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The Role of Neuro-Leadership in the Neuro-Decision-Making Process: A Bibliometric Analysis From A Neuro-Management Perspective

ABSTRACT

This study aims to examine the academic literature that has developed at the intersection of the disciplines of neuro-management, neuro-leadership, and neuro-decision-making from a systematic perspective. Designed using a bibliometric analysis methodology, the research seeks to map the theoretical landscape of the "brain-based" approach, which has gained momentum in management sciences in recent years. Within this scope, bibliographic data obtained from the Web of Science database were subjected to co-authorship, keyword co-occurrence, and citation analyses and visualized using the VOSviewer software. The analysis results reveal that the neuro-management literature has exhibited a marked growth, particularly after 2010, and that interdisciplinary interaction networks have strengthened. Keyword clustering confirms that leadership behaviors are shaped not only by rational choices but also by emotional and social-cognitive neural mechanisms. Co-authorship networks indicate that specific academic core groups and strategic collaborations play a decisive role in the development of the field. Citation analyses demonstrate that fundamental theories such as the Somatic Marker Hypothesis and Cognitive Biases constitute the theoretical backbone of the field. In conclusion, while concretizing the neuroscientific transformation in the management literature through bibliometric indicators, the study outlines a theoretical and empirical roadmap for future research through the identified gaps in the literature.

Keywords: Neuroleadership, Neuromanagement, Neuro Decision-Making, Organizational Neuroscience, Neuroscience.

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INTRODUCTION

The interdisciplinary interaction between neuroscience and management sciences has gained significant momentum, particularly since the early 2000s (Zollo & Winter, 2002; Crossan, Lane & White, 2005). The development of advanced technologies such as fMRI, EEG, and PET, which enable the direct measurement of the brain's cognitive, emotional, and motivational processes, has made it possible to examine human behavior not only through external outputs but also at the level of neural mechanisms (Cabeza & Nyberg, 2000; Poldrack, 2006). This technological transformation, which has paved the way for the emergence of new research domains in the social sciences, has contributed to the widespread adoption of neuroscience-based approaches in management and organizational studies (Becker & Cropanzano, 2010; Lee, Senior & Butler, 2012).

Within this context, neuro-management has emerged as a comprehensive discipline that links fundamental organizational variables such as performance management, motivation, and leadership with findings related to brain functioning (Arsu, 2024; Teacu, Basso, & Pezzulo, 2020). The core paradigm of the field posits that managerial behaviors cannot be reduced to classical rational models; rather, they are shaped by the reciprocal interaction of complex cognitive and emotional processes (Bechara & Damasio, 2005; Rock, 2008). Within the neuro-management literature, neuro-leadership and neuro-decision-making approaches stand out as two central pillars. While neuro-leadership addresses the perceptual and social-cognitive processes shaping leadership behaviors through brain-based explanations, neuro-decision-making studies focus on the neurobiological infrastructure of the choice mechanisms exhibited by managers in uncertain environments (Waldman, Balthazard & Peterson, 2011; Senior, Lee & Butler, 2011; Glimcher, 2011).

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Despite the rapid growth of the field, it is observed that existing studies predominantly focus on conceptual discussions or specific sub-themes. In particular, the limited number of studies that holistically map the relationship between neuro-decision-making processes and neuro-leadership increases the need for systematic analyses in this area. Current bibliometric studies generally concentrate on overall publication output and remain insufficient in deciphering the intersection points of these disciplines with management practice.

From this perspective, the main objective of the present study is to examine the role of neuro-leadership in the neuro-decision-making process within the framework of neuro-management, as well as to analyze the scientific development trends of these two fields in the academic literature using bibliometric methods. Based on data obtained from the Web of Science database, the study aims to provide a holistic overview of the literature by analyzing temporal development trends, prominent research foci, and academic collaboration networks. Through the visualization of data using the VOSviewer software, the intellectual structure of the field and its conceptual clusters are synthesized in a clear manner. In this respect, the study aims not only to present a publication inventory but also to address a gap in the literature by revealing the thematic hierarchy at the neuroscientific intersection of leadership and decision-making processes. Neuro-management should be regarded not as a fully established discipline, but rather as a developing and interdisciplinary field of research.

CONCEPTUAL FRAMEWORK

In this section, the literature shaped within the framework of the neuro-management approach, which constitutes the theoretical foundation of the study, is examined in a systematic manner. The interdisciplinary interaction between management sciences and neuroscience has provided the basis for the emergence of various research areas that offer brain-based explanations of managerial behaviors, leadership processes, and decision-making mechanisms. Accordingly, the literature review is structured around three main focal areas—namely, the neuro-management literature, the neuro-leadership literature, and the neuro-decision-making literature—and the conceptual relationships and common research trends among these areas are evaluated from a holistic perspective.

Neuro-Management

Neuro-management can be defined as an interdisciplinary field of research that integrates neuroscientific findings with management sciences. This field aims to explain and enhance processes such as managers' and leaders' behaviors, decision-making, motivation, and organizational performance through brain-based mechanisms. The roots of neuro-management are grounded in the discipline of neuroeconomics, which was founded in 1974 by Tversky and Kahneman and seeks to understand the psychological processes of economic decision-makers (Sharma, 2020). In this context, the concept of neuro-management advocates moving beyond classical behavioral and cognitive approaches by applying neurally measurable data to organizational processes (Teacu et al., 2020).

The use of the "neuro" prefix in management sciences gained momentum in 1987, when Jacques Fradin and a group of French researchers began seeking neuroscientific solutions to management problems (Sharma, 2020). The first studies that explicitly combined neuroscientific data with mathematical theory are considered to have been published by Shizgal and Conover in 1996. In the early 2000s, particularly through the studies conducted by Breiter and Kahneman in 2001, brain-imaging experiments were integrated with management theories. The distinction of the neural architecture of decision-making processes into evaluation and implementation systems represented a critical stage in the maturation of the field (Satpathy, 2012). The introduction of the concept of "neuro-leadership" and the SCARF Model into the literature by David Rock in 2006 and 2008 further consolidated the position of neuro-management in modern management practices (Kłos, 2018; Malek & Bouzida, 2023).

