COMPREHENDING SUBCONSCIOUS CONSUMER BEHAVIOR IN THE DIGITAL AGE VIA NEUROMARKETING*

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ABSTRACT

The method of examining a consumer's psychological and brain cues to determine their preferences and comprehend how they make decisions is known as neuromarketing. A wide range of procedures connecting neurology and marketing practices are included in neuromarketing. Its primary function is the conversion of brain impulses into patterns of consumer behaviour. Utilizing a variety of tools, neuromarketing strategies follow the brain's and body's initial subconscious response to an advertisement, packaging, or content. Among the tools that are most often used for the needs of neuromarketing research, the following stand out: Functional MRI (fMRI), Electroencephalogram (EEG), Electrocardiogram (ECG) (which are also used in neuroscience), but also tools such as Eye-tracking, Galvanic skin response (GSR) and Facial coding (FC). Pricing decisions and branding enhancements in advertisements, graphics, packaging, and content are made based on test results. The prejudice present in the research is among the field's weaknesses. Many of the people who criticize neuromarketing do not think the information, which is obtained from research in this area, is reliable because it is still in its infancy. The use of data gained from brain imaging raises ethical concerns for marketers, as some of them strive to limit our awareness of their genuine intentions, and some activities lack transparency. Possible ethical dilemmas arising from neuroscience applications encompass customers' awareness, consent, and comprehension of what can be perceived as a violation of their right to privacy. New technologies have been integrated with and major improvements made to the tools used for this type of research recently. With devices placed on the head and hands to monitor customers' responses and changes in muscle control over an extended period of time, neuromarketing techniques have already been incorporated into immersive technology. The introduction of AI into neuromarketing is a significant development that will improve the accuracy, speed, and breadth of consumer insights obtained via neuromarketing tools.

Keywords: Neuromarketing, Consumer Behaviour, New Technologies

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INTRODUCTION

In order to establish an unbreakable tie between the customer and the product, neuromarketing connects with the subconscious and emotional aspects of the consumer. It is an interdisciplinary field that integrates marketing, psychology, and neuroscience concepts. Neuromarketing relies heavily on measuring consumers' emotional and cognitive responses to different marketing strategies (Karmarkar, 2011). Neuromarketing techniques support successful branding, product design, and advertising (Belden, 2008).

Comparing neuromarketing to more conventional qualitative consumer research approaches reveal significant methodological benefits. The excitement and optimism must be balanced, though, as is the case with any emerging technology. As of right now, neuromarketing is merely a rather oblique indicator of brain activity. Although neuromarketing is still in its infancy methodologically, it has the potential to be extremely beneficial to marketing professionals if it develops into a more patient, cautious, and discerning field. Marketing experts will find greater value in the information supplied by neuromarketing as it becomes increasingly credible over time (Baltezarević & Baltezarević, 2014). In 2023, the market for neuromarketing was estimated to be worth USD 3.23 billion worldwide. After expanding at a CAGR of 8.9% over the projected period (2024–32), it is anticipated to reach USD 6.95 billion in 2032. The desire for more in-depth customer insights using neuroscience methods like fMRI and EEG is driving the global neuromarketing business. Companies use neuromarketing to optimize product design and advertising efficacy by taking into account the responses of subconscious consumers. The market is growing as a result of developments in neurotechnology and rising competition in consumer goods and services (Straitsresearch, 2024).

Through the application of emotional appeals, colour psychology, social proof, neuro-optimized web design, narrative, retail shop layouts, product packaging, and pricing tactics, companies may produce more persuasive marketing campaigns that connect with their target market and increase conversions. It's critical to keep in mind that neuromarketing is a customized strategy. Since every company and sector is different, success depends on customizing methods to appeal to certain target audiences (Powell, 2024). Highly sophisticated consumer insight is produced via neuromarketing and anthropology, and in certain cases, it can even anticipate 95% of what a consumer will likely do before they ever realize it (Allen, 2023).

With the use of AI and neuromarketing, marketers may predict future consumer behavior and adjust their marketing strategies accordingly. As a result, marketers can develop more individualized and successful marketing strategies that enable them to produce campaigns and content that connect with specific customers on a deeper level, increasing engagement and cultivating brand loyalty (David, 2024).

