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**Effectivity of Organizational Cognitive Neuroscience on Managerial
Decision-Making: A Review of Recent Literature and Future
Directions**



Effectivity of Organizational Cognitive Neuroscience on Managerial Decision-Making: A Review of Recent Literature and Future Directions



¹*Brian Mateyo Haketa, ²Dr. Abubaker Qutieshat

¹*Post Graduate Student: Graduate School of Business

²Lecturer, Graduate School of Business

University of Zambia

<https://orcid.org/0000-0002-0719-3007>

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Abstract

Purpose: This article offers a methodology for evaluating OCN research by academics, stressing possible theoretical advances and putting an emphasis on empirical studies for theoretical understanding.

Methodology: The current scope of OCN was examined utilizing a systematic evaluation technique, which indicated three separate groupings of operations in economics, marketing, and organizational behavior.

Findings: Organizational behavior is an oddity since it has more empirical studies. As suggested, the field's many studies approach account for this largely. All three groups contribute to our understanding of how living things make decisions.

Unique Contribution to Theory, Policy and Practice: As per this article, OCN research has bestowed a considerable understanding of the limitations of human freedom in multiple fields and the role of autonomy in shaping work. In addition to the topics proposed by the authors of the examined publications, it also emphasizes newer areas of investigation.

Keywords: *Neuroscience. Business ethics, Organizational Cognitive neuroscience, Decision Making*

1. INTRODUCTION

Biology covers management and organization studies; Hanna et al. (2013) explain that this phenomenon is known as a ‘cognitive revolution,’ which has generated interest in investigating how our thoughts and cognitive functions shape our actions and effectiveness. They contend that “this transformation has largely been limited to guessing what goes on inside the “black box” of executives” (Hannah et al., (2013) and suggest a similar revolution in methodology. Hannah et al. (2013) stated that it is a way of managing and organizing that involves different disciplines and methods. Hannah and her colleagues in 2013 studied neuroimaging. The study delves into numerous techniques and discoveries (Lee et al. 2012; Senior et al. 2011).

Academics are developing neuroscience-based services more slowly than practitioners. This has resulted in academic upheaval (see Nature Neuroscience (July 2004) and The Lancet Neurology (September 2004)). Some individuals in the field have raised concerns about quickly adopting advanced technology such as neuroimaging without sufficient attention to proper procedures (Watts 2014). In this situation, the school group should explore, spread, and evaluate the basic ideas and research results of Organizational Cognitive Neuroscience (OCN). This article gathers recent empirical information to assist in consolidating the OCN field on this subject.

Organizational cognitive neuroscience studies how brain systems generate new hypotheses about organizationally relevant problems (Senior et al. 2011). In their subsequent work, they made this definition bigger without focusing only on the method. This study contributes to organizational and cognitive neuroscience.

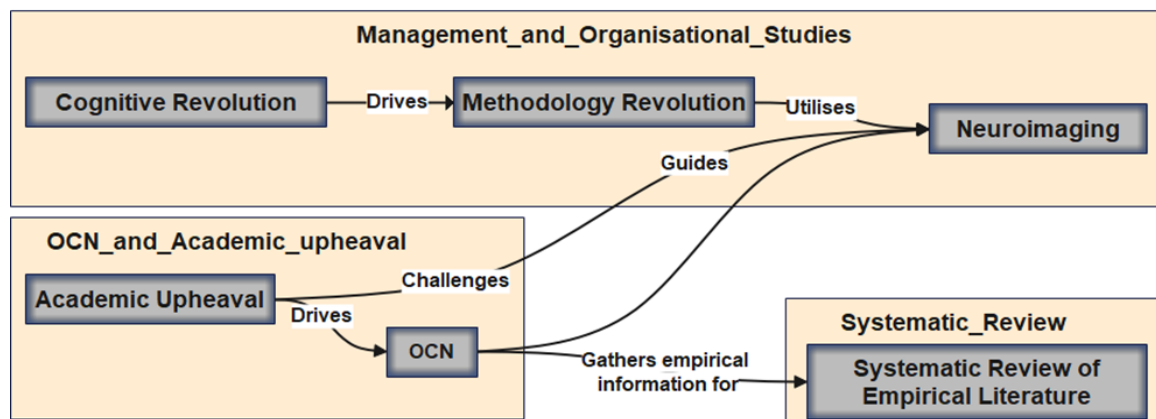


Figure 1: Neuroscience Shifts Network

Figure 1 represents the relationships between the Cognitive Revolution, Methodology Revolution, Neuroimaging, academic upheaval, OCN, and the systematic review of the empirical literature. The figure illustrates the connections between various concepts and sources related to Organizational Cognitive Neuroscience (OCN) and its impact on management and organization studies.