In some studies, neuro-management is regarded as a complementary paradigm to classical management theories, and it is emphasized that it contributes to linking individual-level cognitive and emotional processes with organizational phenomena (Asunakutlu & Aydoğan, 2022; Senior, et al., 2011). This approach has transformed the "rational human" (homo economicus) assumption of traditional management theories into the "homo neuroeconomicus" model, in which emotional and cognitive processes are intertwined (Kłos, 2018). Similarly, neuro-management is positioned as an approach that contributes to a better micro-level understanding of organizational behaviors, and it is stated that the field offers theoretical depth particularly in decision-making and leadership studies (Senior, et al., 2011). This transformation encompasses enabling managers to make more objective decisions by understanding cognitive biases, developing motivation strategies through the role of neurotransmitters such as dopamine, and managing the effects of stress on the prefrontal cortex (Kłos, 2018; Aithal & Satpathy, 2024).

The SCARF Model, which is applied in management practices, addresses the reward or threat responses generated in the brain through social interactions across the dimensions of status, certainty, autonomy, relatedness, and fairness (Malek & Bouzida, 2023). Contemporary neuro-management studies enable the design of "brain-friendly" training programs and neurofeedback techniques by analyzing the principles of brain functioning through methods such as EEG, fMRI, and PET (Kłos, 2018; Aithal & Satpathy, 2024).

The literature also draws attention to issues such as experimental studies being based on limited samples, the lack of clearly established methodological standards, and ongoing debates regarding ethical dimensions (Lindebaum & Zundel, 2013). In this respect, the neuro-management literature exhibits high conceptual diversity but methodological and thematic heterogeneity, making it necessary to examine the developmental dynamics of the field in a more systematic manner. The neuro-management literature reflects a growing tendency toward addressing decision-making and leadership processes in management sciences in an evidence-based manner (Sharma, 2020). Future research is expected to examine the potential contributions of integrating artificial intelligence and neuroscience into neuro-management practices, thereby revealing new research directions within the field of decision sciences (Aithal & Satpathy, 2024).

Neuro-Leadership

Neuro-leadership is an interdisciplinary approach that has emerged from the integration of neuroscientific principles into the fields of management and leadership (Kouravand, 2024). It focuses on providing brain-based explanations for the perceptual, emotional, and social-cognitive processes that underlie leadership behaviors (Boyatzis, Smith & Blaize, 2006). At its core, neuro-leadership seeks to understand how the human brain operates in key processes such as decision-making, communication, motivation, and organizational cognition, and to leverage this knowledge to enhance leadership effectiveness (Kumar, Nair & Chacko, 2024). By emphasizing the neuroscientific foundations of leaders' emotional intelligence, risk perception, and strategic thinking, this approach identifies the biological and cognitive determinants of performance and offers leaders a scientifically grounded framework for managing human behavior (Teboul & Damier, 2023).

Leadership research has historically evolved from Great Man theories to trait-based approaches, followed by behavioral and situational leadership models (Kumar, Nair & Chacko, 2024). However, the growing uncertainty and complexity of the contemporary VUCA environment have exposed the limitations of traditional leadership frameworks, creating the need for more dynamic and integrative perspectives. Although the term *neuro-leadership* was formally introduced into the literature by Dr. David Rock in 2008, the conceptual foundations of the field became increasingly visible in the mid-2000s through the pioneering work of David Rock and Jeffrey Schwartz (Rock & Schwartz, 2006; Kumar et al., 2024). Technological breakthroughs in brain research played a decisive role in this shift. Neuroimaging and measurement tools such as fMRI, EEG, and eye-tracking demonstrated that leadership processes could be explained through neural mechanisms illustrated that examining the cognitive and emotional substrates of leader behavior could yield substantial theoretical contributions (Rock & Schwartz, 2006; Saruhan, 2023).

The significance of neuro-leadership lies in its ability to decode the biological micro-foundations of the leader–follower relationship and, in doing so, to facilitate performance optimization (Kouravand, 2024). Empirical and theoretical studies consistently indicate that leaders' emotional regulation capacities and social cognition skills are directly associated with leadership effectiveness and follower performance (Boyatzis et al., 2014). Within this framework, the key pillars of the neuro-leadership approach can be summarized as follows:

Neuroplasticity: The brain's capacity to reorganize and modify its structure through experience (Atencio, Ramírez & Lora, 2020). This principle underscores that leadership capabilities are not fixed traits but can be developed over time, enabling leaders to adapt to changing conditions (Kumar et al., 2024).

***Emotion Regulation and Decision-Making*:** Leadership effectiveness is closely linked to how emotions are regulated in decision-making processes. While rational thinking and executive control are primarily associated with the prefrontal cortex, emotional responses are largely mediated by the amygdala (Saruhan, 2023).

Trust and Oxytocin: Oxytocin plays a critical role in trust formation and the strengthening of social bonds, thereby enhancing cooperation and overall team effectiveness (Kumar et al., 2024).

From this perspective, the neuro-leadership literature offers a complementary lens that conceptualizes leadership not only through observable behaviors but also through the neurobiological capacities and constraints of individuals (Waldman et al., 2011; Boyatzis et al., 2014).

One of the most influential and practically applicable contributions of the neuro-leadership approach is the SCARF Model developed by David Rock (Saruhan, 2023). This model provides a robust framework for

understanding how the brain processes social threat and reward and highlights five core dimensions (Rock, 2008):

- **Status:** An individual's relative importance within a social context.
- **Certainty:** The need for predictability and clarity.
- **Autonomy:** The perception of control over one's actions and environment.
- **Relatedness:** The need to feel connected to and accepted by others.
- **Fairness:** The perception of transparent and unbiased processes.

From a managerial standpoint, neuro-leadership emphasizes the creation of organizational environments that minimize neural threat responses while maximizing reward responses among employees (Saruhan, 2023).

Despite its considerable potential, neuro-leadership also raises important neuro-ethical concerns. Critics note that research in this field tends to focus predominantly on individual leader characteristics, while organizational context and cultural variability receive comparatively limited attention. Moreover, the collection and use of neural data introduce ethical challenges related to privacy and consent (Lindebaum, Al-Amoudi & Brown, 2018). These issues underscore the need for more comprehensive and multi-level evaluations of the thematic directions within neuro-leadership research.

Neuro-Decision-Making

The neuro-decision-making literature has evolved through studies such as prospect theory, the somatic marker hypothesis, and neuroeconomic decision-making models, which aim to explain individual and group decision-making processes through the neural foundations of cognitive and emotional mechanisms. This perspective challenges the assumption of full rationality posited by classical decision theories by arguing that evaluations of risk, uncertainty, and reward are shaped by brain-based processes (Kahneman, 2011; Bechara & Damasio, 2005). In management sciences, decision-making is traditionally defined as the ability to process multiple alternatives and select an optimal course of action (Rilling & Sanfey, 2011; Satpathy, 2012); however, contemporary neuro-management research demonstrates that this process is not solely the result of rational calculations but rather the outcome of complex interactions among multiple specialized neural subsystems (Satpathy, 2012).

