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Research Article

Mapping Neuromarketing in India: A Bibliometric and Network Analysis of Research Trends, Drivers, and Implementation Challenges

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Abstract: The potential for neuromarketing to revolutionize consumer insights and marketing strategies has led to its increasing popularity as a multidisciplinary field that blends marketing and neuroscience. This paper explores the multitude of factors that influence the use of neuromarketing in India, a fast-growing market with unique cultural, economic, and regulatory contexts. This review article's goal is to look into the various factors that affect neuromarketing's use in India. The field of neuromarketing makes use of techniques and ideas from neuroscience to understand consumer behavior. In addition, the study synthesizes the body of current literature and empirical research to identify the key elements that are encouraging and hindering the use of neuromarketing by Indian enterprises. Technological infrastructure, legal and regulatory frameworks, moral issues, cultural quirks, and organizational preparedness are all important concerns. A study that uses mapping to analyze research on neuromarketing in India finds important themes, patterns, and connections between different factors by using methods like co-citation analysis, co-word analysis, and network analysis. A thorough bibliometric analysis, which provides information on a wide range of issues and publication trends, can address this problem. This review summarizes the existing literature, identifies areas that require additional research, and proposes strategic applications of neuromarketing strategies that are suitable for the Indian market.

Keywords: Neuromarketing, Bibliometric Mapping, Consumer Neuroscience, VOS viewer, Co-citation Analysis, Network Visualization.

INTRODUCTION

Neuromarketing is a discipline that adds value to marketing research and guides businesses in harnessing the benefits of marketing. Research-based development of neuromarketing helps increase quality and better understand customers. This study provides insight into the use of neuromarketing in online retail advertising. This study will allow researchers to expand research on the impact of neuromarketing on consumer sentiment. The study of how consumers respond to marketing stimuli using their senses, cognition, and emotions forms the foundation of the field. The area of marketing that focuses on how the brain reacts to marketing tactics is called neuromarketing. Utilizing neuroscience technology, neuromarketing investigates, studies, and comprehends how customers' unconscious behavior reacts to research on marketing and advertising (V. Venkatraman et al., 2015; A.H. Alsharif et al., 2022). To comprehend and affect customer behavior, the multidisciplinary area of neuromarketing combines concepts from neurology and marketing. Neuromarketing studies how the brain reacts to stimuli related to marketing to understand the fundamental processes that influence consumer behaviors such as brand loyalty and purchase decisions. Neuromarketing measurements include a person's memory encoding, their sensory approach to a product, how their emotions react to a product or service, consumer preference for a brand, and how frequently they can recall it. Ale Smidts, a professor at the University of Erasmus in Rotterdam, coined the term "neuromarketing" to refer to the application of neuroimaging techniques to market research (Roebuck, 2011). According to Cacioppo and Bertson (2005), Bright House America was the first corporation to use the term "neuromarketing" in the literature. Professor Read Montague of Baylor College of Medicine in Houston, Texas, published "Cola Brains," one of the most widely cited studies on the use of neuromarketing, when it was first published in 2004 (McClure et al., 2004; Pispers & Dabrowski, 2011). To evaluate and comprehend customer behavior toward marketing tactics like advertising, researchers and marketers have mostly relied on conventional marketing techniques, such as self-report assessments (G. Vecchiato et al., 2016). This assertion is true even though conventional marketing techniques are unable to yield accurate, valid, and broadly applicable data regarding the unconscious behavior of consumers, such as their decision-making and emotional states (L. Alvino et al., 2020).

The ultimate objective of neuromarketing, according to Witchalls C. Witchalls (2023), is to locate a "buy button" in the brain that can be targeted and activated by future advertisements. Over the past ten years, there has been a sharp increase in interest in the phrase "neuromarketing" (P. Lina et al., 2022). As a result, academics and industry

professionals are genuinely interested in neuromarketing as a means of obtaining more precise data regarding consumers' unconscious reactions to marketing stimuli, such as their emotions, attitudes, preferences, and motivation (N. Verhulst et al., 2020; N. Hamelin et al., 2017). To name a few, many academics believe that neuromarketing strategies are advantageous to businesses and customers alike. According to these authors, consumers would gain from the creation of products and campaigns that suit their needs, and for organizations, it would lead to the saving of vast resources spent on inefficient and ineffective campaigns, ensuring greater competitiveness and improvements to customers (Morin, 2011; Dinu & Tanase, 2010). Neurom2010). G integrates tools and insights from neuroscience, psychology, and marketing to explore how consumers truly feel, think, and act in response to marketing stimuli. Unlike conventional research approaches, neuromarketing techniques—such as EEG (electroencephalography), fMRI (functional magnetic resonance imaging), and eye-tracking—offer a more objective glimpse into the decision-making processes of consumers by monitoring real-time physiological and neurological responses (Kawala-Sterniuk et al., 2021; Rawnaque et al., 2020).

The demand for neuromarketing research has increased over the past few years among advertising and brand promotion companies. The discipline's biggest advantage is that it can potentially reveal hidden information by peering into consumers' minds; however, critics argue that marketers exploit it to deceive consumers for their own gain (Perrachione, 2008), and Akin & Sututemix (2014) argue that neuromarketing is unethical because it reveals consumer emotions that influence purchasing decisions. To put it briefly, neuromarketing is the academic use of neuroscience to research and comprehend how customers' brains and bodies react to marketing stimuli like television commercials. These responses include decision-making, emotions, attention, and memory. Recent systematic reviews show that research in this field has accelerated significantly, especially after 2017, driven by technological advancements and an increasing demand for personalized marketing strategies (Zhu et al., 2022; Archana & Mahajan, 2023). This surge is also reflected in the rising number of publications in high-impact journals such as *Frontiers in Psychology* and the *Journal of Consumer Behaviour*. The behaviorization and elucidation of the research trends found in the scientific literature are essential given the complexity of the area and the vast range of potential research methodologies. While there has been a global surge in neuromarketing research over the past ten years, there are still very few and limited studies in India. Since the concept and applications of neuromarketing research are still relatively new in the Indian context, there are, in fact, still very few and restricted uses of this study in this country.

This review fills a gap in the literature by conducting an in depth study of the use of neuromarketing in India and inve stigating the factors influencing the use of neuromarketing in India.

His study leads to a moreprofound understanding of the li mitations and problems of neuromarketing and can inform the improvement and development of new theories and m odels in practice.

The disadvantage is that neuromarketing research in India is scarce and limited. This review explores the challenges and limitations faced in implementing neuromarketing in India. More importantly, it can help improve the application and use of neuromarketing techniques by guiding practitioners and decision-makers on how to overcome limitations and barriers. The findings can lead to the effective and efficient use of neuromarketing in marketing research and decision-making. In addition, the management of organizations will benefit from the results of this study and they will be able to make and develop the necessary arrangements to improve the application of neuromarketing.

The data analysis results indicate that there are 12 journals that publish significant papers in the field of neuromarketing. This study primarily gathered 110 references based on information gathered by the Web of Science (WOS) and used CiteSpace to examine the most productive nations, universities, authors, journals, and prolific publications in the field of neuromarketing. This work investigated the mapping of co-citation, bibliographic coupling (BC), and co-occurrence (CC) through the examination of knowledge maps. Additionally, we employed the most robust citation bursts to examine popular research across various time periods and evaluate the patterns in neuromarketing research instruments and methodologies. Researchers can better grasp global patterns and future research directions by utilizing the overview of neuromarketing trends and trajectories provided by this study.