This article discusses the systematic review technique just illustrated in Figure 1. The empirical literature on economics, marketing, and organizational behavior is examined, as shown in Figures 2 and 3, and the overall contributions and future research paths are discussed

2. METHODOLOGY

Transfield et al. (2003) conducted a systematic literature evaluation using specific methods to understand how well OCN research explains human behavior and organizational effectiveness. This method was adopted since OCN (like most new disciplines) lacks paradigmatic consensus. Around 1/3 of the inclusion/exclusion items did not originate from business or psychological database searches. They were found through a snowball process instead.

Two search engines (EBSCO and Thomson ISI Web of Knowledge Social Sciences Division) were used to locate pertinent articles on psychology and management. The researchers only considered publications in English that had undergone peer review. They discovered 657 articles. At first, in the review, they learned about cognitive neuroscience, management, and organizational science as important terms.

They began their study by examining the written material on cognitive neuroscience in management and organizational sciences. They did this by not considering articles that only mentioned cognitive neuroscience in one sentence. They removed articles about management or organization in organizational situations, like how the prefrontal cortex is organized or how neural networks are used for managing wastewater. Amongst a pool of more than one thousand articles, exactly 57 were deemed suitable for the initial phase.

Also, the total became 169 after adding 112 more items. This insured that no vital work would be lost. To prioritize research techniques and findings over speculative ideas, we only considered OCN articles published after 2014 in our search. They did not choose organizational cognitive neuroscience because it is included in other categories.

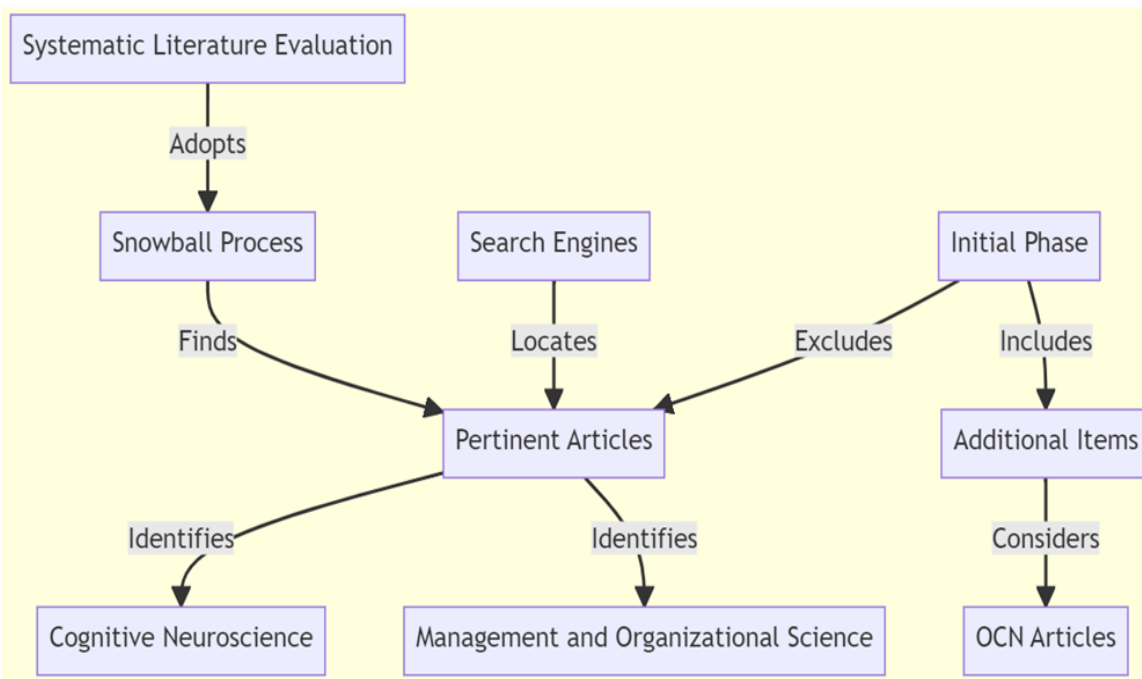


Figure 2: Systematic Literature Evaluation

Figure 2 visually represents the methodology used in the research, highlighting the systematic literature evaluation, the snowball process for finding articles, the use of search engines, the identification of pertinent articles, and the consideration of OCN articles.