LITERATURE REVIEW

The ability to get into customers' mental processes has given businesses the opportunity to better understand consumer behaviour, which underpins an individual's decision-making process. Neuromarketing approaches have assisted commercial organizations in identifying and addressing individuals' true needs, aspirations, and wants (Cherubino et al., 2019). It can be said that, these methods allow for the discovery of hidden subconscious information in consumers' minds (Baltezarević & Baltezarević, 2022).

By using brain-imaging technologies to measure neural signals and physiological activities, neuromarketing offers a contemporary lens through which marketers can directly probe consumers' minds. This eliminates the need for cognitive or conscious participation and gives marketers an enhanced ability to observe and comprehend consumers' neurological responses and the factors that influence their purchasing decisions. Put differently, it underscores the significance of analysing consumer behaviour from a neuroscience standpoint in order to facilitate product marketing (Karmarkar & Plassmann, 2017). A brain map that shows which parts of the brain are activated in response to a particular marketing signal can be created using three well-established, accurate, non-invasive neuroimaging techniques (Morin, 2011).

By identifying the activity of the 86 billion neurons in the nervous system, which synapses to interact with other neurons or important cells, they create neuroimages that show clearly defined active brain regions. The increased resources needed for these activities, oxygen (fMRI) or electricity (EEG and MEG), tell the neuroimaging devices to record these millisecond-long, moment-to-moment neural events. A direct measure is frequently thought to be electrical neural transmission. However, as an indirect method, fMRI, for instance, necessitates the examination of both the recorded variables and the brain activity itself (Newman, 2019). Using fMRI technology, Read Montague of Baylor College of Medicine examined the brains of individuals who drank Coca-Cola or Pepsi in 2004. The individuals' conscious awareness of the brand they were drinking was associated with higher brain activity, according to the data. The frontal cortex of the brain exhibited greater activity when the preferred brand was consumed. The brain region known as the frontal cortex is important in short-term memory, decision-making, and

attention to detail. This is the first scientific demonstration of the relationship between brand popularity and the brain's emotional attachment, as well as the significance of neuromarketing as a reliable marketing strategy (Solomon, 2018).

Through the use of neuromarketing, it is possible to identify the specific component of an advertisement that leaves a pleasant impression on the minds and memory of potential customers. This can assist in choosing and arranging the audio-visual elements of a successful commercial (Fugate, 2007). The areas of the brain that engage when someone observes a certain stimulus, for instance, in a calm, controlled setting, may differ greatly from those of someone who sees the same stimulus in a chaotic, unpredictable one, such as a shopping mall (Lee et al., 2007). Three categories can be used to classify neuroscience methods: (1) tools for recording neural activity inside the brain, such as fMRI, EEG, GSR, ET, EMG, and ECG; (2) tools for recording neural activity outside the brain, such as GSR, ET, EMG, and ECG; and (3) methods for interventions, such as neurotransmitters and transcranial magnetic stimulation (TMS) (Lim, 2018).

Typical neuromarketing equipment comprise: 1. Electroencephalography (EEG): EEG gauges electrical activity in the cerebral cortex, the brain's outermost layer. Participants' heads are fitted with EEG sensors, and after that, non-invasive electrodes pick up the subject's brainwaves. In a single second, EEG sensors may capture up to thousands of snapshots of the electrical activity produced in the brain. In order to process the data, the captured brainwaves are first transmitted to amplifiers and then to a computer or cloud. It is possible to record the enhanced signals, which resemble wavy lines, on a computer, a mobile device, or a cloud database. 2. A method of measuring brain activity that analyses blood flow to specific brain regions is called functional magnetic resonance imaging, or fMRI. It is less feasible to do customer research because machines can cost up to a half million dollars. 3. Eye tracking counts the length of time an individual spends on an object by tracking their eye movements and visual attention using a camera. For assessing UX and visual media, this tool is quite helpful. 4. Electrodermal activity (EDA) measures sympathetic nerve activity in the sweat glands using hand sensors (Emotiv, 2024). 5. Facial electromyography (fEMG) is a method that records the electrical activity produced during face muscle contractions. fEMG has the following benefits: it is a non-invasive, objective assessment that can be performed in real-time and integrated with other physiological parameters. The fact that only a small number of muscles can be sensibly followed at once, the electrodes on the participants' faces can cause discomfort, and the data interpretation process can be somewhat challenging and complex (Allen, 2023).