THE SIGNIFICANCE OF NEUROMARKETING

The goal of the area of neuromarketing is to better understand how customers subconsciously respond to brands, products, and commercials by fusing neuroscience with marketing. Its importance stems from its capacity to offer more profound understandings of consumer behavior than conventional marketing research techniques. By probing the subconscious, neuromarketing can uncover preferences and reasons that customers might not be able to express. Using insights from neuromarketing, brand experiences can be developed that create strong emotional ties and loyalty. Understanding the emotional triggers that boost brand affinity can help businesses build stronger, more enduring customer relationships.

Participants' prejudices or the need to give socially acceptable answers might have an impact on traditional market research methodologies like surveys and focus groups. Also Market research can be enhanced and expand by studying the cognitive and affective aspects of consumers through neuromarketing approach by using invasive brain-computer interfaces and tracking physiological responses (Kawala-Sterniuk et al., Citation2021). One way that neuromarketing can influence

product design is by identifying the attributes or designs that generate favorable emotional reactions. Similarly, it may improve product placement on shelves or digital platforms by understanding how visual attention and decision-making processes work. Companies can use neuromarketing to enhance the overall customer experience. By better understanding how customers interact with various touchpoints, businesses can design customer journeys that are more satisfying and easier to use. While neuromarketing offers practical benefits, it also raises ethical questions regarding consumer privacy and manipulation.

It is imperative for companies to appropriately handle these problems by guaranteeing transparency and consent in their research procedures. Businesses that have employed neuromarketing research services to learn what consumers think about their ads or goods include Google, CBS, Frito-Lay, and A&E Television. The term "neuromarketing" was coined in 2002 by Ale Smidts (Nyoni and Bonga, 2017). In the 1990s, Prof. Gerald Zaltman of Harvard Business School and Dr. Gemma Calvert of Neurosense Ltd. founded enterprises engaged in neuromarketing (Levallois et al., 2019). White papers on the possible uses of neuromarketing have also been released by Unilever's Consumer Research Exploratory Fund (CREF) (Salati et al., 2018).

In summary, by utilizing the subconscious mind, neuromarketing greatly expands our understanding of customer behavior. According to S. J. Stanton, W. Sinnott-Armstrong, and S. A. Huettel (2017), this enables marketers to develop more successful campaigns, optimize product offers, boost brand loyalty, and improve the general consumer experience. All of these things lead to improved commercial outcomes. Because neuromarketing has the capacity to uncover hidden information about customer behavior and identify implicit and automatic processes that influence consumer decision-making, it has a tremendous impact on businesses and society. Traditional approaches could not do this (Tusche et al., 2010). Gaining a comprehensive knowledge of human mental behavior is an ongoing quest. The social and biological sciences now work in harmony as a result of this. The social, behavioral, physiological, and management sciences have made substantial strides in a number of areas thanks to the cooperative research efforts of natural and social scientists. The biological and social sciences began to work together more effectively as a result of the information. The social, behavioral, physiological, and management sciences have made substantial strides in a number of areas thanks to the cooperative research efforts of natural and social scientists. Both individual choices and the brain mechanisms behind such choices are taken into consideration by the theoretical insights about human decision-making that neuroeconomics and decision neuroscience have contributed (Shiv & Yoon, 2012). However, despite its potential, the field is not without its criticisms. Concerns about ethics, privacy, and data transparency continue to loom large. For instance, the invasive nature of some tools like fMRI and the potential for consumer manipulation have sparked debates about the ethical boundaries of neuromarketing (Stanton et al., 2017; Goncalves et al., 2024).

MATERIALS AND METHODS

Databases like Web of Science (WoS) and Scopus were used in a bibliometric approach. Citespace and VOSviewer were among the tools used to:

- Co-citation analysis (to find conceptual clusters and influential literature)
- Co-occurrence of keywords (to investigate thematic trends)
- Network analysis (to show the ways in which nations, authors, and institutions collaborate)

This paper employs bibliometric analysis to map and assess the academic landscape of neuromarketing in a systematic manner, with a focus on India. Bibliometric methods such as co-citation, co-word, and network analysis help to find key trends, important publications, famous authors, and main topics in the literature, due to the field's mix of different disciplines and growing complexity. With this method, researchers can see the structure of neuromarketing knowledge, comprehend how it has evolved over time, and identify gaps in the Indian research environment. Ultimately, the bibliometric analysis serves as a key tool to guide more research and the strategic use of neuromarketing techniques tailored to the specific market conditions in India. The paper focuses on central concepts such as "Neuromarketing," "Bibliometric Mapping," "Neurophysiological measure," "Consumer Neuroscience," and "VOSviewer." These keywords are chosen because they directly represent the core themes and methodologies of the study. They capture the essence of both the phenomenon being investigated (neuromarketing and its impact on consumer behavior) and the analytical approaches used (bibliometric mapping and co-occurrence techniques).

Bibliometric Analysis

The twenty-four documents from the Scopus database that are listed in Table 1 have been examined and analyzed. Table shows that the USA, Spain, Italy, the UK, and Germany published over half of all the publications, indicating that these nations are important contributors to the advancement of NM research. As we can see from Table 1, with nearly seventy-seven publications published, including four by Emory University, the USA is the leading generating nation in the NM area. With 48 papers, Spain is regarded as the second-most productive nation. Italy, the United Kingdom, and Germany came next with thirty-eight, thirty-three, and thirty papers each.

Table 1: Top production countries and Institutions in Neuromarketing.

Country	TP	Institution	TPi
USA	77	Emory University	04

Spain	48	Universidade da Coruna	07
Italy	39	Universita degli Studi di Roma La Sapienza	24
UK	34	University of Oxford	06
Germany	31	Zeppelin University	04
China	26	Zhejiang University	09
Japan	21	Toyama Prefectural University	04
Turkey	17	Galatasaray University	03

Leading Authors

Table 2 illustrates our findings that the ten most productive authors in the NM topic were associated with three different nations Italy, the UK, and China. 107 documents were published by these authors in total. In addition, with a total of 22, 17, 10, and 9 papers, 508, 383, 147, and 297 citations, respectively, the four most productive authors on the list are Babiloni, F., Vecchiato, G., Cherubino, P., and Astolfi, L., from Italy. The fifth most productive author is Lee, N., from the UK, who has published nine papers, four hundred and seventy-three citations, and seven h-indexes since 2007. Surprisingly, with 226 citations and an 8-h-index, Toppi, J., is the least productive author in the top ten list.

Table 2: Top authors on Neuromarketing Research Publications

Author Name	FP	TP	TC	H-index	Institution
Babiloni, F., Italy	2008	22	508	10	University degli study the Roma La Sapienza,
Vecchiato, G,	2010	17	383	08	Consiglio Nazionale delle Research, Italy
Cherubino, P. Italy	2011	10	147	06	University degli study the Roma La Sapienza,
Astolfi, L. Italy	2008	09	297	06	University degli study the Roma La Sapienza,
Lee, N.	2007	09	473	07	Warwick Business School , UK
Cincotti, F. Italy	2008	08	283	05	University degli study the Roma La Sapienza,
Ma, Q.	2007	08	145	06	Ningbo University, China
Maglione, A. G. Italy	2011	08	152	05	University degli study the Roma La Sapienza,
Mattia, D.	2008	08	283	05	IRCCS Fondazione Santa Lucia, Italy
Toppi, J. Italy	2010	08	226	05	University degli study the Roma La Sapienza,

Keywords analysis

The keyword analysis revealed that researchers in neuromarketing are primarily focused on two main themes: the technical aspects of brain measurement and the psychological factors influencing consumer behavior. In plain language, the analysis showed that keywords such as “EEG,” “fMRI,” and “neuroimaging” form one cluster, highlighting the importance of advanced brain scanning tools in understanding how the brain reacts to marketing stimuli. On the other hand, keywords like “consumer behavior,” “emotion,” “decision-making,” and “advertising” cluster together, indicating that a significant part of the research is devoted to studying how consumers feel and think when they interact with brands and products. In simple terms, the findings suggest that neuromarketing research is all about using modern technology to peek into the brain’s responses and connecting those insights directly to why and how people choose certain products over others. This blended focus on technology and psychology points to a growing interest in uncovering the subconscious drivers of consumer actions, ultimately aiming to create more effective and personalized marketing strategies.