A study of 40 scientific and marketing articles revealed an extra article from a special issue of the *Frontiers of Human Neuroscience Journal* titled *Society, Organizations, and the Brain: Heading towards a Unified Cognitive Neuroscience Perspective*. Six different academic papers reinforce the belief. Pynta and others investigated a topic in 2014.

Forty empirical articles were closely analysed and grouped into three clusters. The clusters showcased economics with 15 publications, marketing with 13 papers, and organizational behavior with 12 papers. Neuroeconomics and neuro-marketing are well-known research fields; thus, it is unsurprising that they are combined. They study and classify the forty empirical articles using the OCN literature framework. From 2014 through 2021, OCN research was affected by economics, marketing, and organizational behavior.

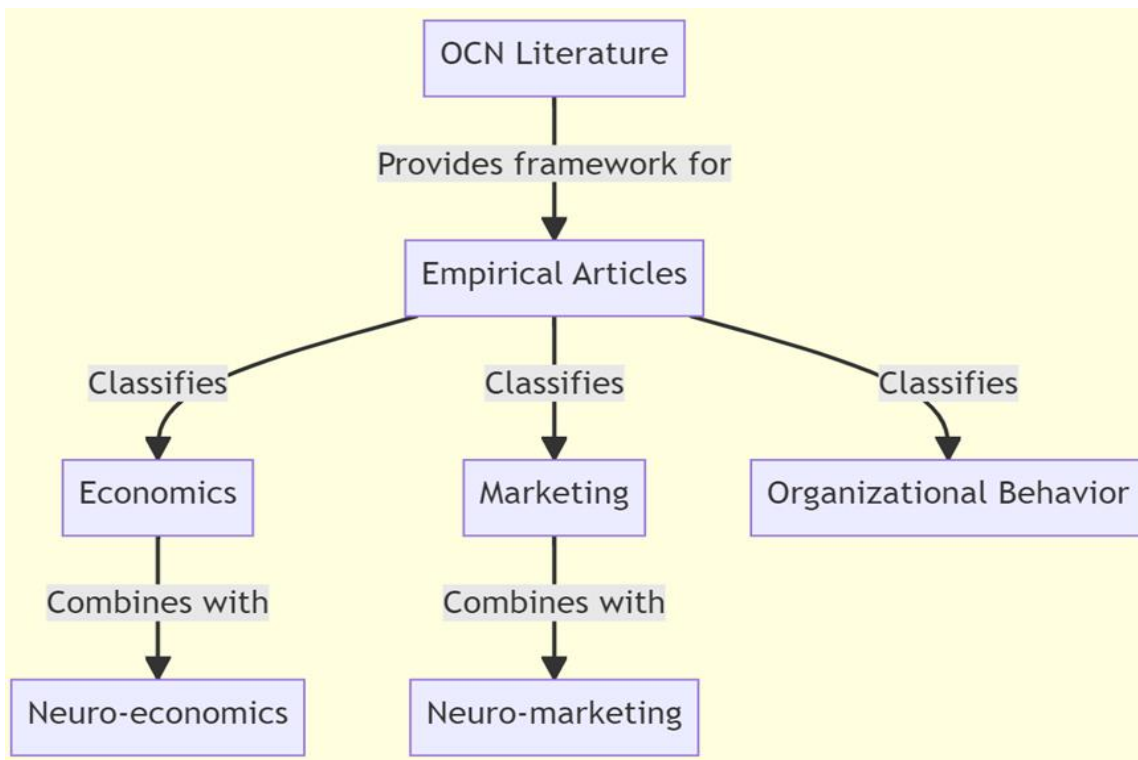


Figure 3: Classification of the Empirical Articles

Figure 3 visually represents the classification of the empirical articles into three clusters: economics, marketing, and organizational behavior. It also shows the connection between these areas and the related neuroeconomics and neuro-marketing research fields. The OCN literature is depicted as the framework used for studying and classifying empirical articles.

Figures 1 and 2 provide a comprehensive visualization of the methodology used in the research, emphasizing the process of finding pertinent articles, the classification of empirical articles, and the connection to related fields within the realm of Organizational Cognitive Neuroscience

3. RESULTS

This section presents the conclusions from our examination of the relevant prior research.