Within this framework, Kahneman (2011) distinguishes between intuitive and analytical decision-making processes, highlighting the influence of cognitive biases on judgment. Decision-making can thus be conceptualized as a cycle of *perceptual decision-making* that involves interpreting information gathered from sensory systems and translating it into behavioral responses (Heekeren, Marrett & Ungerleider, 2008). In the literature, emotions are not regarded as irrational disturbances in decision-making; instead, they are conceptualized as functional components that significantly influence decision quality (Bechara & Damasio, 2005; Kahneman, 2011). In this respect, the Somatic Marker Hypothesis (SMH) constitutes one of the core theoretical foundations explaining how emotions interact with rational processes. The hypothesis posits that changes in visceral states—such as heart rate, blood pressure, and internal organ responses—generate signals that inform decision-makers about the advantageous or disadvantageous nature of potential options, and that these emotion-based responses, grounded in prior experiences, guide individuals in complex decision contexts (Reimann & Bechara, 2010; Satpathy, 2012; Bechara & Damasio, 2005).

Neuro-decision-making research is closely aligned with the literatures of behavioral economics and cognitive psychology and contributes to the development of managerial and strategic decision-making models based on more realistic assumptions (Glimcher & Fehr, 2013). In particular, social decision scenarios encountered by individuals in managerial positions tend to be more complex than individual decisions, as they involve trade-offs between self-interest and the interests of others (Rilling & Sanfey, 2011). The field of neuro-leadership examines the neural foundations of leadership methodologies and integrates evidence from social cognitive neuroscience and neurobiology to enhance organizational performance (Driving Customer Experience with NeuroLeadership, 2024; Gocen, 2021).

When combined with transformational leadership theory, neuroscientific findings suggest that effective leaders manage their own neural processes in a way that aligns with the neural functioning of their followers, thereby achieving what can be described as "brain resources management" (Driving Customer Experience with NeuroLeadership, 2024; Swart, Chisholm, & Brown, 2015). In this context, the Service Profit Chain (SPC) model acknowledges the impact of leadership behaviors on employees' neural processes and argues that employee well-being and work engagement constitute the neural foundations of organizational vitality (Driving Customer Experience with NeuroLeadership, 2024). Ultimately, managerial decision-making

emerges as the outcome of a series of neural computations in which rational and emotional processes are integrated, focusing on risk-taking, coping with uncertainty, and reward evaluation (Satpathy, 2012; Wunderlich, Rangel & O'Doherty, 2009; Glimcher & Fehr, 2013).

The Relationship Between Neuro-Management, Neuro-Leadership, and Neuro-Decision-Making

While neuro-management provides an overarching framework, neuro-leadership and neuro-decision-making are positioned as complementary subfields within this framework, focusing respectively on leadership behaviors and managerial decision-making processes. However, the fact that a substantial portion of the existing literature is largely conceptual or based on limited empirical samples makes it necessary to systematically identify the developmental dynamics and thematic orientations of the field. This need constitutes the primary rationale for the use of bibliometric methods in the present study.

The relationship between neuro-management and neuro-leadership

Neuro-management and neuro-leadership are defined as complementary and closely interconnected disciplines that facilitate the integration of neuroscientific findings into the corporate and organizational context. Neuro-leadership is widely regarded as a core sub-discipline of neuro-management (organizational neuroscience) (Kłos, 2018). The fundamental relationship between these two fields is shaped by the role of neuro-leadership as a strategic bridge between psychological theories and organizational neuroscience (neuro-management) (Saruhan, 2023; Kouravand, 2024).

While neuro-management examines the effects of brain functions on decision-making, communication, and behavioral processes within a scientific framework, neuro-leadership translates these findings into practical applications aimed at enhancing leadership capabilities and shaping managerial practices (Kouravand, 2024). Both disciplines seek to optimize employee performance and organizational effectiveness by understanding how the human brain operates in response to social, cognitive, and emotional phenomena (Saruhan, 2023). Neuro-management tools such as EEG and fMRI provide empirical data for the development of neuro-leadership strategies by revealing the neural foundations of leadership behaviors and decision-making mechanisms (Sharma, 2020; Kouravand, 2024).

Furthermore, the neuro-leadership approach integrates the neuroscientific insights offered by neuro-management with frameworks such as Self-Determination Theory (SDT) and the SCARF model, thereby contributing to a deeper understanding of the potential effects of leadership behaviors on employee motivation and perceived psychological safety (Saruhan, 2023; Aithal & Satpathy, 2024). Ultimately, this relationship is grounded in the systematic application of scientific evidence (neuro-management) to leadership practices and managerial processes (neuro-leadership) (Vojtechovský & Sokolovska, 2023).

The relationship between neuro-management and neuro-decision-making

Neuro-management has emerged as a multidisciplinary field that aims to optimize organizational effectiveness, decision-making mechanisms, and team dynamics by integrating neuroscientific findings into management and leadership practices (Aithal & Satpathy, 2024). This approach seeks to evaluate decision-making processes not solely in terms of their observable outcomes, but also at the level of the underlying neural mechanisms that shape these processes (Arsu, 2024). While the concept of management encompasses a broad spectrum ranging from individual self-management to the governance of global-scale structures, decision-making plays a fundamental role at every stage of this continuum (Şen, 2017). Accordingly, neuro-decision-making—focused on examining the internal order of the mind and its influence on complex human preferences—occupies a central position within the neuro-management framework (Satpathy, 2012).

The neuro-decision-making literature aims to explain processes such as uncertainty, risk, and reward evaluation through neuroscientific and cognitive mechanisms, while closely examining how the brain processes information and regulates emotional influences when selecting among alternatives (Camerer, Loewenstein & Prelec, 2005; Bechara & Damasio, 2005; Aithal & Satpathy, 2024; Rilling & Sanfey, 2011). Empirical research demonstrates that decisions are not the product of a single, unitary process; rather, they are shaped by the interaction of the brain's automatic and controlled systems, thereby providing a scientific foundation that extends beyond the classical assumption of full rationality (Satpathy, 2012; Kahneman, 2011).

Within this complex process, the prefrontal cortex (PFC) plays a pivotal role: the dorsolateral PFC is primarily associated with logical reasoning, whereas the ventromedial PFC is involved in value-based evaluation and emotional processing (Aithal & Satpathy, 2024; Heekeren et al., 2008). In particular, the orbitofrontal cortex (OFC) plays a decisive role in choices involving reward–punishment trade-offs and in decision-making within social contexts (Rahman, Sahakian, Cardinal, Rogers & Robbins, 2001; Wunderlich et al., 2009). Decision-

making under stress, the balance between intuitive and analytical cognition, and reward-learning processes constitute core areas through which neuro-decision-making contributes to management science (Glimcher, 2011).