Keyword analysis is a useful quantitative technique that has been widely utilized recently to look into particular topics in marketing, assuming that keywords provide a logical explanation of the documents' content (Alsharif, Salleh, Baharun, Hashem, et al., 2021; Wang & Chai, 2018). The link strength of a pair of keywords indicates how frequently they occur in the same article. The total number of these linkages indicates the total number of times these two keywords occur together. The four analysis methods utilized in bibliometrics are burst word monitoring, co-word cluster, co-word frequency, and co-word association. Importantly, co-word analysis examines keywords that occur together. A numerical value is used to describe the link between two terms; the higher the number, the stronger the correlation (Goyal & Kumar, 2021; Ravikumar et al., 2015; Saha et al., 2020). The minimum number of times a keyword might show up in VOSviewer was determined to be five. Accordingly, terms that appear together two or more times in a paper will be displayed on the bibliometric map. As seen in Figure 3, only forty-three of the terms that were input into VOSviewer to map the literature with at least five occurrences matched the thesaurus. Because it is a practical method for addressing research trends on a particular topic by looking at previously published papers, including those in the marketing business, co-occurrence analysis is usually employed by academics (Wang & Chai, 2018; Alsharif, Salleh, & Baharun, 2020; Khudzari et al., 2018).

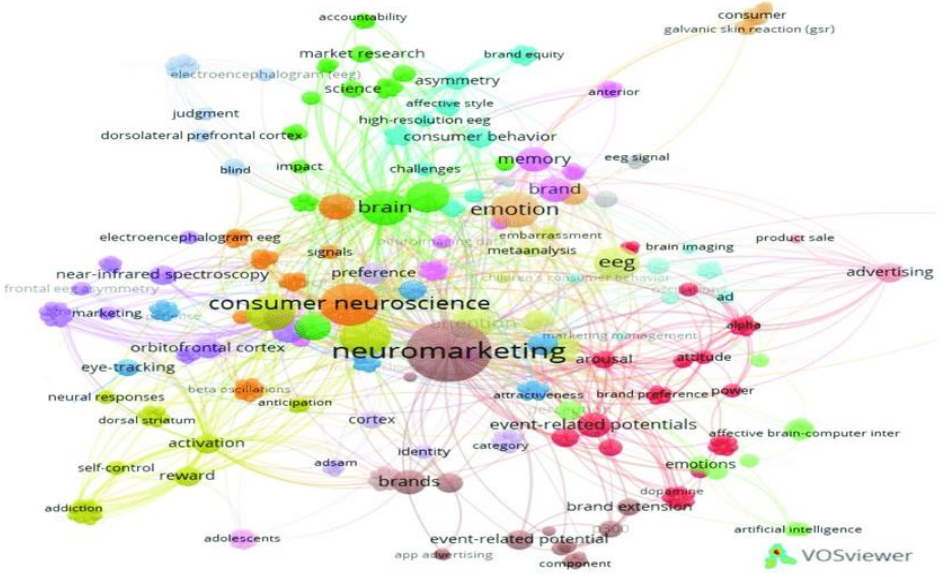

Figure 1: Keyword analysis of Factors affecting Neuromarketing

By tracking physiological changes and brain activity, the field of neuromarketing—which blends marketing and neuroscience—aims to gain a deeper understanding of customer behavior. Numerous factors impact the effectiveness of neuromarketing. In neuromarketing, a few crucial elements should be examined. Emotional responses have a significant impact on consumer behavior decision-making. Brands employ emotional cues to create memorable experiences. It is crucial to get customers to pay attention. One method for determining where customers' eyes are directed is eye tracking. Customer memory and brand loyalty can be impacted by marketing messaging that is memorable (H.Plassmann et al., 2012). According to M. Reimann et al. (2010), neuromarketing exploits biases including confirmation bias and the anchoring effect that affect consumer choices. The use of sound, smell, and sight in sensory marketing can influence how consumers perceive a brand or product. Understanding the needs, ambitions, and objectives that motivate customers allows one to better customize marketing strategies (D. Ariely, & G. S. Berns, 2010). Techniques like fMRI and EEG are used to assess brain activity in order to ascertain how consumers react to marketing stimuli (A. Dimoka, et al., 2011). These indicators display emotional reactivity and stress levels in response to marketing messages. Analyzing microexpressions can help one comprehend real emotional reactions (R. Ohme, et al., 2009). determines the location and duration of a person's gaze over multiple areas of a visual scene. uses facial coding, heart rate, and skin conductance to gauge emotional responses. Two methods for studying how the brain responds to marketing stimuli include EEG and fMRI (G. Vecchiato, et al., 2011). Handling sensitive data, like brain scans and individual reactions, requires strict ethical guidelines. The thin line separating influencing and regulating customer behavior raises ethical questions. Brands must be transparent about their use of neuromarketing data in order to avoid losing customers' trust (D. Ariely & G. S. Berns, 2010). Customers' cultural background influences how they respond to marketing messages. Peer pressure, social proof, and group dynamics can all significantly impact consumer choices. Both personal beliefs and social norms influence the decisions and actions of consumers (C. Morin, 2011). By using neuromarketing data to tailor marketing campaigns to individual preferences, effectiveness can be raised. The expansion of digital platforms has created new opportunities for real-time neuromarketing analysis. Artificial intelligence (AI) has the potential to evaluate vast amounts of neuromarketing data, providing deeper insights and predictive capabilities (N. Lee et al., 2007). When combined, these components improve our understanding of and proficiency with neuromarketing, enabling businesses to create more effective and client-focused advertising campaigns.

Co-citation network analysis and data clustering

Nineteen publications with at least eighty citations are the initial findings. VOSviewer created an incomprehensible random cluster map in order to display the co-citation map. As a result, we determined the top ten documents using the methods that Kumar and Ranjani (2018) suggested, which allowed us to select the top 10 papers from each cluster. In order to tackle the scope's intellectual growth, a co-citation network analysis has been implemented.