3.1. MAKING ECONOMIC DECISIONS

Researchers have extensively studied biological economics and risk preferences, but little research on how these affect economic decisions (Coates et al., 2009). The assessment recommends exploring two different areas of research, which could provide us with fresh knowledge about how

people make economic decisions. Two experiments were carried out to explore how hormones might influence people's financial decisions involving risk. According to Apicella et al. (2008), males with testosterone levels one standard deviation higher than the mean engaged in 11% additional risky financial gambling. Coates and Herbert (2008) seek to explain bubbles and collapses in the stock market. During a stock market crisis, cortisol enhances risk aversion and intensifies the market's downward trend, while testosterone boosts risk-taking in a bubble economy (Coates and Herbert, 2008).

Table 1: Influence of Hormones on Financial

<i>Study</i>	<i>Hormone</i>	<i>Effect on Risky Financial Gambling</i>
<i>Apicella et al. (2008)</i>	Testosterone	11% increase for males with high testosterone levels
<i>Coates and Herbert (2008)</i>	Cortisol	Enhances risk aversion during stock market crises
<i>Coates and Herbert (2008)</i>	Testosterone	Boosts risk-taking in a bubble economy

Table 1 showcases the effects of hormones on financial decision-making. The study by Apicella et al. (2008) found that males with higher testosterone levels engaged in 11% more risky financial gambling. Coates and Herbert (2008) highlighted the role of cortisol in enhancing risk aversion during stock market crises and testosterone in boosting risk-taking in a bubble economy.

Trust and mistrust engage distinct neural networks and have distinct behavioral impacts. Dimoka (2010) proposes that fMRI can support theories by establishing a connection between trust and mistrust. Most cortical regions that respond to trust tests differ between men and women, with women activating more brain regions. Empathy-mediating neurons can predict gender disparities.

By using neuroimaging, scientists can find parts of the brain that may impact our future choices. Weber and Huettel (2008) discovered that making choices involving risk or time triggers specific responses in the brain. Brain areas in control predicted delayed behavioural results. The inferior frontal gyrus, lateral and ventrolateral prefrontal cortices, and lateral orbitofrontal cortex were

activated by selecting the delayed choice.

Entrepreneurs might use evidence from other fields, like innovation and technology, to decide when to cease mining and explore alternatives. In their study, Laureiro-Martinez et al. (2014) utilized the game to examine how managers and business owners make choices. Compared to managers, entrepreneurs made comparable total payments in a shorter time. By studying the brain, researchers have gained new insights into how people make important economic decisions, which has caused us to question things we previously believed. This literature demonstrates how emotional and social aspects affect financial decision-making via brain mechanisms. It also shows that the same neural pathways are utilized for immediate and delayed decisions.

3.2. MARKETING-RELATED NEUROLOGICAL DECISION RESEARCH

Exploring the physiological details of these aspects can support researchers in examining market-based judgments and advancing the theory of decision-making. The latest experiential models indicate that brands can trigger emotional and physical reactions while being remembered, recalled, and assessed (Esch et al. 2012). According to Schaefer and Rotte (2007), this idea is popular.

Saad and Vongas (2009) suggest that hormone research can bring marketing benefits. Affording a car triggers a competitive endocrinological response. Importantly, they refuted the impact of speeding because the males in the study agreed to adhere to the speed restrictions. Verbeke and colleagues carried out a study in 2014 to look into how attachment types and dopamine affect salespeople. Goal-directed, motivating, and reward-related activities may benefit from avoidant attachment types. The challenge of ensuring both client safety and meeting their needs can contribute to improving our skills and achieving success.

Table 2: Neural Responses in Marketing Decision-Making

<i>Study</i>	<i>Brain Regions Activated</i>
<i>Schaefer and Rotte (2007)</i>	Emotional and memory-related regions
<i>Bakalash and Riemer (2013)</i>	Amygdala (activated by memorable ads)
<i>Knutson et al. (2007)</i>	Insula (activated by compliments), medial prefrontal cortex (less active)

The table above highlights the neural response in making a marketing decision. Studies by Schaefer and Rotte (2007) suggest that brain areas associated with emotional memory are activated. Backlash and Reamer (2013) found that remembering ads activated the amygdala more than forgetting ads. Knutson et al. (2007) demonstrated activation of the insula by praise and decreased activation in the medial major cortex during purchase choices.

