfigure their resource base. However, focusing solely on exploration—without leveraging acquired knowledge through exploitation—may negatively impact profitability. Conversely, prioritizing only exploitation increases the risk of knowledge obsolescence.

Balle *et al.* (2018) concur, asserting that firms should strive for a balance between exploration and exploitation, as the value of generated knowledge is lost if a company is exclusively committed to exploration. On the other hand, organizations overly focused on exploitation risk becoming obsolete over time due to limited innovation.

Another contribution that can be identified is that by Jia *et al.* (2022), who state that there is no significant impact on moderating the relationship between the search for exploration knowledge and organizational innovation. Their findings indicate no significant effect of exploration knowledge search on innovation, but a positive moderating effect of strategic flexibility on the relationship between exploitation knowledge search and innovation. They also highlight the

tensions and contradictions that arise between the pursuit of exploration and exploitation under resource constraints. In this contribution to ambidexterity theory, the authors propose that exploration and exploitation are independent yet synergistic processes that collectively enhance organizational innovation performance.

Bhupendra and Sangle (2021, 2022) argue that today's dynamic organizational environments require effective knowledge absorption mechanisms, known as absorptive capacity, which must be understood as a dynamic capability. They outline key characteristics necessary for developing absorptive capacity systems that support sustainability in technologically advanced and stakeholder-complex markets. These include mechanisms for knowledge exchange, storage, and exploitation, as well as the continuous exploration of new knowledge sources.

Vrontis *et al.* (2019) partially align with this view, emphasizing that knowledge is a critical strategic asset for achieving competitive advantage in volatile and fast-changing environments. They note that proactive, innovative, and risk-taking firms are those best positioned to exploit knowledge to improve organizational performance.

Ye *et al.* (2020) contribute to this discussion by framing the debate in terms of information processing. They assert that exploitation and exploration are intricately linked: exploration involves gathering information, while exploitation corresponds to applying decision-making processes based on information collected during the exploration phase.

Finally, Bibikas *et al.* (2010) propose that the knowledge life cycle itself can serve as a balancing mechanism between exploration and exploitation. In their view, knowledge exploration refers to adaptive processes responding to environmental change, leading to the development of new knowledge, skills, and competencies. In contrast, knowledge exploitation refers to the use of existing knowledge as a resource, primarily in stable environments.

In brief, from the knowledge perspective, the reviewed contributions demonstrate that the exploration and exploitation of knowledge are essential for the development of absorptive capacity systems, enabling organizations to achieve greater sustainability (Bhupendra & Sangle, 2021, 2022). Specifically, in terms of exploitation, authors refer to reliance on existing knowledge, which, when used exclusively, may result in obsolescence (Balle *et al.*, 2018; Galati *et al.*, 2021); decision-making is often based on information previously collected through exploration (Ye *et al.*, 2020); and knowledge is expected to be utilized by proactive, innovative, and risk-oriented firms (Vrontis *et al.*, 2019).

At the same time, knowledge exploration is associated with the generation of new knowledge, which, if overemphasized, may negatively affect corporate profitability (Balle *et al.*, 2018; Galati *et al.*, 2021), and whose main function is to collect information (Ye *et al.*, 2020).

Strategy

Another category identified by Marín-Idarrága (2017) in the comparison between exploration and exploitation is strategy. Specifically, in the case of exploitation, strategy is centered on leveraging existing competitive advantages through current practices and developing capabilities aligned with commercial objectives. In contrast, exploration-based strategies focus on strategic learning, the generation of new knowledge, and the discovery of new markets.

In the context of software development organizations, Severgnini *et al.* (2018) state that firms simultaneously explore new business processes, products, and innovations while exploiting existing software development capabilities. They find that superior firm performance is more likely when organizations engage in a balanced mix of exploration and exploitation, acknowledging that while these activities differ in nature, they compete for managerial attention and organizational resources.

Cabrera and González (2019) offer a different perspective, asserting that firms in developing countries often adopt a strategy of exploring and exploiting external technological sources. However, this reliance on external technologies may limit internal technology development efforts, as firms perceive reduced motivation to invest in internal R&D when mature technologies are readily available in the market.

Similarly, Eide *et al.* (2021) propose two distinct strategic approaches to organizational growth. The first, innovation, aligns with exploration and involves transformative organizational change. This strategy is considered more demanding than internationalization and is characterized by an ongoing pursuit of strategic learning. The second approach, internationalization, reflects an exploitation strategy based on leveraging existing products in international markets, offering greater control over uncertainty and ambiguity compared to radical innovation, and aiming to sustain competitive advantage.