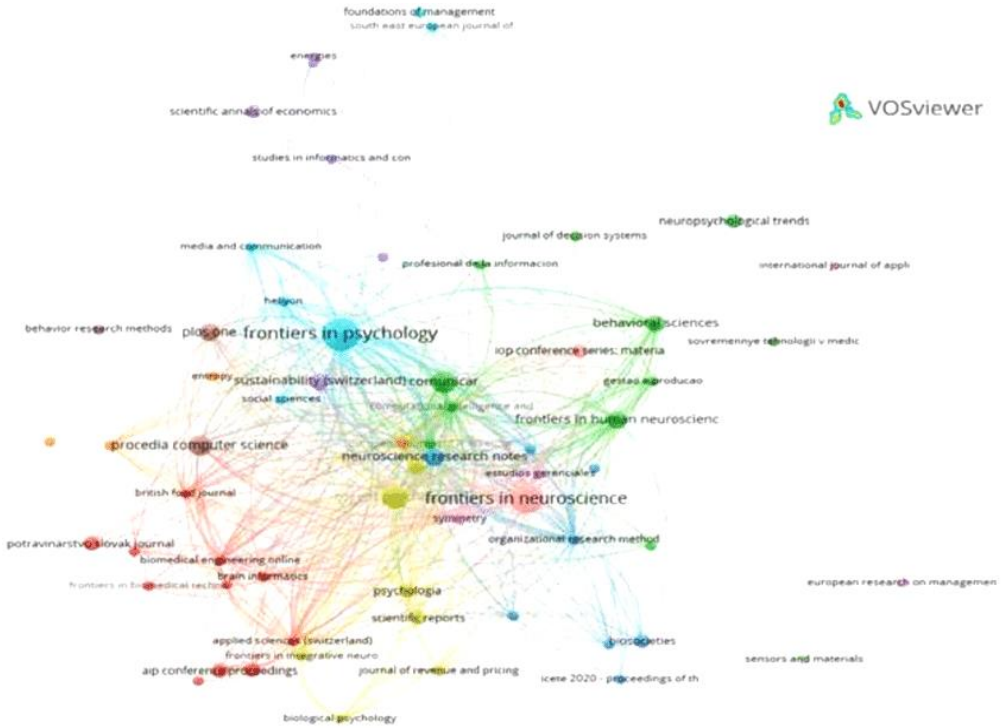

Figure 2: Map of Sources That Published Research on Neuromarketing

The **first and largest cluster**, represented in red and led by **C. Morin (2011)**, includes works that lay the conceptual groundwork for neuromarketing. These papers discuss the basic principles of applying neuroscience to marketing, how consumer behavior is influenced at a subconscious level, and why traditional self-report methods fall short. This foundational body of work is crucial for understanding the field's core purpose and justifies the shift toward more scientifically grounded consumer research.

The **second cluster**, shown in green and led by **Ariely and Berns (2010)**, focuses on the **ethical dimensions** of neuromarketing. These scholars question the potential misuse of neuromarketing technologies, such as manipulating consumers by accessing their subconscious thoughts or infringing on their privacy. The literature in this cluster urges a more cautious and reflective approach, highlighting the need for regulatory frameworks and ethical guidelines. This group contributes to shaping responsible neuromarketing practices, which are especially important in emerging markets like India, where legal and moral frameworks are still evolving in this space.

The **third cluster**, marked in blue and influenced by **Reimann et al. (2010)**, delves into the **emotional and sensory responses** of consumers. These studies explore how visual aesthetics, product design, and emotional appeal influence consumer decision-making at a neurological level. The insights from this cluster have practical applications in advertising, branding, and packaging, helping companies design stimuli that resonate more deeply with target audiences.

The **fourth cluster**, in yellow and dominated by **Nick Lee et al. (2017)**, focuses on **technological and methodological advancements** in the field. This includes the use of tools like EEG (electroencephalography), fMRI (functional magnetic resonance imaging), eye tracking, and facial expression analysis. The works in this group emphasize the importance of methodological rigor, data interpretation challenges, and the integration of neuroscience into marketing research. It reflects the technological backbone of neuromarketing and outlines how scientific tools can be applied in real-world business contexts. Although each cluster focuses on a different dimension—conceptual foundations, ethical concerns, emotional processing, and technological methods—they are all closely linked. Together, they provide a comprehensive understanding of neuromarketing as a multifaceted field that blends theory, practice, ethics, and innovation. Notably, the Indian research landscape has yet to make significant contributions to any of these clusters, indicating a gap in local engagement with global neuromarketing discourse. This also presents an opportunity for Indian researchers to localize these frameworks, address culturally specific challenges, and expand the intellectual boundaries of neuromarketing in the Indian context.

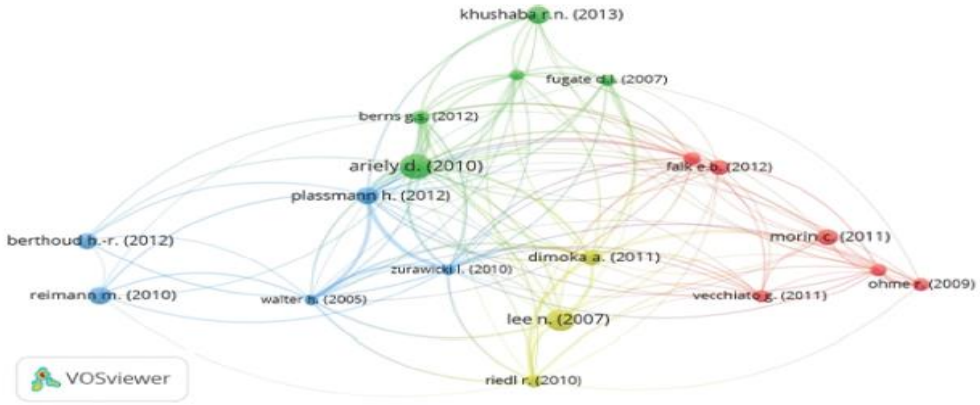

Figure 3: Co-citation network analysis of Neuromarketing

Limitations and Challenges with Neuromarketing

Three primary fields are involved in the hybrid field of neuromarketing: marketing, psychology, and neuroscience (A.A. Mansor and S.M. Isa, 2020; A. Javor et al., 2013). Despite its creative promise, neuromarketing—which combines neuroscience and marketing to understand consumer behavior—presents a number of obstacles and constraints. The expense and complexity of acquiring the required knowledge and technology provide one of the main obstacles. Essential tools for neuromarketing and neuroimaging techniques such as fMRI and EEG are costly to use and maintain, and proper data interpretation requires specialist understanding. Due to its expensive cost, few well-funded groups are able to access it, which inhibits experimentation and wider applicability. In order to meet customer wants, boost stock value, and boost earnings, businesses aim to discover innovative ways to comprehend what's on consumers' minds (P. Cherubino et al., 2019). Furthermore, using neuromarketing raises ethical questions, especially in relation to customer autonomy and privacy. The capacity to see into the subconscious wants and preferences of customers raises concerns regarding consent and manipulation. There's a fine line between being aware of what customers need and taking advantage of their psychological weaknesses, which can result in deceptive tactics that erode their confidence.

Significant methodological limitations accompany ethical concerns. Many times, the conclusions drawn from neuromarketing research lack ecological validity. The real world is not always replicated in laboratory settings or artificial stimuli, which makes it challenging to extrapolate findings to genuine consumer behavior in natural situations. Furthermore, there is a risk of oversimplification when interpreting brain data due to its inherent complexity. The brain's reactions do not always serve as clear-cut markers of certain ideas or emotions, which might cause errors in interpretation and an overestimation of the correctness of the data. Thus, corporations are using neuroscience tools (fMRI and EEG) in their studies to better understand consumers' unconscious behavior as a result of technological advancements in these technologies (H.A. Ahmed et al., 2022). "The ultimate goal of neuromarketing is to identify a 'buy button' in the brain that can be targeted and triggered by future commercials," according to C. Witchalls (2023). The use of these high-tech tools to potentially find a "buy button" in a consumer's brain has prompted society and academia for example researchers, journalists, and media to discuss ethical concerns regarding the use of these tools, potentially influencing or even manipulating consumers' decisions (E. Singer, 2004; Y.I. Ulman et al., 2015).

Furthermore, nothing is known about the long-term consequences and efficacy of neuromarketing techniques. The long-term effects of marketing efforts impacted by neuromarketing strategies are yet unknown, even though short-term advantages can be quantified. With time, preliminary findings may become outdated due to the dynamic nature of customer behavior and outside factors. Finally, as neuromarketing becomes more well known, it is coming under more regulatory and public scrutiny. Considering the necessity of legislation to stop potential abuses, governments and consumer protection organizations are growing increasingly watchful. The use of neuromarketing strategies may be further restricted by this changing regulatory environment, requiring practitioners to constantly adapt. Furthermore, instead of studying ailments like autism and cancer, experts and journalists have claimed that these pricey instruments belong in the commercial sector. As a result, ethical problems like secrecy and privacy present new difficulties and constraints (S.M. Isa et al., 2019). Individual and cultural variations present another difficulty for neuromarketing. Cultural, societal, and personal characteristics can cause neural responses to differ dramatically throughout different demographic groups, making the development of marketing methods that are universally applicable more difficult. Due to this variability, large-scale, diversified sampling is needed, which is frequently unfeasible and raises the difficulty and expense of the study.