OCN extensively uses neuroimaging in their marketing studies to discover market-related brain substrates, overlooking the potential benefits of hormone-focused research. In 2013, Bakalash and Riemer mentioned that socio-cognitive emotional memory has not received enough attention. The researchers found that memorable ads activate the amygdala more than forgettable ones. By fostering social involvement, broadcasters may enhance viewer loyalty and brand recognition. It looks like preference is a blend of what you prefer and the cost. Knutson et al. (2007) said that people might gain and lose money when making buying choices. Their research demonstrates that brain patterns can predict purchase decisions. If someone gives us many compliments, it makes the insula active and makes the medial prefrontal cortex less active.

3.3. NEUROLOGY OF ORGANISATIONAL DECISION MAKING

The OCN uses hormonal and neuroimaging techniques less often than earlier clusters. Various techniques indicate that exploring organizational hierarchy is a valuable topic for research. OCN uses different subjects and ideas. In 2009, Zyphur et al. conducted a study to compare testosterone and status using salivary testosterone. A greater disparity between testosterone levels and social status leads to decreased effectiveness within the group. Lately, management has been researching the biological foundation of behavior.

Neuroimaging studies have pinpointed the location of past and present decision-making processes in the brain. Using fMRI, the recollections of resonant and dissonant leaders were compared by Boyatsis et al. (2012). Remembering unfamiliar leaders triggered avoidance, limited focus, diminished sympathy, and unpleasant feelings (e.g., right anterior cingulate cortex).

The research by Woolly et al. in 2007 explores how groups currently make decisions. The investigators analyse the collaboration between team members and how it contributes to forming strong teams. Having the right skill sets makes collaboration unnecessary and does not make people perform better. Confirmation bias was examined by Woolley et al. (2007) in their research on virtual teams and collaboration technology. A relationship between self-complexity and

adaptive decision-making among military leaders was uncovered by Hannah and Hannah (2013).

The EEG of civilian and military leaders was examined by Balthazard et al. in 2012. Their findings identify frontal brain regions related to planning, anticipation, and emotional regulation. According to Balthazard et al. (2012), neuroscientific testing could help choose and position company leaders. Nevertheless, these ways can bring up moral worries.

The evolutionary theory discusses leadership's biological aspects. Companies led by male CEOs with larger faces relative to their height seem to perform better. According to Spisak et al. (2012), followers favour leaders with pertinent facial features. The correlation between facial measurements of CEOs and business performance is more significant in decision-making teams that follow strict guidelines.

Measuring asymmetry involves looking at the body's right and left sides. Other novel strategies use developmental stability, the capacity to tolerate environmental or genetic challenges during development. In 2012, Senior and his colleagues explored whether how leaders behave can make a difference in how their group performs.

Table 3: Neural Responses in Marketing Decision-Making

<i>Study</i>	<i>Brain Regions Activated</i>
<i>Boyatsis et al. (2012)</i>	Right anterior cingulate cortex
<i>Woolly et al. (2007)</i>	Collaboration-related brain regions
<i>Hannah and Hannah (2013)</i>	Self-complexity and adaptive decision-making
<i>Balthazard et al. (2012)</i>	Frontal brain regions related to planning
<i>Spisak et al. (2012)</i>	Facial recognition-related brain regions
<i>Senior et al. (2012)</i>	Asymmetry and developmental stability

Table 3 summarises the neuroscience of organizational choice-making primarily based on the information; that is in addition to the study with the aid of Boyatsis et al. (2012) on the consequences of resonant and imperfect leadership, Woolly et al. (2007) investigating crew decision-making and performance, Hannah and Hannah (2013) studying the relationship between

self-efficacy and adaptive decision-making, Balthazard et al. (2012) inspecting mind regions related to making plans and emotional law, Spisak et al. (2012) take a look at the relationship between face measures and CEO business performance, and Senior et al. (2012) discover heterogeneity and developmental stability in management.

Tables 1, 2 and 3 visually represent the relevant information about hormones' influence on financial decision-making and the neural responses in marketing decision-making, as mentioned in the given data.

4. DISCUSSION

Cognitive neuroscience in companies is facing a major decision point. Healey and Hodgkinson (2014) describe a new subfield of studying brain mechanisms as the main drivers of organizational behavior. Some other scientists warn that using neurology in management and organization studies is a risky distraction (Lindebaum 2013; McLagan 2013). According to Foxall (2014), solving problems with concepts is stressed as significant in OCN. This work was done to carefully evaluate OCN research by examining present scientific studies and their methodological flaws.

OCN's approach to management and organization research shifted in the mid-2000s. Back in the days before 2007, distinct parts were devoted to strategy, finances, marketing economics and organizational psychology. The estate was divided into three poles after 2007. It is crucial to spread OCN concepts because economic and marketing clusters work well together; this might be because neuroeconomics and neuromarketing have progressed more than neuroimaging techniques. The marketing employees implement modern methods such as EEG.