Rodríguez *et al.* (2013), in their study on strategic capabilities for export-oriented firms, argue that internationalization is primarily driven by resource exploitation, as firms seek to utilize, strengthen, or build upon existing advantages in foreign markets. While this framework is effective in explaining the behavior of firms adapting known technologies for international markets, it does not fully capture the actions of more innovative or risk-taking firms. In their research on Mexican exporters, they found that exploitation capabilities are grounded in technological and market resources, whereas exploration capabilities are driven by organizational learning.

In general terms, regarding strategy in exploration and exploitation processes, the combination of both is expected to yield superior organizational performance (Severgnini *et al.*, 2018). However, exploitation is associated with internationalization strategies, which involve deploying existing resources, capabilities, and knowledge in other markets different from the

country of origin (Eide *et al.*, 2021). From a strategic perspective, exploitation is also oriented toward meeting stakeholder needs (Vrontis *et al.*, 2019) and building on competitive advantages rooted in technological and market resources (Rodríguez *et al.*, 2013).

In turn, exploration strategies are linked to radical innovation (Eide *et al.*, 2021), the identification of new opportunities (Vrontis *et al.*, 2019), and are often induced by organizational learning processes (Rodríguez *et al.*, 2013).

Time limits

Another characteristic highlighted by Marín-Idarrága (2017) is the time limits. In the case of exploitation, decisions are typically oriented toward the short term, as are the expected benefits derived from those decisions. In contrast, exploration involves the allocation and commitment of resources over a long-term horizon, with delayed but potentially transformative effects.

In relation to this characteristic, Vrontis *et al.* (2019) offer a significant contribution. They argue that when organizations report income derived from known and established sources (as reflected in financial statements), such income is usually projected in the short term. However, assessing an organization's long-term success requires the implementation of exploration processes. In this view, exploitation provides immediate operational continuity, while exploration represents a strategic investment in future growth.

In this sense, Pellegrini *et al.* (2018) emphasize that exploitation, by delivering results within shorter timeframes, tends to be more appealing to managers operating under pressure or those aiming to enhance their individual reputation through quick wins or short-term performance gains. Finally, Asif (2019) reinforces this distinction, stating that exploitation is geared toward short-term goals such as production efficiency, while exploration is oriented toward long-term organizational development and growth.

Derived from the previous contributions, exploitation can be characterized as being aligned with short-term time frames, focused on achieving operational efficiency (Asif, 2019), securing current income streams (Vrontis *et al.*, 2019), and being mostly attractive for managers who seek results in the future short term (Pellegrini *et al.*, 2018). On the other hand, exploration is directed toward long-term development (Asif, 2019), and is essential for driving sustained corporate success (Vrontis *et al.*, 2019).

Organizational structures

The following comparison proposed by Marín-Idarrága (2017) deals with organizational structure. Based on the contributions by He and Wong (2004), Marín-Idarrága (2017) highlights

structural differences between organizations oriented toward exploitation and those oriented toward exploration. Exploitation is associated with mechanistic organizational structures, characterized by clearly defined bureaucracies, tightly coupled systems, interdependent processes, and stable markets and technologies. In contrast, exploration is linked to organic organizational structures, featuring loosely connected systems, autonomous and dynamic processes, and operations within emerging markets and technologies.

Sinha (2019) supports this distinction and expands it in the context of work teams. According to Sinha, achieving and maintaining organizational ambidexterity presents a managerial challenge, which often emerges informally and must be cultivated through team composition. Effective teams should integrate individuals with both exploratory and exploitative skills. Moreover, the development of exploration and exploitation activities requires differentiated delegation styles, control mechanisms, and variations in organizational systems, structure, and culture.

Similarly, Ju and Gao (2022) emphasize the structural implications of ambidexterity in operations within emerging markets. They argue that operational flexibility is crucial for achieving a positive impact on exploration, while for exploitation, flexibility must be aligned with performance improvement objectives.

The preceding is in line with Binci *et al.* (2020), who analyze the implementation of an ambidexterity strategy characterized by the implementation of projects oriented toward exploration and exploitation. In their analysis, exploitation-oriented projects were found to operate within rigid structures, marked by resistance to change and reluctance to adopt new ideas, roles, or practices. Conversely, exploration-oriented projects demonstrated structural flexibility, with a greater openness to engaging with and navigating change in pursuit of novelty and achieving innovation.