Furthermore, it is possible to influence customer behavior using neuromarketing strategies, which raises questions regarding consumer autonomy and the swaying of people's judgment. It is especially concerning when neuromarketing strategies are employed for immoral or detrimental ends, including endorsing unhealthy items like alcohol and tobacco (A.H. Alsharif et al., 2021). As a result, some governments have implemented specific measures to limit the misuse of neuroscience techniques in response to

worries about the power of neuromarketing (S. Nemorin and O.H. Gandy, Jr. 2017). There are difficulties in combining neuromarketing with conventional marketing techniques. Marketers need to strike a balance between traditional market research techniques and neurological insights. Behavioral and demographic data must frequently be contextualized with neuromarketing data in order to get a complete picture of customer preferences. Effective coordination between neuroscientists and marketing experts is necessary for this integration, which calls for a multidisciplinary approach.

Moreover, the regulatory environment surrounding neuromarketing is continually changing. The application of neuromarketing strategies is not governed by set rules or regulations. Because of the possibility of exploitative applications and inconsistent practices, regulatory frameworks are necessary to uphold moral norms and safeguard consumer rights. H. Plassmann et al. (2015) have explored further noteworthy aspects of neuroscience investigations, which offer information to enhance comprehension of consumers' brains by presenting correlational data instead of causative proof. Therefore, they recommended utilizing physiological or neuroimaging methods to enhance the assessments of customers' actions and perceptions. In conclusion, although neuromarketing provides insightful information about consumer behavior, its application is hampered by issues with the complexity of the human brain, ethics, accessibility, affordability, ecological validity, integration with conventional marketing strategies, and legality. For neuromarketing to be used in the future in an ethical and efficient manner, these issues must be resolved.

EXPLORING FACTORS INFLUENCING NEUROMARKETING IMPLEMENTATION IN INDIA

The potential of neuromarketing, a multidisciplinary area that combines marketing, psychology, and neuroscience, to completely transform how businesses perceive and engage with their customers has drawn a lot of attention in recent years. With the continuously expanding consumer market in India, neuromarketing presents a special chance for marketers to reach consumers' subconscious minds and create more potent advertising campaigns. However, there are a number of obstacles to overcome before neuromarketing can be used in India. The ignorance of marketers and other business experts regarding neuromarketing is one of the main issues. Companies may find it challenging to get suitable individuals to carry out neuromarketing research as a result of this ignorance, which may cause a scarcity of neuromarketing specialists. The high expense of neuromarketing research and tools is another major obstacle to the application of neuromarketing in India. For small and medium-sized businesses (SMEs) or startups, the infrastructure and equipment needed for neuromarketing studies—such as eye-tracking technologies, electroencephalography (EEG), and functional magnetic resonance imaging (fMRI)—are costly. Furthermore, businesses thinking about using neuromarketing may be greatly discouraged by ethical worries about it, such as invasions of privacy and possible manipulation. For neuromarketing to be used ethically in India, informed permission and openness in data collection and use are essential.The development of this discipline in India may also be hampered by a lack of funding and financial resources for neuromarketing tools and research. The nation's ability to acquire competence in neuromarketing is further hampered by the scarcity of labs and facilities in business schools and colleges. In conclusion, despite the fact that neuromarketing has a lot of potential for Indian enterprises, there are a number of obstacles standing in the way of its application, such as a lack of knowledge and comprehension, high expenses, moral dilemmas, and a lack of funding. It would be essential to address these issues if neuromarketing is to expand and become widely used in India.

Cost of Neuromarketing Research Tools

The area of neuroscience research known as "neuromarketing" focuses on understanding consumer behavior by analyzing the brain's natural processes and responses. Additionally, by using this data, one may predict human behavior, understand promotion trends, and determine the profitability or loss of advertisements, in addition to providing insight into the inclinations, inspirations, and wishes of customers (A. Stasi et al., 2018). In 2015, the global market for neuromarketing innovations reached $21.0 million. According to R.N. Khushaba et al. (2013), the market is predicted to grow from $22.0 million in 2016 to $50.3 million in 2021 at a compound annual growth rate (CAGR) of 18.0%. According to a report released by The Data Warehousing Institute (Cuesta et al., 2018), conclusion research and drifting infused with extensive information analysis can enhance sales and advertising by up to 24%. With its application of emotional analysis and comprehension of cognitive behavior science to customer decision-making, neuromarketing is emerging as a legitimate study paradigm. Neuroscientists have different associations with consumer behavior and preferences than with brands and product needs. While neuromarketing techniques may not guarantee success, they do present a significant advantage over traditional advertising methods. Subliminal readings used in conjunction with neuromarketing can have a beneficial impact on comprehending and therefore enhancing advertising behavior.

Neuromarketing is the study of customer behavior in reaction to the marketing mix using neuroscience technologies such as fMRI and EEG. These instruments are regarded as costly pieces of equipment. Consequently, when compared to more conventional marketing research, neuromarketing tests are incredibly costly. Although neuromarketing research is expensive, it offers deep insights into customer behavior that can significantly improve marketing tactics. To choose the optimal course of action for their unique needs, businesses must balance the costs and potential advantages (Rupali Gill and Jaiteg Singh, 2022).

Because deep insights into consumer behavior require sophisticated technologies and specialized knowledge, neuromarketing techniques and research come at a

premium cost. Depending on the extent and complexity of the research, the investment may be large—between tens of thousands and several hundred thousand dollars—but the possible returns may outweigh the costs. Specialized software and data processing tools needed to understand the complex data these devices generate are also included in the high expenses. According to J.H.C. De Oliveira (2014) and E. Gurgu et al. (2020), neuromarketers and researchers interested in conducting trials encounter several noteworthy obstacles and constraints, including the expense of neuromarketing technologies. For instance, the estimated cost of an fMRI machine is USD 1.5 million. Businesses may view the high expense of neuromarketing as a strategic investment, particularly those in fiercely competitive industries. Through an awareness of the unconscious forces influencing consumer behavior, businesses may create goods and marketing campaigns that are more compelling and effectively connect with their target markets. In conclusion, many businesses may find that investing in neuromarketing tools and research is beneficial despite the initial high cost, given the profound insights into customer behavior and tactical benefits they offer. The choice to fund neuromarketing should be founded on a thorough analysis of the possible advantages and a comprehension of the ways in which these insights might propel commercial success.

Thus, lowering the price of upcoming studies will contribute to the improvement of neuromarketing research and the production of higher-quality publications. Similarly, Singh and Gill (2022) noted that there are various restrictions associated with neuromarketing, including the high expense of conducting research. In agreement with G.B.G. Turna et al. (2021 and D. Hensel et al. (2017, one of the primary obstacles to and constraints on the growth of neuromarketing research is the high expense of carrying out neuromarketing experiments in the business sector to analyze customer behavior.