This topic has expanded due to the methodological agnosticism of OCN articles (Senior et al. 2011). The researchers needed additional time to modify neuroscience methods for studying organizational behavior. OCN research in management and organizational sciences demonstrates human sociability (Saad and Vongas 2009). Developing decision and choice prediction models can be advanced through OCN's research. This information assists researchers and practitioners in comprehending the molecular mechanisms underlying decision-making. According to Dimoka (2010), fMRI has the greatest possibility to confirm ideas like trust and distrust. Knutson et al. (2007) propose that purchasing decisions may be related to projected gains and losses, in addition to profit, and that certain brain activation patterns predict purchase. According to the brain, liking something is good, while paying a high price is not so good. However, marketers consider past events, current situations, and future possibilities when they decide on things.

OCN research has collaborated with different fields of neuroscience to illustrate how free humans are. OCN investigates the dividing line between self-determination and predetermination (determinism). System One processes thoughts with speed, automatically and unconsciously, relying on emotions. System 2 is slower, more conscious, explicit, and logical.

Numerous publications examine personal autonomy in management and organizations. Tabibnia et al. (2008) discovered that accepting fair offers involved emotional control linked with negative affect, but accepting unfair offers resulted in greater happiness ratings. For example, how people respond favorably to popular symbols (Mason et al., 2009) and how pricing might boost subjective estimates of agreeableness (Plassmann et al., 2008).

Just like in economics and marketing, organizational behavior studies similar things. Memories of resonant and dissonant leaders facilitate the investigation of emotions and decision-making (Boyatzis et al. 2012). Many other evolutionary topics (including autonomy) are investigated. Economics, marketing, and organisational behavior require further fundamental research. The difficulties of empirical collaboration inside the OCN are most likely an indication of scarcity. By studying management and organizations, you can learn about OCN.

The outcome of cognitive neuroscience in organizations is unknown. On one extreme, advocates call for a new biologically-rooted subfield that maps neural mechanisms as the prime causes of organisational behavior. Scholars say applying neurology to MOS is a distraction. OCN's spread maintains consistent economic and marketing clusters. Neuroeconomics and neuromarketing have developed with neuroimaging. The marketing cluster is using new methods (EEG and SST).

OCN research reveals human sociability in management and organization; this helps academics and practitioners understand decision-biological making's mechanisms. By doing OCN research, decision-making models might get improved. OCN studies self-determination and predetermination (determinism). Much research on decision-making is rational. OCN research has revealed human freedom limits. Evolution affects the choices and actions we make today.

Economics, marketing, and organisational behavior require basic research. The difficulty of empirical collaboration in OCN suggested scarcity. The field of management and organization studies utilizes the term OCN. OCN research could help understand the biological components, mechanisms, and decision-making outcomes. OCN research can help build choice models and policy and management frameworks.

Using OCN research findings responsibly is essential for ethical management practices; this is crucial as OCN use grows. In order to understand defendants' mental capabilities better, lawyers sometimes request brain scans that can give useful insights for jurors when deciding on punishments. Balthazard et al. (2012) acknowledge OCN knowledge is not applicable here but propose a neurologically-based assessment of leader behavior. Lindebaum and Zundel (2013) discuss neuroscientific approaches that analyse basic organisational mechanisms.

5. Recommendation the Future

The article recommends more diverse study methodologies are needed for, especially when examining the effects of hormone levels on behavior and neuroimaging. It implies that more methodological variety in the study of organizational behavior is conceivable. Additionally, it urges a more moral application of OCN research to organizational management.

Although practice-based organizations currently help neuromarketing scientists and consultants professionally, more is required to prevent damaging practical implementations. In addition to addressing management and organizational growth, the analysis raises the prospect of evaluating leader conduct using a neurological framework.

6 Conclusion

The study concludes that reductionism or neuroscientific techniques need to be disregarded if leadership studies are to improve. As human neurology's boundary is crossed in the context of management and organizations, organisational cognitive neuroscience offers new study prospects. We used empirical studies to review the state of OCN research in this work. OCN has methodological disagreements and concerns, which we acknowledge. All three OCN clusters reveal human freedom to act. With this knowledge, we can improve our decision-making and work self-determination.

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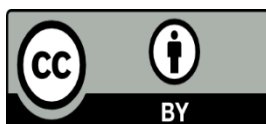
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