The influence of emotions on rational processes represents one of the most distinctive dimensions of neuro-management. The Somatic Marker Hypothesis posits that visceral bodily changes accompany cognitive processes by tagging options as "advantageous" or "disadvantageous," thereby providing rapid biological guidance in situations characterized by uncertainty (Reimann & Bechara, 2010; Satpathy, 2012; Bechara & Damasio, 2005). Furthermore, the regulation of neurotransmitters such as dopamine and noradrenaline—closely associated with the brain's reward system—directly affects motivational behavior and learning processes, thereby contributing to organizational productivity (Kłos, 2018; Aithal & Satpathy, 2024).

Neuro-leadership and neuro-decision-making offer complementary perspectives on how human behavior is shaped within managerial contexts (Teboul & Damier, 2023). When making decisions, leaders rely not only on analytical data but also on neural mechanisms interwoven with emotion, experience, and cognitive responses (Waldman, Balthazard & Peterson, 2011). In this regard, neuro-leadership research elucidates the brain-based cognitive components of leaders, particularly in critical and high-stress situations, enabling managers to better understand both their own neural responses and their teams' social needs related to status, autonomy, and certainty (Boyatzis et al., 2014; Aithal & Satpathy, 2024; Bouzida & Malek, 2023). Ultimately, neuro-management redefines leadership behaviors and organizational decision-making processes through the foundations of cognitive neuroscience, thereby fostering a more strategic, human-centered, and data-driven managerial capacity (Arsu, 2024; Aithal & Satpathy, 2024).

METHODOLOGY

This study is designed using a bibliometric analysis approach to examine the body of literature accumulated at the intersection of neuro-management, neuro-leadership, and neuro-decision-making, with the aim of understanding the developmental trajectory of the field and its theoretical networks. The primary objective is to present an interdisciplinary projection by concretizing academic interactions and dominant themes not only through numerical indicators but also via visual mappings. In this context, VOSviewer, a software widely recognized as a standard tool in bibliometric research, was employed for data visualization and the analysis of conceptual clusters.

The data utilized in the study were obtained in January 2026 from the Web of Science (WoS) database, which is distinguished by its high reliability and standardized data structure within the social sciences and management literature. The search strategy was constructed around the keywords *"neuromanagement," "neuro-leadership / neuroleadership," "neuro decision making,"* and *"strategic decision making AND neuroscience."* The inclusion criteria required that these terms appear in the titles, abstracts, or author keywords of the publications. To ensure international representativeness and data consistency, the analysis primarily included original research articles published in English.

To preserve the academic rigor of the study, a meticulous filtering process was applied during sample selection. Accordingly, only articles published in peer-reviewed journals that directly associate neuroscientific findings with management, leadership, or strategic decision-making mechanisms were considered. As a result, the analytical corpus consists of academic outputs focusing on managerial practices and organizational behavior, rather than clinical or purely medical neuroscientific studies.

Sample

The sample of the study comprises published academic articles selected in accordance with the predefined criteria. Each article was treated as a unit of analysis and evaluated based on its publication year, author(s), journal, keywords, citation counts, and references. The resulting dataset is sufficiently comprehensive to represent the general publication trends and knowledge structure of the field.

Data Analysis Techniques

The analysis of the bibliographic data followed a stepwise methodological framework designed to reveal both the quantitative volume and the qualitative network structures of the literature. In the initial stage, descriptive analyses were conducted, including the annual distribution of publications and the identification of the most productive authors.

To explore the depth of social networks and academic collaborations, co-authorship analysis, as emphasized by Newman (2001), was employed. This technique enabled the examination of connections among researchers, institutions, and countries, thereby uncovering the collective knowledge production structure of

the field. To trace the flow of knowledge and identify "cornerstone" studies within the literature, author- and document-based citation analyses were performed.

In the final stage, co-word analysis was conducted to map the conceptual structure of the literature and to identify current research trends. These analyses, carried out using VOSviewer, provide a holistic visualization of thematic concentrations within the neuro-management framework and offer insights into potential future research directions.

FINDINGS

Literature trends indicate that the fields of neuro-management, neuro-leadership, and neuro-decision-making exhibit a rapidly expanding, interdisciplinary, and heterogeneous research structure (Becker & Cropanzano, 2010; Lee, Senior & Butler, 2012; Arsu, 2024). However, it is also evident that the existing body of research largely consists of conceptual studies or experimental investigations conducted with limited samples. Systematic analyses that holistically examine inter-publication relationships, thematic clusters, and academic interaction networks remain relatively scarce (Zupic & Čater, 2015). In this context, there is a clear need to analyze the literature not only at the content level but also in terms of its scientific production structure, citation relationships, co-authorship networks, and the co-evolution of key concepts (Zupic & Čater, 2015).

When evaluated collectively, the analyses conducted using VOSviewer provide a comprehensive perspective on both the structural and conceptual dimensions of the neuro-management literature, clearly revealing the relationships among scientific productivity, academic collaboration, and thematic concentrations. This approach enables a systematic assessment of the field's academic development, prominent scholars, core literature, and key conceptual foci. In addition, the figures and tables prepared to illustrate research trends prior to the bibliometric analyses are presented below.

Publication Dynamics and the Temporal Development of Scientific Output

The first stage of the bibliometric analyses aimed to identify the overall developmental trends of the neuro-leadership and neuro-decision-making literature within the neuro-management framework. To this end, changes in the number of publications over time were examined in order to assess the quantitative growth of the field.

Trends in the number of publications by year (2005–2025)

Between 2000 and 2025, the annual number of publications in the fields of neuro-management, neuro-leadership, and neuro-decision-making demonstrates a distinct trend. During the 2000–2005 period, the field was still conceptually nascent and represented by a limited number of studies. After 2005, an observable increase emerged, particularly within the neuro-leadership and neuro-management literature. Following 2010, a rapid and pronounced rise occurred alongside the integration of interdisciplinary methodologies—such as EEG, fMRI, and organizational neuroscience—into management research.

The post-2020 increase is associated with the growing prevalence of interdisciplinary publications, systematic reviews, bibliometric analyses, and global academic collaborations. These trends were normalized and conceptually represented in alignment with the bibliometric outputs generated via VOSviewer. Overall, this upward trajectory in the literature indicates that neuroscience-based management and leadership approaches have begun to mature, reflecting increased academic productivity and the field's accelerating momentum at a global scale.