Existence of Manipulation and Ethics

Advertisers and marketers have traditionally used self-reports such as surveys, interviews, and focus groups to better understand customer behavior such as decision-making, emotions, attention, and moods. Modern neuroscience technology is being used by advertisers and marketers to better comprehend customers' unconscious and subconscious behaviors in response to the marketing mix, thanks to recent advancements in the discipline of neuroscience. This has sparked conversations about ethical issues, including data misuse, privacy, and secrecy, that affect both society and academia. These devices have the ability to read consumers' minds, which gives them access to personal information about their likes and ideas. This might be viewed as a privacy violation. Neuromarketing is a relatively young field of marketing research that uses neuroscience technologies to study the brain correlates of customers' unconscious behavior in reaction to marketing stimuli (M. Nadanyiova, 2017; A. Bleier et al., 2020). Thus, it is regarded as unethical to access customers' minds and violate their privacy and confidentiality. According to Mileti et al. (2016), two areas of neuro-ethics that consumers are concerned about are autonomy and privacy, as they fear that neuromarketing techniques may be able to get their personal information. Manipulating and managing consumers by swaying their decision-making and "buy button" is another problem that prevents neuromarketing from being implemented in India.

Researchers and advertisers may misuse neuromarketing research findings to maximize corporate profits, as noted by K.L.A. Dierichsweiler (2014) and M.D. Bercea Olteanu (2015). This is regarded as unethical and a violation of human rights. Researchers and advertisers can use the results of neuromarketing research to manipulate consumers' minds or affect their purchase decisions by analyzing consumers' thoughts, emotions, preferences, attention, and memory, as highlighted by D. Palmer and T. Hedberg (2013).Furthermore, according to D. Lewis (2005), neuromarketers are able to pinpoint a consumer's mental "buy button" in order to directly affect and manipulate their decision-making.

Shortage of Experts in Neuromarketing

Experts in neuromarketing, a specialist discipline that integrates neuroscience with marketing to gain a deeper understanding of customer behavior, are now in limited supply in India. The lack of these resources is becoming more and more obvious as companies try to stay ahead of the curve in a market that is always changing. India is becoming more and more in need of neuromarketing specialists as a result of the country's quick digital transformation and growing emphasis on knowing customer preferences. Businesses in a variety of industries, including technology and retail, are eager to use neuromarketing data to enhance customer experiences, develop better marketing strategies, and increase sales. Eye-tracking, EEG, and fMRI are examples of neuromarketing tools that provide organizations with useful information about how customers react to various stimuli and help them create more effective marketing campaigns. There are still not enough skilled neuromarketing experts in India, despite the increased interest.

Being a specialized discipline, neuromarketing calls for a special combination of understanding in psychology, neuroscience, and marketing. There aren't many universities in India right now that provide specific instruction in neuromarketing. According to Ahmed et al. (2022), the majority of marketing programs now in use do not thoroughly explore the neuroscientific elements required for this subject. In India, a large number of companies and academic institutions are still unaware of all the advantages of neuromarketing. This ignorance results in less funding being allocated to research projects and training courses that have the potential to produce a new generation of neuromarketing specialists. The industry requires experts who are not only knowledgeable about conventional marketing principles but also have a firm grasp of neuroscientific techniques and resources. It is difficult to find someone with this kind of multidisciplinary experience (M. Banos-González et al., 2020). Indian businesses may find themselves at a disadvantage in comparison to international rivals who are already using

these strategies if they do not have access to neuromarketing information. Insufficient expertise might hinder creative thinking in marketing tactics, as companies might depend on conventional approaches that don't provide as much in-depth understanding of their target audience. 2017 saw M. Nadanyiova.

India's universities and colleges must create and provide degrees and specialized courses in neuromarketing. Working with foreign organizations can also aid in providing India with cutting-edge education and training. Businesses and academic organizations can collaborate to boost neuromarketing research and development. In order to develop fresh talent, these collaborations may also involve sponsoring internships and scholarships. In conclusion, the lack of neuromarketing specialists in India is a problem, but it also presents a chance for development and creativity. Through education, industry-academic alliances, and awareness-building, India can develop a strong neuromarketing professional ecosystem that will shape consumer insights and marketing tactics going forward.

Shortage of Financial Resources in India

The absence of funding from businesses and academic institutions as a result of cost tools or business priorities presents an intriguing additional barrier to the application of neuromarketing in India. When asked about problems that prevent the adoption of neuromarketing, participants also brought up the important issue of lack of money or investment in the sector. Furthermore, the absence of funds has a detrimental impact on neuromarketing, building labs, purchasing equipment, and even recruiting or inviting specialists to instruct staff members in the usage of the equipment. According to O.M. Bradfield (2021), funding or investment in neuromarketing trials is crucial to the field of neuromarketing research. Without it, the area's findings would be weak or nonexistent due to the high cost of procedures or studies

Proper Understanding and Knowledge

One of the primary obstacles and difficulties in implementing neuromarketing in India is the deficiency of awareness and understanding in both academics and industry. As a result, in order to study how consumers react to marketing stimuli, both academia and business continue to rely on conventional marketing techniques. As a result, there is a deficiency of understanding regarding neuromarketing, including its definition, methods for conducting neuromarketing research, and techniques for data analysis and interpretation. According to S. Stanton et al. (2017), doing neuromarketing research necessitates a high level of technical expertise in order to handle this cutting-edge equipment, conduct the experiment, evaluate the brain wave data, and interpret the results. Consequently, the research cannot be properly carried out, and high-quality results cannot be achieved without this understanding.

Finding publications that social science researchers can easily grasp is difficult since most of them make use of neuroscience technologies, including functional magnetic resonance imaging (fMRI), which require specialized knowledge to use successfully. Furthermore, conducting neuromarketing research alone is very challenging for social science researchers without a multidisciplinary team from psychology and neuroscience. Understanding publications on neuromarketing that use neuroscience methods like fMRI, PET, MEG, and EEG is challenging. High-tech tools are also needed for neuromarketing, which can be very expensive for small and medium-sized businesses. Because of this, self-report methodologies are preferred by these small and medium-sized businesses when doing consumer research, which causes a misunderstanding of the nature of neuromarketing research.

Therefore, when small and medium-sized businesses attempt to advertise, they are unaware of how to apply neuromarketing to increase the efficacy of their marketing strategies accordingly. According to V. Crespo-Pereira et al. (2020) and E. Kolar (2014), neuromarketing has gained popularity recently, which may give small and medium-sized businesses the chance to experiment with utilizing or implementing neuromarketing methods by supporting neuromarketing agencies.

Required Time

Previous studies have identified a number of challenges associated with labor-intensive neuromarketing research, such as the length of time needed for participant recruitment, experiment design, data interpretation, and experiment execution. For instance, because brain waves and data are difficult to read and experts are needed, researchers with a background in social science find it difficult and complex to evaluate the experiment's findings. In agreement with A. Dimoka et al. (2012), it is more challenging to understand the extracted data from the neuromarketing experiment, which makes use of the fMRI or EEG. This is seen as one of the difficulties that social science-trained researchers in the field of neuromarketing face. According to F. Rawnaque et al. (2020), one of the difficulties with neuromarketing is the time commitment required for data analysis due to its complexity. Furthermore, sufficient time is required to plan the experiment and find volunteers. M.D. Bercea (2012) and Larson and Carbine (2017) have pointed out that one of the difficulties in extrapolating the results of experiments in neuromarketing and consumer behavior research is a limited sample size. Z. Eser et al. (2011) claim that the limited sample sizes and unfavorable associations with legal and ethical concerns make neuromarketing trials challenging.