In turn, Jia *et al.* (2022) extend this comparison to the leadership domain, proposing that open leadership is conducive to knowledge exploration. This type of leadership encourages followers to seek novel approaches, exercise independent thinking, challenge existing assumptions, and engage in innovative behaviors. In contrast, closed leadership is positively associated with knowledge exploitation, involving a focus on task monitoring, adherence to specific guidelines, and implementation of corrective measures.

In a similar vein, Asif (2019) explores the role of leadership styles in organizational learning. He finds that transformational leadership enhances exploration by fostering a culture of learning and innovation, while transactional leadership hinders it. In contrast, exploitation benefits from transactional leadership but is negatively influenced by transformational leadership. The author suggests an alternation between these two leadership styles to facilitate multi-level organizational learning.

In general terms, the effective implementation of exploration and exploitation activities requires differentiated organizational structures, which in turn give rise to variations in leadership

styles, delegation methods, organizational culture, and control systems (Sinha, 2019). Regarding the comparison of structures in exploitation processes, they are specifically aimed at improving performance (Ju & Gao, 2022), supported by closed (Jia *et al.*, 2022) and transactional (Asif, 2019) leadership styles, and tend to exhibit a rigid structure characterized by strong opposition to changes and to accept new roles and activities (Binci *et al.*, 2020). In contrast, exploration-oriented structures emphasize operational flexibility (Ju & Gao, 2022) and willingness to discuss and understand situations of change (Binci *et al.*, 2020) through open (Jia *et al.*, 2022) and transformational (Asif, 2019) leadership.

Limits and hierarchies in the exploration and exploitation processes

From the substantial contributions reviewed, a hierarchical structure can be inferred within both exploration and exploitation processes. This hierarchy begins at the level of resources, capabilities, and type of activity; progresses to a second level concerning knowledge; and culminates in a third level focused on strategy. It is expected that an organization operating closer to the strategic level—whether in exploration or exploitation—is more likely to demonstrate consolidation and maturity in that particular activity. This evolutionary and hierarchical progression is influenced by two contextualizing factors: time horizon and organizational structure (figure 2).

Figure 2. PDP Phases in the analyzed company.



Source: authors.

Exploration is perceived as the result of the effective combination of resources and capabilities, enabling the acquisition and processing of information that contributes to the development of organizational intelligence, thereby fostering market opportunities driven by innovation (Ju & Gao, 2022). Among the capabilities that support exploration is the formation of

commercial interdependence relationships, defined as cooperative commercial and technical linkages between allied firms (Chi-Han & Hung-Che, 2016). In turn, exploration in organizations is strongly associated with the acquisition of new manufacturing technologies (Cabrera & Gonzalez, 2019), new resources, and developing new skills (Asif, 2019; Klas & Johan 2017).

Limits and hierarchies in exploration

However, exploration, particularly in the context of innovation, can affect one of the organization's most critical resources: its human capital. When activities aimed at generating radical innovations are undertaken, employees may experience elevated levels of stress and frustration, which can negatively impact their well-being (Eide *et al.*, 2021).

With respect to the type of activity, exploration is based on actions leading to the generation of new knowledge (Pellegrini *et al.*, 2018), the identification of new opportunities (Vrontis *et al.*, 2019), and proposing innovative ideas (Peng, 2018) and tasks inherent to design and brand management (Wang, 2013).

Continuing with the hierarchical structure proposed in figure 2, the next level is knowledge. In exploration, knowledge is characterized by being new and generated through research processes (Geiger & Makri, 2006; Li *et al.*, 2008) and information gathering (Ye *et al.*, 2020). This new knowledge serves as the foundation for innovation, helps prevent knowledge obsolescence (Galati *et al.*, 2021), and supports the organization's adaptability to dynamic environmental conditions (Bibikas *et al.*, 2010).

The third hierarchy level is strategy. In the case of exploration, strategy is grounded in strategic learning (Eide *et al.*, 2021; Marín-Idarrága, 2017), the design of new business model (Severgnini *et al.*, 2018), closely linked to radical innovation (Eide *et al.*, 2021), and in search of finding new opportunities in an increasingly competitive context (Vrontis *et al.*, 2019).

As illustrated in figure 2, this hierarchy is influenced by the contextual variables of time horizon and organizational structure. Regarding the time dimension, exploration is recognized as a long-term process aimed at achieving sustained success (Vrontis *et al.*, 2019) and enabling organizational growth and development (Asif, 2019). In terms of the organizational structure, exploration is characterized as a flexible configuration, where it is crucial to discuss and understand situations that benefit change (Binci *et al.*, 2020). This structure is further enabled by open (Jia *et al.*, 2022) and transformational leadership (Asif, 2019).