Benefits of neuromarketing include: a) Gaining a complete understanding of clients' perspectives (neuromarketing strengthens mental connections with customers). b) Using emotional reactions to improve products: Some elements of flyers, billboards, websites, and videos may cause viewers to react favourably or unfavourably. Businesses can look at these kinds of responses thanks to neuromarketing (Ahamed, 2024). c) Enhancing user experience: The success of digital products such as websites and apps depend heavily on user experience (UX). It establishes how simple and enjoyable a digital interface is for consumers to interact with. With neuromarketing, UX design transforms into a science focused on building enjoyable and easy-to-navigate digital environments for users, which boosts happiness and loyalty. d) Designing websites and apps: The use of neuromarketing to improve the user experience of apps and websites is growing. Businesses can strategically place important information and calls to action on webpages by employing techniques like eye-tracking to determine which sections of the page are most visited and which are avoided (Çakar et al., 2017). e) Boosting sales and profitability: Increasing sales and strengthening the bottom line are the ultimate objectives of any marketing plan. With its in-depth analysis of customer demands, neuromarketing provides insightful information that can immediately boost revenue and profitability. Neuromarketing goes beyond conventional marketing strategies to uncover the fundamental causes behind customer decisions to choose particular products over others by simplifying the nuances of consumer preferences and choices. Businesses can optimize resource allocation and maximize return on investment by fine-tuning their marketing campaigns with the data-driven approach of neuromarketing. The outcome is a marketing plan that addresses the decision-making procedures involved in making a purchase. f) Building brand loyalty: The conversion of infrequent purchasers into devoted patrons and brand ambassadors is symbolized by brand loyalty, which is the marketing industry's crown jewel. In this quest, neuromarketing gives brands an advantage by allowing them to engage with customers on a more profound and emotional level (Caha, 2024).

The prejudice present in the research is one of the field's limitations. Since neuromarketing is still in its early stages, many of its detractors doubt the veracity of the data. Most of the data is released by neuromarketing corporations or academics affiliated with these businesses. Because of this, the results may be skewed to the companies' own advantage, endangering their validity (Javor et al., 2013). The majority of businesses that offer neuromarketing services would claim to conduct their business ethically, much like any advertising company. They won't purposefully spread misinformation or unlawful content. Most neuromarketing companies don't

test children under the age of 18 (Conik, 2018). However, these methods of brain-controlling people are highly contentious from a social and legal standpoint. Proponents of neuromarketing declare that the goal of the strategy is to better understand their clientele in order to provide them with better service (Dooley, 2012). Despite the fact that neuromarketing actually infringe upon an individual's privacy, the current data protection laws are unable to protect individuals from such interference on the basis of broad principles. The only way an individual can assert his rights is by making reference to the vague and interpreted basic right to privacy. Furthermore, the Civil Code or the Act on Regulation of Advertising both contain rules pertaining to the protection of autonomous will can be used as a safeguard against neuromarketing tactics. The outcome of such a lawsuit in court is very hard to predict. Nonetheless, courts must to state unequivocally that they value protecting people's privacy and autonomy more than the financial interests of corporations (Solarczyk, 2017). People demand control over the data they contribute, and with neuromarketing, they don't even fully know what data they are giving the corporation. Data protection laws will be a major burden in the near future (Martinez, 2023). Neuromarketing is just as ethical as marketing as a whole. Ads that are fraudulent or deceptive can coexist with those that are genuine. Ads that promote safe products to children can coexist with those that raise awareness about acceptable products. Ethics are determined by the way a tool is utilized and the marketer's intention, not by the tool itself (Allen, 2023).

Regretfully, most of the technology related to brain research are extremely expensive. Even a more commonplace device like an fMRI scanner can cost a half million dollars. Moreover, there is the maintenance cost to consider. The next challenge would be to locate the appropriate personnel to run everything. It's not the same as learning how to operate a 3D printer or conducting a neuroscience experiment on the brain. In addition to having a great deal of technical understanding to operate the machines, it's crucial to understand how to collect and arrange the data afterwards. It can be challenging to locate the correct individual to oversee and assist with these technologies in light of this (Chi, 2022).