Shortage of Labs and Facilities

There aren't enough tools since they're either too expensive or aren't appropriate for business schools. This implied that there has been limited and restricted neuromarketing research, which has reduced the amount of academic work produced in the neuromarketing journals of these organizations. Business faculties largely lack neuromarketing techniques, such as fMRI and wireless EEG, to investigate consumers' subconscious or unconscious behaviors in reaction to marketing stimuli, as

previously validated by studies (Ahmed et al. 2022). As a result, academia has not added much to our understanding of neuromarketing. Because these investigations require large spaces to set up instruments like fMRI, business universities lack labs or other places to conduct those studies. Modern technology such as fMRI and EEG is used in neuromarketing research, which necessitates specific locations or labs that might not be available in business schools (Nadanyiova, M. 2017). Furthermore, it costs a lot of money to operate a neuromarketing laboratory (J.H.C. De Oliveira, 2014).

Potential Solutions for Enhancing Neuromarketing Implementation in India

Providing Facilities and Labs

The study's findings demonstrated that well-equipped facilities and infrastructure are required for neuromarketing research since it relies on the use of physiological tools like ET and GSR as well as neuroimaging tools like fMRI and EEG. These tools serve as the foundation for neuromarketing research. Infrastructure and labs are essential for research in general and neuromarketing in particular, according to De Oliveir (2014). To investigate how consumers respond to advertising and other components of the marketing mix, neuromarketing necessitates laboratories equipped with physiological and neuroimaging tools. The findings of the study show that methods, tactics, and tools are essential to carrying out high-caliber neuromarketing trials. We now arrive at our second interesting point.Neuromarketing research uses neuroimaging tools including fMRI, EEG, and fNIRS as well as physiological tools like ET, GSR, and EMG. Neuromarketing research mainly relies on these tools to investigate how consumers react to the marketing mix, which includes brands and advertising.The study of the neurological correlates of consumer behavior, such as emotions and decision-making, in reaction to marketing stimuli, such as television advertising campaigns, is known as neuromarketing. It accomplishes this by employing self-report techniques as questionnaires, physiological instruments (ET and GSR), and neuroimaging tools (fMRI). According to L. Alvino et al. (2020), neuromarketing approaches, tools, and strategies are crucial for carrying out neuromarketing-related investigations.

In agreement with P. Cherubino et al. (2015), the business and economic world have adopted these cutting-edge neuromarketing instruments to solve concerns and questions related to marketing and economic transactions. These tools necessitate well-equipped labs and facilities. These techniques have also helped neuromarketers gain a deeper understanding of the fundamental processes that underlie real-world decision-making. This advances the field of neuromarketing application globally and contributes significant new insights to the body of research. Another topic that was explored was the expense of neuromarketing research and tools, as this expense has impeded the field's advancement in certain nations. Reducing the expense of neuromarketing research can aid in the development of neuromarketing trials by boosting the quantity of studies, researchers, theories, and new model creation, according to V. Crespo-Pereira et al. (2020). According to P. Lina et al. (2022), if researchers can lower the cost of their methodologies or studies, neuromarketing research will become more affordable and faster than other marketing strategies. This can assist researchers in carrying out additional studies in the domains of marketing, social sciences, and medicine.

Establishing very Strong Collaborative Networks

Since neuromarketing is a diverse topic, cooperation between academic institutions and industry partners is crucial to enhancing the application of neuromarketing in India. The first intriguing element is the cooperation between academic institutions and coworkers. Colleague cooperation will, of course, enhance neuromarketing research and yield high-caliber results that can offer insightful knowledge to the academic and professional worlds. In this regard, individuals with any background in marketing can work alongside those from abroad. In order for them to believe that the plan will be successful, they must have strong relationships and effective networking. In line with a previous study (E. Gurgu et al., 2020), conducting high-quality neuromarketing research and gaining more precise and accurate findings that can assist both academia and industry depend heavily on collaboration among universities or colleagues. The second intriguing element has to do with industry collaboration. Experiments involving neuromarketing require well-equipped labs and infrastructure, which come at a high cost. As a result, it is impossible to dispute the significance of working with the industry to fund neuromarketing research or to sponsor experiments of this kind. De F. Rawnaque et al. (2020) assert that industry-university cooperation is critical to advancing neuromarketing research.

Compliance with Regulations and Laws

As previously mentioned, neuromarketing research studies brain illnesses, cancers, autism, etc. using neuroscience methods and technology, such as fMRI, which is available in medical departments (hospitals and medical facilities). As a result, businesses can perform customer tests and boost profits by utilizing neuroscience technologies in the marketing and business domains. This has sparked conversations about moral concerns, including corporate or researcher compliance as well as government and academic rules and regulations pertaining to the usage of these kinds of instruments. Government laws and regulations, therefore, are a must for researchers, organizations, and institutions to follow. These laws and regulations are thought to be the catalysts for developing neuromarketing research in India as well as throughout the world.

In agreement with D. Ariely and G. Berns (2010), neuromarketing instruments like functional magnetic resonance imaging (fMRI) are employed in tobacco and alcohol advertising campaigns. These technologies are expensive and are designed to maximize business rather than the welfare of the public. This has sparked a conversation about ethical difficulties, potential ethical problems, and researchers' adherence to legal and regulatory requirements. Therefore, when neuroscientists, neuromarketers, and firms undertake their neuromarketing

research, the most delicate concerns that should be taken into consideration are ethical issues and compliance with government rules and regulations. Therefore, in order to enhance neuromarketing research, businesses and researchers must respect and adhere to legal requirements as well as ethical considerations (E. Arlauskaitė et al., 2013).

Improving Awareness and Knowledge in India

In India, neuromarketing is a very new and unexplored field. Enhancing the comprehension and expertise of researchers and personnel is a crucial measure towards elevating the neuromarketing domain and research in India. Because nearly everyone has a smartphone and social media apps on it, faculty and researchers can now expand their knowledge in a variety of ways, including by employing media and social media (such as Facebook, Instagram, and posters at universities). In an effort to provide researchers and staff with information and understanding regarding neuromarketing, social media is crucial. Enhancing neuromarketing research involves training; similarly, "we can send our people or staff overseas for training."

Training programs for researchers on how to utilize neuroscientific instruments and analyze brain waves and signals are crucial, as noted by M. Banos-González et al. (2020). Additionally, in order to train staff on how to utilize neuromarketing tools, interpret data, and conduct neuromarketing research utilizing neuroimaging methods like fMRI and EEG, it is imperative to invite or hire experts due to the dearth of neuromarketing specialists. Previous research (Banos-González et al. 2020) indicates that neuromarketing professionals play a critical role in tool preparation, research or experiment execution, data gathering, and interpretation.

Increasing of Financial Resources

Money can have a big impact on academia for any kind of research, including neuromarketing and other fields. The study's conclusions demonstrated how expensive it is to perform neuromarketing research and buy the necessary instruments. As a result, funding for neuromarketing research is needed from the government or business sector. In agreement with De Oliveira (2014), the money is very important and is seen as a chance to foster interaction and collaboration, which will enhance the neuromarketing study. The need for financing—from the government or academic institutions—to enable academia to acquire neuromarketing instruments and carry out studies or tests was another topic covered.
As noted by O.M. Bradfield (2021), researchers can focus on sustainability while conducting neuromarketing experiments by focusing on funding or investment in neuromarketing research and approaches.

Practical application of Neuromarketing in the Indian Context

India’s diverse consumer base within the fast-moving consumer goods (FMCG) sector. Neuromarketing techniques—such as EEG and eye-tracking—can be deployed to gauge how consumers from different regions react emotionally to various packaging designs and advertising campaigns. A local FMCG company might use these insights to tailor its packaging to not only capture attention but also to evoke positive emotional responses that enhance brand loyalty. For instance, studies have shown that emotional cues derived from neuromarketing studies can significantly affect consumer recall and preference, which directly translates into better sales outcomes (Plassmann et al., 2012). By aligning packaging design with regional cultural nuances, companies can create more resonant brand images that appeal to diverse consumer segments across India.