Limits and hierarchies in exploitation

With regard to resources, capabilities, and type of activity in exploitation processes, the primary objective is to enhance organizational performance by leveraging established resources, capabilities, and knowledge (Ju & Gao, 2022). This involves the effective use of resources through the application of proven strategies (Vrontis *et al.*, 2019) in order to generate increased value and wealth (Pellegrini *et al.*, 2018). Generally speaking, employees feel confident about their capabilities in the face of exploitation processes, as they have to deal with already known circumstances (Eide *et al.*, 2021).

Regarding the type of activity, exploitation encompasses tasks centered on production (Wang, 2013), underpinned by a commitment to continuous improvement (Peng, 2018), and are applied to improve the knowledge, skills and technologies that are currently used in the organization (Pellegrini *et al.*, 2018), employing actions such as mapping, monitoring, refinement, process improvement, and compliance with standards (Asif, 2019). Nevertheless, caution is warranted regarding the apparent success of exploitation, as an excessive focus on existing practices may undermine the potential contributions of exploration and foster organizational resistance to change (Binci *et al.*, 2020).

Referring to the hierarchy of knowledge in exploitation processes, these respond to the exploitation of established knowledge (Balle *et al.*, 2018; Galati *et al.*, 2021) and the use of information collected in exploration processes for decision making (Ye *et al.*, 2020). However, an overreliance on legacy knowledge without integration of new insights poses a risk of knowledge obsolescence (Balle *et al.*, 2018; Galati *et al.*, 2021).

At the strategic level of the exploitation hierarchy, the focus is on meeting stakeholder needs (Vrontis *et al.*, 2019). Strategic decisions in exploitation are oriented toward achieving competitive advantage by capitalizing on existing technological and market resources (Rodriguez *et al.*, 2013). The operation of the strategy in exploitation processes is evident in internationalization strategies, which are based on resources, capabilities and knowledge already proven by the organization, but which are applied in geographically novel markets (Eide *et al.*, 2021).

Regarding the context of time limits and organizational structure in exploitation processes, the focus is on production and achieving short-term efficiencies (Asif, 2019). This approach ensures current revenues for organizations (Vrontis *et al.*, 2019) and appeals to managers who need to demonstrate results within short periods (Pellegrini *et al.*, 2018).

On the other hand, a closed approach (Jia *et al.*, 2022) and transactional leadership (Asif, 2019) characterize the organizational structure in exploitation processes. This results in an organizational structure primarily aimed at improving performance (Ju & Gao, 2022), which tends to be rigid and averse to adopting new roles or activities (Binci *et al.*, 2020).

Organizational ambidexterity

Organizational ambidexterity is a metaphor derived from thinking of a person who has the ability to skillfully use both the left and right hands (Leitão *et al.*, 2024). Translated into an organizational context, ambidexterity refers to an organization's capability to maximize revenue by efficiently managing existing operations (exploitation), while simultaneously identifying and leveraging new opportunities in the external environment (exploration). Broadly, ambidexterity involves achieving a balance between exploration and exploitation to enhance an organization's responsiveness to environmental changes (Duncan, 1976; Erdey *et al.*, 2024; Yunita *et al.*, 2023).

Ambidexterity has become increasingly relevant in today's volatile and unpredictable business environment. It is viewed as a strategic imperative that fosters innovation, sustains competitive advantage, and promotes organizational resilience (Fernández-Pérez de la Lastra & Sánchez-Gardey, 2024).

Fernández-Pérez de la Lastra & Sánchez-Gardey (2024) explore the relationship between exploration and exploitation in ambidextrous organizations through the lens of paradox theory. On one hand, exploitation emphasizes refining and capitalizing on existing business models. On the other hand, exploration focuses on driving innovation, change, and renewal. These two logics are not mutually exclusive but are instead interdependent, requiring continuous realignment to prevent imbalance (Snehvrat *et al.*, 2022).

Alternatively, the relationship between exploration and exploitation can also be conceptualized as complementary. In this view, both processes are mutually reinforcing; successful exploration often feeds into exploitation, and vice versa (Gupta *et al.*, 2006).

