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An Overview of Neuromarketing Strategy Applied by Marketers as a Marketing Tool

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ABSTRACT : Neuromarketing focuses primarily on brain activities, comprehending consumers' subconscious minds, elucidating their preferences, motivations, and expectations, and forecasting their behavior. Therefore, neuromarketing is the study of how people's brains respond to advertising and other brand-related messages by scientifically monitoring brainwave activity, eye tracking, and skin response. It involves measuring physiological and neural impulses to gain insight into customers' motivations, preferences, and choices. This paper aims to scrutinize neuromarketing strategies applied by marketers as a marketing tool in marketing management and figure out how to deal with them. This study conducts a critical review of existing literature. We summarize the context of neuromarketing, its terminology, concepts, procurement process, real-world business examples, methods and techniques, managerial applications, conclusions, and implications for consumer research. The results indicate that neuromarketing holds significant potential for consumer research, as it facilitates the collection of information and new insights that businesses can use to develop customer-centric ideas. As a result, this review will assist researchers in developing effective approaches to provide better and more efficient services to consumers by utilizing scientific methods to understand how consumers respond to marketing campaigns.

Keywords: Neuromarketing, Neuroscience, Neuromarketing Tools, Managerial Applications, Neuromarketing Ethics.

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1. INTRODUCTION

Marketing has long been a critical part of business operations. The goal of marketing is to identify consumers' needs and wants and create products or services that satisfy them. Marketing strategies have evolved over time as businesses seek to improve their understanding of consumer behavior. In recent years, neuromarketing has emerged as a new and powerful tool for understanding consumer behavior. Marketers have used neuromarketing, a combination of neuroscience, psychology, and marketing, to enhance their understanding of consumer behavior and predict purchasing behavior in complex marketing environments. Marketers who integrate neuromarketing into their strategy can understand and know the buy button (Dr. Reason Masengu et al., 2024). There is currently a growing interest in a deeper understanding of consumer behaviour. In this context, the union of different disciplines such as neuroscience and marketing has given birth to new fields of knowledge, e.g. neuromarketing (Robaina-Calderín & Martín-Santana, 2021). A. A. Mansor & Mohd Isa (2020) strongly relate the central concept of neuromarketing to brain activities, understanding consumers' subconscious minds, explaining consumers' preferences, motivations, and expectations, and predicting consumers' behavior. One of the biggest questions in today's market is what drives consumers to decide on one product instead of another. There is a growing interest in understanding how brain responses influence the decision-making process of consumers. Neuromarketing aims at achieving this goal by applying to consumers an understanding of cognitive

processes and their influence on decision-making, and it has better performance when used jointly with traditional marketing techniques (Jordao et al., 2017). Neuromarketing is an emerging research field that aims to understand consumers' decision-making processes when choosing which product to buy. Businesses eagerly seek this information to enhance their marketing strategies by comprehending the factors that leave a positive or negative impression on consumers. It has the potential to revolutionize the marketing industry by enabling companies to offer engaging experiences, create more effective advertisements, avoid the wrong marketing strategies, and ultimately save millions of dollars for businesses (Khondakar et al., 2024). In recent years, the media has frequently used the term 'neuromarketing'. These public discussions have generally centered around potential ethical aspects and the public's fear of negative consequences for society in general and consumers in particular. Consumers refer to commercial applications of neuroscientific methods as 'neuromarketing' and scientific ones as 'consumer neuroscience' (Javor et al., 2013). Consumers view neuromarketing as a new innovation in marketing, utilizing neuroscience to investigate which stimuli trigger specific customer behaviors. Neuromarketing aims to extract decision-making information from triggers to achieve the desired outcome for marketing objectives. Neuromarketing assists businesses in product development, marketing, and advertising by understanding more about customers' minds through the use of neuroscience advances (Nilashi et al., 2020). Neuromarketing delves into the human brain to enhance our understanding of consumer behavior. Neuromarketing traces neural circuit activities inside the brain using magnetic resonance imaging (MRI) technology (Alsmadi & Hailat, 2021). The marriage of big data 2.0 and political neuromarketing is a new interdisciplinary field of inquiry. Big Data 2.0 and neuromarketing techniques play an unusual role in reading political consumers' minds and helping the controversial candidate meet one of the most unexpected victories in the presidential elections (Hegazy, 2021). Neuromarketing, a multidisciplinary field, uses neuroscientific techniques to study consumer behavior, allowing for objective assessment of emotional and spontaneous reactions, despite the complexity of factors influencing food choices (Stasi et al., 2018). Organizations invest in social networks to connect with target audiences, achieve virality, and increase visibility. Neuromarketing predicts user behavior using biometric measurements, enhancing content engagement and demonstrating social influence, as users often mimic others' actions (Vences et al., 2020)