Similarly, in the expanding e-commerce sector, companies like Flipkart and Amazon India could benefit from neuromarketing research to optimize website layouts and digital advertisements. Through eye-tracking and facial coding techniques, these firms could identify which website elements or ad visuals trigger the most engagement and adjust their interfaces accordingly. This is particularly valuable in an environment where digital competition is fierce, and the need for personalized, engaging user experiences is high. With a deep understanding of subconscious consumer reactions, these companies could not only improve user experience but also reduce bounce rates and boost conversion rates. Another practical implication is in the realm of advertising strategy for regional brands. Traditional marketing methods often depend on self-reported customer surveys, which might not capture the real emotional impact of an ad. By integrating neuromarketing methods—such as functional magnetic resonance imaging (fMRI) and skin conductance measurements—advertisers could design campaigns that are tested for authenticity and deep emotional impact prior to launch

Finally, the ethical application of neuromarketing also serves as a practical lesson for Indian marketers. Incorporating neuromarketing insights responsibly can build consumer trust, as companies demonstrate transparency in how they use biometric data to fine-tune their marketing strategies. This ethical stance, when communicated clearly in industry practices, not only complies with evolving data protection standards in India but also enhances a brand’s reputation.

In summary, the integration of neuromarketing into the Indian market can offer tangible benefits such as optimized packaging and advertising, improved digital user experiences, culturally tailored campaigns, and a framework for ethical usage. These examples highlight how neuromarketing strategies can translate cutting-edge research into practical tools that drive commercial success and competitive advantage in the dynamic and diverse Indian market.

Bridging the Gap: Overcoming Economic and Ethical Challenges in Indian Neuromarketing

In addressing the challenges of economic and ethical barriers to implementing neuromarketing in India, the paper suggests several practical strategies that blend careful policy-making, stakeholder collaboration, and

methodological improvements.

Overcoming Economic Barriers:
Neuromarketing research in India faces significant economic hurdles mainly due to the high cost of neuroimaging tools and associated research infrastructure. To counter these challenges, the paper advocates for:

- **Strengthening Collaborative Networks:** Developing strong ties between academic institutions, industry players, and government agencies can help pool resources and share high-cost equipment, such as fMRI and EEG machines. Partnerships and collaborations not only reduce individual financial burdens but also foster knowledge transfer and innovation that can lead to more cost-efficient research methods.
- **Increasing Funding and Resource Allocation:** Encouraging funding from both public and private sectors is essential. By demonstrating the commercial potential and long-term benefits of neuromarketing—like improved advertising efficacy and better-targeted campaigns—stakeholders can build a stronger case for investments in this technology. The establishment of government grants or industry-sponsored research initiatives can also alleviate the high cost burden.
- **Investing in Education and Infrastructure:** Expanding specialized courses and building state-of-the-art research labs in business schools and universities can create a local talent pool. This not only reduces the dependency on expensive external collaborations but also develops indigenous expertise that can innovate cost-effective solutions.

Mitigating Ethical Barriers:
Ethical concerns in neuromarketing primarily involve issues of privacy, data manipulation, and consumer autonomy. The discussion in the paper highlights several approaches to alleviate these concerns:

- **Ensuring Transparency and Informed Consent:**
  Researchers and practitioners should adhere to strict ethical guidelines, ensuring that consumers are fully informed about how their data will be collected and used. Transparency in the research process builds trust and mitigates fears of manipulation.
- **Regulatory Compliance and Self-Regulation:** Aligning research practices with existing legal frameworks and ethical standards is critical. The paper suggests that establishing a robust regulatory framework—possibly through industry self-regulation—can help prevent unethical practices, such as exploiting subconscious biases without consumer consent.
- **Balancing Research Benefits with Ethical Standards:**
  While neuromarketing offers deep insights into consumer behavior, it is important to balance these benefits with ethical considerations. By integrating neuroscientific approaches with conventional marketing methods, researchers can design studies that respect consumer autonomy. Ethical reviews, regular audits, and interdisciplinary dialogue between neuroscientists, marketers, and ethicists can foster an environment where innovation does not compromise ethical values.

In summary, the paper stresses that overcoming these barriers requires a dual approach: enhancing economic viability through collaborative investments and resource sharing, and upholding ethical standards through transparency, regulatory compliance, and interdisciplinary cooperation. With these strategies in place, neuromarketing could be implemented in a way that is both economically sustainable and ethically responsible in the Indian context.

Limitations
An effective approach for mapping scholarly networks and quantifying research trends in bibliometric analysis is to use data taken from databases such as Web of Science and Scopus. However, using these databases has a number of methodological drawbacks and difficulties. The inherent difference in database coverage is one major drawback. Not all journals are equally covered by Scopus and Web of Science; some fields might be overrepresented while others continue to be underrepresented. This may result in a bias in the research output, limiting the findings' generalizability by possibly ignoring disciplines or regions that are underrepresented in these databases (Wang & Chai, 2018).

CONCLUSION

A mapping-based bibliometric analysis offers a systematic approach to understanding the interconnected factors influencing neuromarketing in India. By visualizing clusters, networks, and trends within the literature, researchers can get insights into how cultural, economic, technological, regulatory, and ethical factors influence consumer behavior and guide marketing strategies in this dynamic market. This review summarizes the existing literature, identifies areas that require additional research, and proposes strategic applications of neuromarketing strategies that are suitable for the Indian market. In conclusion, the use of neuromarketing in India is impacted by a variety of technological, cultural, legal, and economic factors. The rapid advancements in biometric and neuroimaging technologies have given neuromarketing tactics a strong foundation. However, the expensive cost of these technologies and the need for specialized knowledge, particularly for small and medium-sized firms, may significantly hinder their general adoption. Over the past few decades, neuromarketing has progressed in both academia and industry; for example, there are now more publications and neuromarketing agencies. The multidisciplinary field of neuromarketing, which blends marketing, psychology, and neuroscience to better understand how consumers subconsciously respond to their surroundings, makes use of contemporary neuroscience and physiological technologies like fMRI, EEG, and ET. As a result, the challenges and limitations related to the use of neuromarketing in India are increasingly recognized in

both academic and industry contexts.

We also examined the difficulties and constraints that Indian academics have while trying to perform neuromarketing research in this study. Cultural aspects are also very important. The cultural context of India is broad and complicated; therefore, neuromarketing techniques need to be highly customized and flexible to suit different customer categories. To create marketing campaigns that effectively resonate with Indian consumers, it is imperative to have a thorough understanding of the local languages, traditions, and beliefs. Economically speaking, there is a large market for neuromarketing applications due to the expanding middle class and rising disposable incomes. However, because of the differences in economic conditions in various regions, businesses need to carefully segment their markets and adjust their tactics to suit various economic groups.

Ethical and regulatory concerns are equally crucial. India's laws governing consumer data and privacy are changing, and businesses need to carefully follow these regulations to stay out of trouble with the government. To increase consumer acceptability and trust, ethical issues pertaining to privacy invasion and consumer manipulation must be addressed. Ultimately, the ability of businesses to combine cutting-edge technologies with profound cultural insights, business plans, and moral behavior will determine if neuromarketing is successfully implemented in India. By doing this, they will be able to fully utilize neuromarketing's potential to promote customer engagement and company expansion in this vibrant and varied market.

In conclusion, a comprehensive strategy that takes behavioral, cultural, technological, economic, and regulatory aspects into account is necessary for the successful application of neuromarketing in India. Businesses can improve consumer engagement, increase marketing efficacy, and ultimately yield better market outcomes by addressing these factors. As long as these influencing elements are effectively handled and used to benefit both businesses and consumers, neuromarketing in India has a bright future.

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