These are few instances that demonstrate how clever neuromarketing is: a) The classic Christmas ad for Coca-Cola: An excellent illustration of neuromarketing in action is the yearly Coca-Cola Christmas truck trip. A sensory-rich experience is produced by the sound of bells and the image of a red vehicle covered in sparkling lights. The brand successfully links their product to the joys of the holiday season by appealing to sentiments of cosiness, warmth, and nostalgia. b) Apple's design perfection: Apple is known for its elegant and understated product

designs. The sleek designs, simple user interfaces, and tactile experiences that these gadgets provide are all clear examples of neuromarketing concepts. The brand appeals to the demand for luxury and status by creating an identity that is sophisticated and innovative. c) Disney's magical storytelling: Theme parks at Disney share the company's storytelling prowess. Visitors are treated to a mystical experience thanks to the detailed surroundings, engrossing stories, and meticulous attention to detail. Disney ensures that visitors depart with treasured experiences and a desire to return by igniting wonder and emotional connections through neuromarketing (Bluemonarchgroup, 2024).

To better understand the brain psychology and behavioural traits of their target market, major corporations like Nielsen, IQVIA, Kantar, Ipsos, PepsiCo, and others are looking into the usage of neuromarketing. The goal of doing this is to acquire a competitive edge in their respective fields. North America is today able to sustain itself because of sustained innovation and the backing of large enterprises. The European region will come next, with a projected market share of USD 736.09 million and a compound annual growth rate (CAGR) of 8.2% over the course of the projection year (Straitsresearch, 2024).

In addition to the neurological response during the purchase, neuromarketing approaches aid in understanding the entire shopping experience of a client from the time they enter the store until they depart. A virtual store with retail products in both 2D and 3D that simulates a physical store is an intriguing application. Test consumers are exposed to actual marketing scenarios and have their purchasing decisions thoroughly examined (Solomon, 2018). Regardless of format, immersive technology is used to augment or add more visual information to the actual world. It is currently accessible to customers through a range of devices. Immersive experiences have revolutionized the way companies and customers interact. Given that they enable customers to test goods and services in a virtual setting, it is anticipated that their influence will be greatest when making a purchase or selecting a service (Baltezarević, 2023). With devices placed on the head and hands to monitor customers' responses and changes in muscle control over an extended period of time, neuromarketing techniques have already been incorporated into immersive VR technology. This was made possible by the fact that virtual reality (VR) stimulates the sensorimotor system more than other stimuli and may result in more realistic behavioural and psychological responses (Bohil et al., 2011). Given that augmented reality (AR) technology has the potential to greatly mimic the actual world, neuromarketing techniques are crucial for eliciting emotional reactions in AR scenarios. This is especially crucial because not much has been done in the area of AR using neuromarketing strategies or studying the

characteristics of AR in customer behaviour (Gill & Singh, 2022). Wearable dry-EEG devices that smoothly interface with VR (such of the HTC Vibe Pro and Oculus) were created by Bitbrain Technologies in March 2024. This technology increases the accuracy of neuromarketing research by capturing real-world human behaviour to assess user experiences in a variety of settings, including video games and movies (Straitsresearch, 2024).

A study carried out in virtual reality (VR) with the use of neuromarketing techniques shows how the modification of scents might alter our cognitive perception of a trip. 42 participants in the BrainSigns study, which was published in the journal Brain Sciences in February 2021, were required to don an HTC Vive headset in order to participate in two high-speed virtual rail journey trips from Rome to Milan. Electroencephalography (EEG), a method that allows one to quantify the cognitive resources used by participants in processing the surrounding environment and the most significant events of the experience, was used to monitor the participants' brain activity throughout the entire experience. The participants were split into two groups before to participating in the two travel experiences: The first group was exposed to the scent of lavender, while the second group was exposed to the aroma of lemon. By examining the brain reactions of participants exposed to the two distinct groups (the “lavender” and the “lemon”), the study sought to see whether there were any variations in the way cognitive resources were used during the travel experience. The study's findings demonstrated that during the two virtual train rides, participants who were exposed to the scent of lavender exhibited noticeably more frontal theta band activity than participants who were exposed to the scent of lemon. According to this brain pattern, individuals who were exposed to the lavender aroma were able to process the environment and some important events from the experience (such as automatic aural messages related to the communication of a delay) with greater cognitive resources. This study demonstrates rather clearly how the optimal conditions for the deployment of cognitive resources directed toward the processing of information from the environment are created when one is in a state of calm or relaxation (Mancini, 2024).