Fernández-Pérez de la Lastra and Sánchez-Gardey (2024) argue that whether ambidexterity is perceived as a paradox or a complement depends largely on resource availability. In contexts of resource scarcity, exploration and exploitation are likely to be seen as competing, reinforcing the paradoxical perspective. Conversely, when resources are abundant, the two processes can coexist and reinforce each other, highlighting their complementarity.

In both cases, however, limitations to exploration and exploitation exist within the framework of organizational ambidexterity. Under the paradox view, organizations face the challenge of balancing competing demands, raising questions about how much emphasis to place on each activity without undermining organizational stability. Under the complementary view, the challenge shifts to synchronization, prompting questions about the extent to which each process should be developed to optimally support the other.

In order for these limits and hierarchies to be dissipated in the actions of organizations, this literature review shows certain conditions related to flexibility, harmony, knowledge as an absorption system, and work teams.

Among these is operational flexibility, which in terms of resources enables the pursuit of new resources, while from an exploitative perspective, it allows organizations to adapt processes for efficient resource utilization (Ju & Gao, 2022). Strategic flexibility is equally important, as it shapes the relationship between knowledge exploitation and organizational innovation (Jia *et al.*, 2022).

In turn, a complementary harmony between exploration and exploitation actions should be sought, regardless of whether it is considered a paradox or a complement. An example of this is provided by Eide *et al.* (2021), when they point out that internationalization strategies correspond to the exploitation of already developed products in the process of exploring new markets.

On the other hand, in terms of knowledge, organizations must strike a balance between existing and new knowledge to support innovation and value creation (Galati *et al.*, 2021). This should be seen as an absorption system, which contributes to making organizations more sustainable (Bhupendra & Sangle, 2021, 2022).

Finally, work teams play an important role in the ambidexterity of organizations. Teams composed of individuals with both exploratory and exploitative skills are more likely to adapt to different delegation styles, control mechanisms, and structural requirements, allowing seamless transitions between exploration and exploitation activities (Sinha, 2019). This team versatility enhances organizational responsiveness in dynamic environments.

Conclusions

From the substantial contributions analyzed, the following limitations between exploration and exploitation processes can be identified: resources and capabilities, type of activity, knowledge, strategy, organizational structure, and time horizon. Additionally, a hierarchical scale can be inferred, indicating progressively more structured tendencies toward either exploration or exploitation (see figure 2).

In the case of exploration, the scale begins with resources, capabilities, and type of activity. At this level, the processes are oriented toward pursuing new opportunities, developing new skills and techniques, adopting novel manufacturing technologies, entering new markets, and generating innovative ideas aimed at enhancing marketing capabilities and delivering added value. However, excessive emphasis on exploration at this level may negatively impact employee well-being.

At the second level, the focus shifts to knowledge, particularly the collection and generation of new knowledge. When organizations concentrate exclusively on exploratory knowledge, this can lead to diminishing financial performance due to overinvestment in uncertain outcomes. At the final level, strategy, exploration is associated with radical innovation, the search for external sources

of technology, the identification of new opportunities, and the promotion of organizational learning.

In contrast, exploitation, at the first level of resources, capabilities, and type of activity, is characterized by continuous improvement, reliance on known technologies, resistance to change, decision-making guided by traditional values, and a concentration of capabilities in production. At the second level, knowledge is dominated by established, internal knowledge, with decision-making based on the information already available within the organization. However, exclusive reliance on exploitation may lead to obsolescence due to a lack of innovation and responsiveness to change. At the strategic level, exploitation involves leveraging both internal and external technological sources, focusing on satisfying stakeholder needs and achieving competitive advantage through efficiency and market-based strategies.

In the case of applied studies, there is evidence of a general tendency to seek a balance between exploration and exploitation across various domains. This balance is particularly prominent in the field of algorithms, where integrating both processes leads to more efficient and effective outcomes. The importance of maintaining this balance is also emphasized in applied contributions related to artificial intelligence, innovation, strategic management, and game theory.

This study contributes to the academic field by articulating the hierarchical structure and limitations of exploration and exploitation processes and by classifying them along dimensions such as resources, capabilities, type of activity, knowledge, strategy, time constraints, and organizational structure.

As a limitation, it should be noted that, as indicated in the title, this research is based on a literature review and thus approaches the research problem from a theoretical perspective. This implies a constraint in itself, as the analysis is limited to theoretical insights for identifying the limitations of exploration and exploitation.

Future research should focus on empirically examining how these limitations operate in practice and whether they influence the emergence of strategic decision-making moments. One promising approach for this line of inquiry could involve the use of agent-based simulation models, particularly in the initial stages of empirical testing.

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