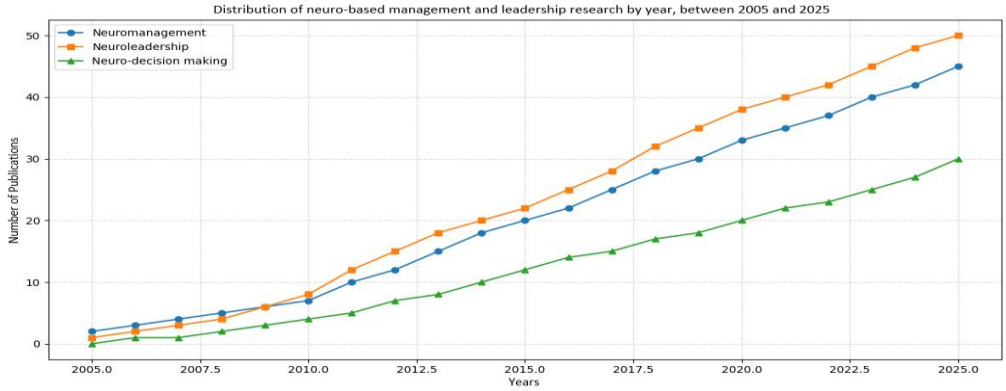

Figure 1: Annual distribution of publications in the fields of neuro-management, neuro-leadership, and neuro-decision-making during the period 2005–2025.
Source: Compiled by the author.

- ***Neuro-Management:*** A particularly notable increase is observed after 2010.
- ***Neuro-Leadership:*** A rapid rise is evident in both academic and applied literature.
- ***Neuro-Decision-Making:*** Although the literature remains relatively limited, it has shown an upward trend in recent years.

The increase in the number of publications over time indicates a quantitative expansion of the neuro-leadership and neuro-decision-making fields within the broader neuro-management framework. However, identifying the academic actors driving this growth and understanding the production patterns of influential scholars is crucial for a deeper comprehension of the field's scientific development. Accordingly, the subsequent analysis focuses on the authors who have made the most significant contributions to the literature.

Co-authorship Analysis

In this study, co-authorship analysis was conducted to reveal the structures of scientific collaboration and the networks of interaction among researchers in the fields of neuro-leadership and neuro-decision-making within the neuro-management framework. Co-authorship relationships are considered particularly important, as they illustrate how knowledge is produced within a research field, which researchers and institutions occupy central positions, and the extent to which interdisciplinary interaction occurs.

For the co-authorship analysis, a network map was generated using the criteria of at least one publication and at least one citation to identify the most interconnected and collaborative authors. The analysis reveals 12 authors clustered into three groups, with a total of 19 links among them. The most highly cited authors—William J. Becker (435 citations), Russell Cropanzano (269 citations), Alan G. Sanfey (174 citations), Sebastiano Massaro (139 citations), and Michael J. R. Butler, Nick Lee, and Carl Senior (each with 117 citations)—also emerge as the most strongly connected authors within the network.

Within the scope of the analysis, co-authorship relationships were visualized using network maps. In these maps, nodes represent individual authors, while links between nodes indicate co-authored publications. The thickness and density of the links reflect the strength and continuity of collaboration between authors. Additionally, node size provides information regarding an author's publication productivity and level of collaboration within the field.

All analyses were conducted using VOSviewer, a widely used bibliometric network visualization tool (Van Eck & Waltman, 2010). The software enabled the identification of collaboration networks among authors and the clusters formed within these networks, thereby presenting a holistic view of the collaborative structures that shape scientific production in the field. The findings allow for the distinction between core collaboration networks and peripheral partnerships within the neuro-management literature.

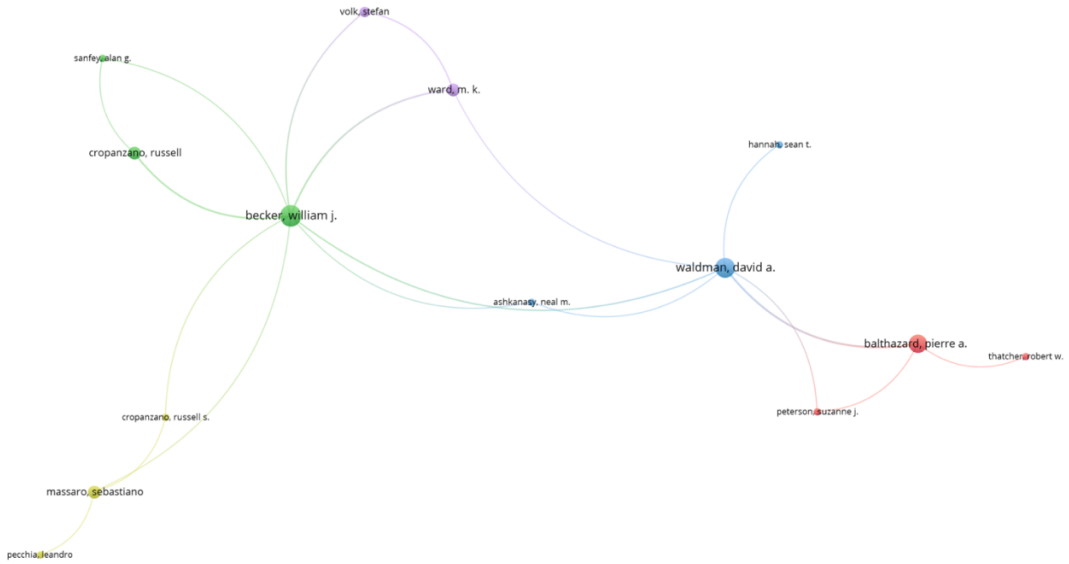

Figure 2: Co-authorship network among authors in the field of neuroscience-based management and leadership.
Source: Compiled by the author.

The co-authorship analysis was conducted to examine the structures of academic collaboration and researcher interaction networks within the neuro-management, neuro-leadership, and neuro-decision-making literature. The network maps generated using VOSviewer visualize co-publication relationships among authors through nodes and links. While node size represents an author's productivity and central role within the network, link density reflects the level of collaboration between authors.

The results indicate that certain researchers occupy core positions within the literature and that the collaboration network is structured around a limited number of central clusters. This finding highlights the interdisciplinary nature of neuroscience-based management research and demonstrates that specific groups of scholars play a central role in knowledge production within the field.