Influencer marketing is among the most effective applications of neuromarketing in social media. When a brand links its product to an online personality, consumers will subconsciously and consciously associate the product with the influencer they follow, connecting it to the good feelings they have for the influencer. This has psychological implications. In addition to humanizing the business, this kind of branding promotes consumer interaction. Marketing professionals can learn a lot about improving the optimization of their social media content by

utilizing functional magnetic resonance imaging and electroencephalogram data (Micu et al., 2021).

An intriguing area of the marketing landscape is the combination of neuromarketing and artificial intelligence (AI). Despite their apparent differences, these two fields can help companies understand consumer behavior and make data-driven decisions. When combined, they produce a synergy that has the power to completely change the way companies interact with their target markets. When neuromarketing and AI come together, amazing things happen. AI's capacity for data processing converts the abundance of information obtained from neuromarketing research into useful insights. By dissecting the patterns in brain activity and emotional reactions, it enables companies to precisely adjust their strategies. AI, for instance, may forecast which aspects of an advertisement will cause viewers to feel strongly by examining neuromarketing data. Then, in order to better suit customer preferences, it can suggest changes to messaging, design, or even product features. Consequently, marketing strategies are able to target the audience's emotional triggers with precision and tailoring. The ability of AI to provide real-time feedback guarantees that marketing campaigns are flexible and responsive. Instantaneous campaign adjustments allow for faster optimizations and higher levels of participation (Dowling, 2023). Neuromarketing can benefit from the usage of implicit associations (IAs). These IAs offer accurate information on the unintentional connections between target audience and the content. Company can improve their messaging to create associations that are advantageous to campaign, product, or brand by being aware of the implicit associations that company's creatives evoke (Reinecke, 2023).

Innovative approaches in computer vision are centered around Convolutional Neural Networks (CNNs). Researchers can now comprehend and interpret emotions more accurately and efficiently thanks to AI-driven facial monitoring tools. They offer insightful information on people's emotional reactions to content, which helps marketers, businesses, and content producers create more memorable and captivating experiences (Allen, 2023). User experience (UX) optimization is critical in the digital sphere, where there is intense competition and short customer attention spans. By identifying the aspects of digital interfaces that users find most compelling, neuromarketing offers insightful assistance in this area. Businesses can create more intuitive and engaging digital experiences that engage customers and foster brand loyalty by researching neurological reactions to website layouts, app designs, and content presentation (Gohain, 2024). The cognitive processes of the user assist AI in deriving inferences from the neural pulse data and in capturing emotions and facial expressions (Etzold et al., 2019).

Subconscious desires are revealed through neuromarketing, and AI uses this information to create hyper-targeted advertising. Through this synergy, brands are able to produce ads that are tailored to audiences' subconscious wants, forging stronger emotional bonds. The application of AI and neuromarketing should be accountable, transparent, and mindful of ethical standards, much like the application of other technologies. To gain the trust of consumers, brands must be transparent about when they use or gather neuromarketing data (Fernandes, 2023).

CONCLUSION

Neuromarketing methods have been changing the understanding of the consumer's subconscious for two decades, pointing out its importance in the creation of marketing strategies. Although such experiments often have the label of pseudoscience with results that cannot be considered relevant and ethical aspects that are debatable, it is undeniable that this field shows astonishing results and potential. The effectiveness of neuromarketing may be seen in many real-world examples, which highlight the potential of comprehending consumer behaviour at a deeper level. Over time, neuromarketing will become methodologically less confused, and with the parallel development of technology and neuroscience, this field will also improve.

Businesses are starting to approach marketing and advertising differently thanks to neuromarketing. The digital environment is changing quickly and continuously as new technologies are developed. With relation to the combination of artificial intelligence (AI) and neuromarketing, neuromarketing reveals the subconscious (hidden) wants of customers in the digital sphere. Through this synergy, brands are able to produce ads that are tailored to audiences' subconscious wants, forging stronger emotional bonds. AI's predictive powers and real-time analysis provide marketers the ability to not only comprehend, but also predict the desires and preferences of their target audience. With the aim of meeting evolving customer demands, this invention heralds the arrival of a new era in dynamic, customized marketing strategies.

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