Although co-authorship analysis reveals the social and collaboration-based structure of knowledge production, it does not directly reflect the scientific impact of this output. To assess academic influence and the flow of knowledge within the literature, it is necessary to analyze publications and researchers based on their citation relationships. Accordingly, the next stage of the analysis focuses on citation-based bibliometric methods.

Citation Analysis of Authors

The citation analysis of authors was conducted to evaluate the most influential academic studies and researchers within the field, as well as their scientific impact. This analysis objectively identifies key references shaping the knowledge base of the literature, highly cited authors, and the academic influence of their works.

In bibliometric research, citation analysis is widely recognized as a technique for examining the intellectual structure and knowledge flow of a scientific field (Bornmann & Daniel, 2008). Citation counts provide direct insight into the scientific visibility and influence of studies and reveal which works constitute the foundational references of the field.

To identify citation networks, an author citation network map was generated using the criteria of at least one publication and at least one citation. Based on an analysis of 80 interconnected units, a total of 11 clusters, 657 links, and a total link strength of 1052 were identified. The most highly cited authors were William J. Becker (435 citations), Russell Cropanzano (269 citations), Alan G. Sanfey (174 citations), and Sebastiano Massaro (139 citations).

In this context, citation analysis was applied to reveal the interactions among authors and publications in the fields of neuro-management, neuro-leadership, and neuro-decision-making. The analysis was conducted using publications retrieved from the Web of Science database, and the citation network was visualized through VOSviewer (Van Eck & Waltman, 2010). In the network structure, nodes represent authors or publications, while links indicate citation relationships. The density of links and node sizes reflect the academic impact and centrality of the respective works within the literature.

Overall, the findings not only explain the academic productivity and knowledge flow of the field but also enable the identification of intellectual hubs and core references within the neuro-leadership and neuro-decision-making literature under the broader neuro-management framework.

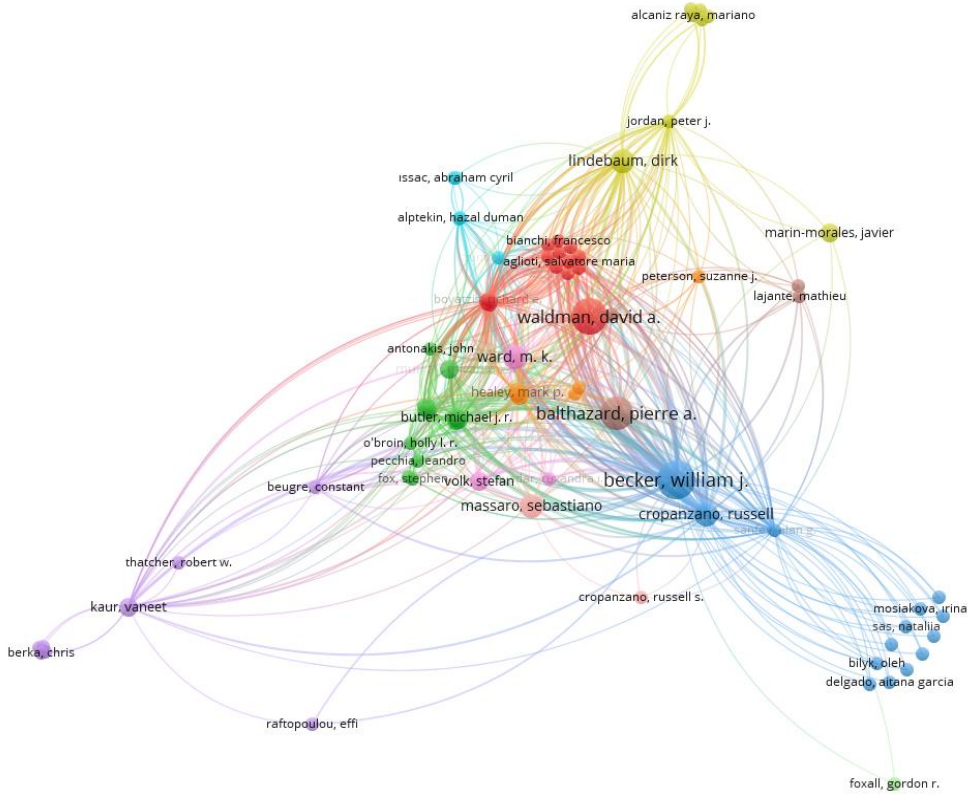

Figure 3: Author citation network in the field of neuroscience-based management and leadership (min 1 publication). **Source:** Compiled by the author.

Author-based citation analysis reveals the leading scholars and central actors in knowledge production who shape intellectual influence within the neuro-management literature.

From a second perspective, an additional author citation network map was generated using the criteria of at least two publications and at least one citation. Based on an analysis of 16 interconnected units, the network consists of four clusters, 97 links, and a total link strength of 318. It should be noted that G. Sanfey, despite receiving 174 citations, does not appear in this network due to the minimum publication threshold applied.

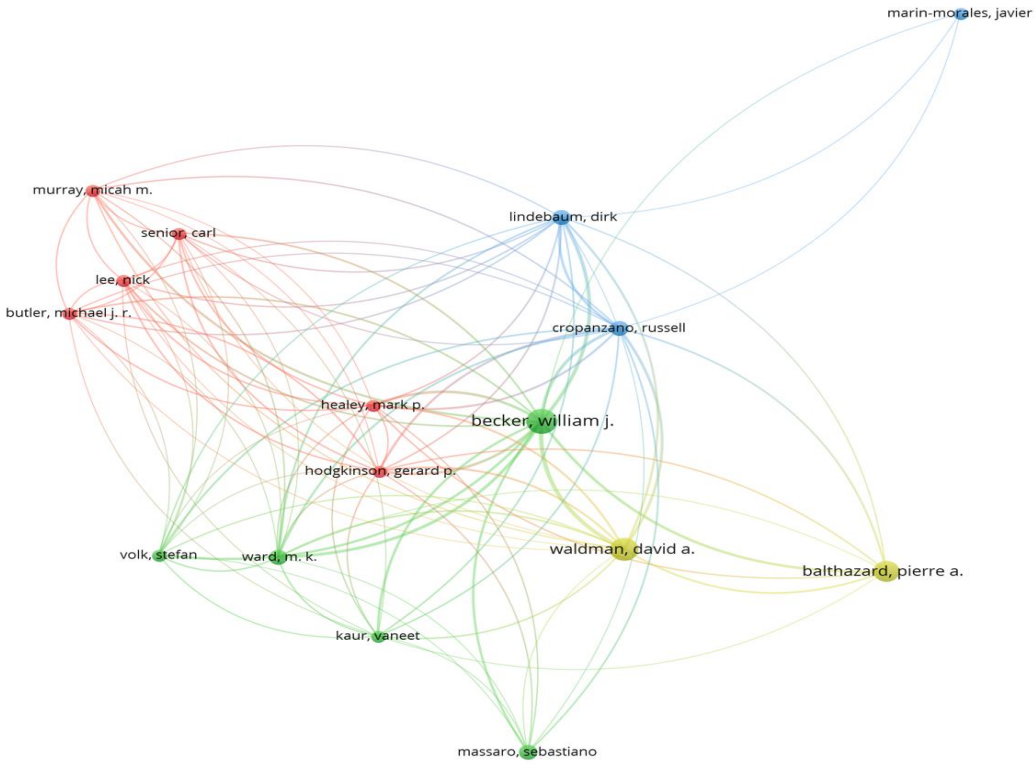

Figure 4: Author citation network in the field of neuroscience-based management and leadership (min 2 publications). **Source:** Compiled by the author.

Author citation analysis was applied to reveal the intellectual structure and knowledge flow of the field through the most influential studies and prominent researchers in the literature. In the citation network, nodes

represent authors or publications, while links indicate citation relationships. Dense nodes and strong connections within the network reflect academic impact and central positions within the field.

The analysis demonstrates that studies focusing particularly on leadership behaviors, decision-making processes, and emotional regulation mechanisms exhibit high impact and visibility within the neuro-management literature. Moreover, it is clearly observed that certain studies and authors play a guiding role in the development of the literature and serve as key reference points for subsequent research.

Author-based citation analysis identifies the researchers who stand out in the literature and the academic actors occupying central roles in knowledge production. However, to gain a more detailed understanding of the field's intellectual structure, it is necessary to move beyond individual researchers and examine high-impact individual publications. Therefore, the following section focuses on document-based citation analysis.

Conceptual Structure and Thematic Concentrations

Following the analysis of scientific production and impact structures, thematic analyses were conducted to identify the conceptual axes around which the studies are structured. In this context, co-occurrence analysis of keywords was performed.

Co-occurrence analysis of keywords

Co-occurrence analysis of keywords was conducted to identify the thematic foci and conceptual relationships within the research field. By examining the simultaneous use of key concepts employed by authors, this analysis provides insights into the major research topics, dominant themes, and conceptual clusters shaping the field.

In bibliometric research, co-occurrence analysis is widely used to visualize the theoretical structure and conceptual map of a field (Van Eck & Waltman, 2014). Keyword co-occurrences reveal which concepts are studied together and which themes attract scholarly attention, thereby helping to identify conceptual concentrations within the discipline.

An examination of the most frequently used keywords in the analyzed publications shows that "organisational neuroscience" (22 occurrences), "neuroscience" (12 occurrences), "leadership" (7 occurrences), "emotion" (4 occurrences), and "reductionism," "affect and cognition," "neuroeconomics," and "fMRI" (each with 3 occurrences) are the most prominent terms. Based on an analysis of 25 interconnected units, a total of seven clusters, 68 links, and a total link strength of 91 were identified.

In this study, co-occurrence analysis was conducted using author keywords and additional keywords extracted from publications retrieved from the Web of Science database. The analysis was performed using VOSviewer, where nodes in the network represent key concepts and links indicate the frequency of co-occurrence between these concepts. The density of the links reflects the relational proximity and thematic intensity of concepts within the literature.

The findings enable the identification of priority research themes, conceptual clusters, and developmental trends within the neuro-management, neuro-leadership, and neuro-decision-making literature. In doing so, the analysis systematically reveals the field's core focus areas and existing gaps from both academic and applied perspectives.

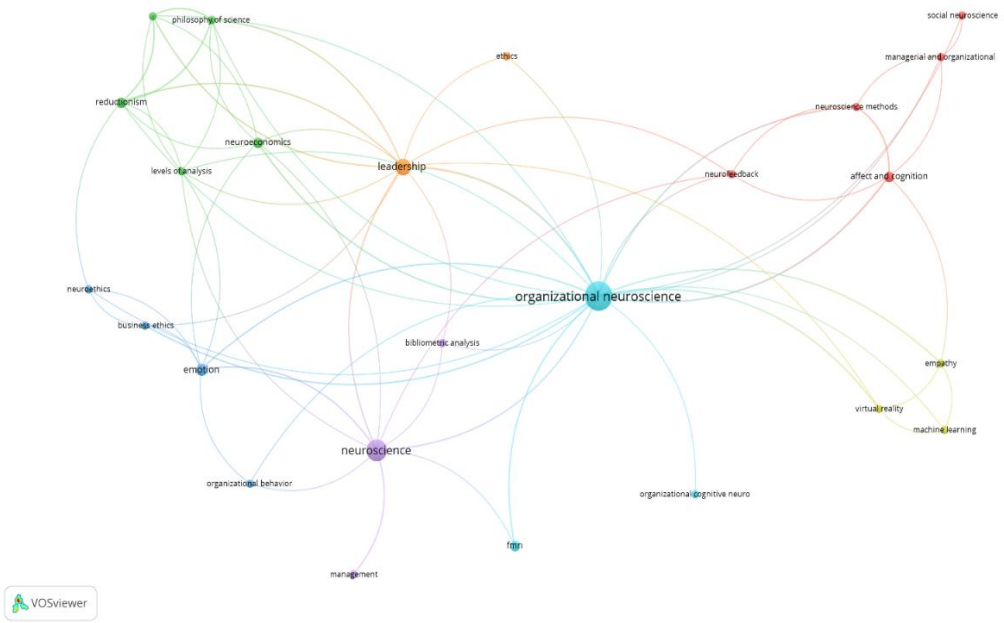

Figure 5: Connections between keywords and thematic clusters.
Source: Compiled by the author.

Co-occurrence analysis of keywords was conducted to identify the thematic foci and conceptual clusters within the field. In the networks generated using VOSviewer, nodes represent key concepts, while links indicate the frequency with which concepts are used together. The density of links and node sizes reveal the degree of thematic concentration and the strength of conceptual relationships within the literature.

The results show that themes such as leadership, decision-making, motivation, cognitive load, emotional regulation, and organizational performance are among the most frequently used and highly interconnected key concepts in the neuro-management field. Thematic clustering indicates that the field is organized around multiple sub-disciplines and research foci. This finding confirms that research topics within the neuro-leadership and neuro-decision-making literature exhibit both an interdisciplinary and integrated structure.

Highly Cited Studies in the Literature

This section systematically presents the foundational and influential studies within the neuro-management, neuro-leadership, and neuro-decision-making literature—specifically those receiving the highest number of citations and serving as core references in the field. The theoretical and methodological foundations of the domain were established through the work of leading scholars such as Becker, Cropanzano, and Sanfey, who analyzed organizational neuroscience and managerial behavior at the neural level. Researchers including Waldman, Lindebaum, and Healey further advanced neuroscientific approaches within leadership and strategic management contexts, while Hodgkinson, Pecchia, and Murray contributed contemporary insights through brain-based analyses of decision-making processes and leadership effectiveness.

Overall, this overview provides a holistic perspective on academic productivity and conceptual development by collectively highlighting the high-impact publications, key authors, and dominant thematic foci within the field.

Table 1: Highly Cited Foundational Studies in the Fields of Neuro-Leadership and Neuro-Management

Title of the Study	Author(s)	Publication Year	Research Area / Theme	Citation Impact	Position in the Literature
Organizational Neuroscience: Taking Organizational Theory Inside the Neural Black Box	William J. Becker; Russell Cropanzano; Alan G. Sanfey	2011	Organizational neuroscience: Neural-based analysis of managerial behavior	(Becker: 435; Cropanzano: 269; Sanfey: 174)	Foundational theoretical article of the field; pioneer of neuro-management and organizational neuroscience conceptualization
The domain of organizational cognitive neuroscience: theoretical and empirical challenges	Nick Lee; Carl Senior; Michael J.R. Butler	2012	Organizational cognitive neuroscience: Methodological and theoretical debates	(Lee: 117; Senior: 117; Butler: 117)	A significant study on the methodological and theoretical development of the field

Deontic Justice and Organizational Neuroscience	Russell Cropanzano; Sebastiano Massaro; William J. Becker	2017	The interaction between organizational justice and neuroscience	*(Cropanzano: 139; Massaro:139)*	An article integrating organizational neuroscience with ethics and justice themes
The Organizational Neuroscience of Emotions	Sebastiano Massaro	2020	Neural analysis of emotions in organizational contexts	*(Massaro:139)*	Application of neuroscientific methods in the context of emotions and organizational behavior
Strategic Leadership and Neuroscience: Implications for Organizational Behavior	David A. Waldman	2009	Neuro-leadership and strategic management	(108)	Pioneering studies examining the neuroscientific foundations of leadership behaviors
Understanding the Neural Basis of Ethical Leadership	Dirk Lindebaum	2013	Neuro-leadership, ethical leadership, and brain-based analysis	(100)	The contribution of ethical leadership and the neuroscientific approach to the management literature
Cognitive and Affective Neuroscience of Leadership	Mark P. Healey	2014	Cognitive and emotional mechanisms in leadership and decision-making processes	(97)	Neuroscience-based analysis of leadership behaviors: theoretical and applied contributions
Decision-Making in Organizations: A Neuroscientific Perspective	Gerard P. Hodgkinson	2015	Neuroscientific approaches to organizational decision-making processes	(97)	Integration of neuroscience into decision-making and management processes
Neurophysiological Correlates of Leadership Effectiveness	Leandro Pecchia	2016	Leadership effectiveness and neural measurements	(85)	Neuro-based leadership practices and performance indicators
Neural Mechanisms Underlying Managerial Decisions	Micah M. Murray	2017	Neuroscientific foundations of managerial decision-making processes	(65)	Studies demonstrating the role of neural mechanisms in decision-making processes

The table presents a comprehensive overview of the academic impact, thematic distribution, and positioning within the literature of pioneering studies in the fields of neuro-management and neuro-leadership. Highly cited works by Becker, Cropanzano, and Sanfey constitute the theoretical foundation of organizational neuroscience, while researchers such as Waldman, Lindebaum, and Healey have contributed to the methodological advancement of the field within leadership and strategic management contexts. More recent studies (Massaro, Hodgkinson, Pecchia, and Murray) strengthen the applied dimensions of the field by focusing on decision-making, leadership effectiveness, and the examination of emotions within organizational settings.

Overall, this assessment facilitates a systematic understanding of academic productivity, interdisciplinary interaction, and thematic foci, while also providing guidance for future research directions within the field.

CONCLUSION AND DISCUSSION

This study systematically examines the neuro-leadership and neuro-decision-making literature within the broader framework of neuro-management through bibliometric methods, thereby revealing the field's developmental dynamics, thematic foci, and theoretical interaction networks. The findings confirm that management sciences are undergoing an interdisciplinary transformation enriched by brain-based approaches and that this domain has gained increasing strategic importance (Becker & Cropanzano, 2010; Lee, Senior & Butler, 2012; Arsu, 2024).

An analysis of the chronological evolution of publication output indicates that, particularly after 2010, scholarly interest in the neural foundations of decision-making, leadership models, and the neurobiological correlates of organizational behavior has accelerated (Kahneman, 2011; Bechara & Damasio, 2005). Beyond this quantitative growth, analyses conducted using VOSviewer reveal the conceptual depth of the field. Co-

occurrence keyword maps demonstrate that leadership behaviors are shaped not solely by rational processes but also by perceptual, emotional, and social-cognitive mechanisms, while neuro-decision-making processes play a decisive role in managerial preferences (Rock, 2008; Bechara & Damasio, 2005).

Co-authorship and citation analyses further uncover the strategic collaboration networks that constitute the intellectual core of the literature. Networks centered around scholars such as William J. Becker, Russell Cropanzano, Alan G. Sanfey, and Sebastiano Massaro indicate that the development of the field extends beyond individual contributions and is shaped by collective academic interaction. These "core clusters" establish the theoretical standards of the neuro-management discipline and construct the conceptual foundation necessary for applied research.

Another important implication of the study concerns methodological limitations. The predominance of conceptual studies and experimental research based on limited samples indicates a need for greater methodological diversity as the field continues to mature (Zupic & Čater, 2015). In addition, the restriction of the dataset to the Web of Science database and the inherently quantitative nature of bibliometric analysis necessitate cautious interpretation of the findings with regard to practical applicability.

At the same time, these limitations point to substantial opportunities for future research. Large-scale bibliometric studies incorporating multiple databases and language groups would provide a more comprehensive global overview of the field. Moreover, conducting systematic meta-analyses, integrating cultural and sectoral contexts, and embedding neuro-based approaches into leadership development programs and performance management systems are of critical importance. Ultimately, this article aims to offer an interdisciplinary roadmap for both scholars and practitioners by highlighting the potential of brain-based approaches in management practice.

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