2. HISTORICAL BACKGROUND

Neuroscience, the study of the brain and how humans process their daily activities, has always been part of other fields (such as neuropsychology in the psychological context). Historically, most neuroscience applications were medical, such as diagnosing and treating attention-deceit disorders, in addition to some other applications in criminology, like eyewitness testimony. The best connection between marketing and neuroscience was in the 1980s, when scholars from both fields joined to improve understanding of consumer behavior by directly observing mental processes inside the human brain (Alsmadi & Hailat, 2021). The term ‘‘neuromarketing’’ (NM) is a recently invented moniker. The Economist (2004) credits Jerry Zaltman with initially proposing a union of brain-imaging technology with marketing in the late 1990s, and when the Atlanta marketing firm, Bright House, opened a neuromarketing division in 2001, the synthesis of neuroscience and marketing began to attract attention in science, business, and journalism (H. Kumar & Singh, n.d.). However, Professor Ale Smidts first coined the term neuromarketing in 2002, characterizing it as the study of the brain's processing of consumer context (buy behavior—how and why they buy). Two US companies (Bright House and Sales Brain) were the first to offer neuromarketing consulting and research services. They promoted the adoption of technology and knowledge from the cognitive neuroscience field within the business context (Iloka & Onyeke, 2020). Gemma Calvert, who founded Neuroscience in 1999 after achieving a PhD in cerebral imaging at Oxford University and publishing papers in the prestigious Science and Nature journals, serves as an example. Revolutionizing the medical world, the pharmaceutical industry, and even the economic sciences, neuroscience has an influence much greater than world awareness (GEMMA, 2004). Baylor College of Medicine in Houston hosted the first-ever neuromarketing conference in 2004. "Meme" is the foundation of neuromarketing. A meme is a unit of information stored in the brain. These units are effective at influencing humans, who are making choices and decisions within 2.6 seconds. Proper selection of a meme can help us recall positive messages, jokes, or songs,

and encourage us to share them. Marketers influence how we remember memes (H. Kumar & Singh, n.d.). In early 2012 saw the launch of the World Neuromarketing Association, an institution that annually organizes the World Neuromarketing Forum. The Neuromarketing Science & Business Association (NMSBA, 2019), the world's first neuromarketing association, has as its mission and objectives the following: promotes the collective interests of neuromarketing professionals; contributes to the development and implementation of international standardization guidelines and to neuromarketing discipline; undertakes to deal with the recognition of discipline, professional ethics and professional codes to be respected; promotes the value of discipline in neuromarketing; encourages members to deepen their specialist knowledge; communicates recent results and knowledge about research among its members; communicates news about neuromarketing; brings together professionals and scientists at international level; protects general social interests related to neuromarketing; communicates information in national and international debates in the field. Starting in 2012, the Neuromarketing World Forum (NMWF, 2019) is the annual event organized by NMSBA that focuses entirely on this emerging field, neuro-science research, consumer insights, and business outcomes. The conference's goal is to bring together top-notch neuroscientific researchers and business professionals to discuss the main challenges and opportunities in using neuromarketing tools to enhance and add value to marketing research. Organizers welcome marketing directors, neuromarketing researchers, neurologists, media directors, and, of course, people with a professional interest in neuromarketing. In its first year, the event brought together not less than 100 researchers specializing in neuromarketing, who extensively discussed topics to help them in the further development of their projects (Gurgu et al., 2020). Nikki Westoby (2019), Director of Neuroscience at Nielsen Consumer Neuroscience, the largest market research company in the world, said recently in an article called The Future of Neuromarketing that “Consumer neuroscience’s much-improved diagnostic capabilities are rapidly making it an essential part of the creative process. Does this imply that we have all the answers now? Of course, this is not true. Human beings are complex. No single technology has a monopoly on the truth.” In the last two decades, neuromarketing (NM) studies have snowballed because scientists and researchers are looking to understand the mechanisms of decision-making in the consumer's brain toward marketing stimuli. NM research uses state-of-the-art technology to gauge the responses of consumers’ minds to marketing stimuli, which is impossible with traditional marketing methods (Alsharif et al., 2021). Hubert & Kenning (2008) Neuromarketing, or consumer neuroscience, is a sub-field of neuroeconomics that addresses marketing-relevant problems using brain research methods and insights. With the help of advanced techniques of neurology that are applied in the field of consumer neuroscience, a more direct view into the ‘‘black box’’ of the organism should be feasible (Hubert & Kenning, 2008). The emergence of new denominations with the prefix "neuro" (neuroeconomics, neuromarketing, neurocriminalité, neurorecrutement, etc.) may suggest that the combination of neuroscience with other disciplines is a fashion phenomenon, which would benefit mainly neuroscientists who are adepts of the movement as well as advertisers (Touhami et al., n.d.). Currently, the marketing mix incorporates neuromarketing, the classification of neuroimaging, and physiological tools, emphasizing the neural responses of consumers' behavior, such as emotions, attention, motivation, reward processing, and perception, for consideration (Alsharif et al., 2023). Neuromarketing is the application of neuroscience to marketing. It involves the direct use of brain images, scanning, or other brain activity measurement technology to measure an entity’s response to specific products, packaging, advertising, or other marketing elements (Devaru, 2018). Marketing practitioners can develop attractive advertisements with emotional content to create a favorable brand image in consumers' minds, according to Ambler et al. (2000). This synthesizes the view that emotions play a role in persuading customers to make decisions to buy products or services. Food companies are interested in using neuromarketing as a marketing tool to fully understand consumers' implicit buying behaviors and avoid placing advertisements and products in the wrong target groups. Food companies are interested in using neuromarketing as a marketing tool to gain a competitive advantage, better serve consumers' needs, and contribute to consumers' health (Köhler, n.d.). Hussein & Dr. Bahire Efe Ozad (2023) explore the potential applications of neuromarketing in advertising, branding, consumer behavior, and user experience, showcasing its ability to revolutionize how brands engage with customers.

3. DEFINING THE CONCEPT OF NEUROMARKETING

Understanding the fundamental functional mechanisms of the nervous system forms the foundation of neuromarketing, a tool for customer relationship management (CRM) (Plakhin et al., 2018). Neuromarketing is a marketing branch that uses medical technologies, such as magnetic functional imaging (fMRI), to understand cerebral responses to marketing stimuli. Researchers use fMRI to assess behavioral changes in different parts of the brain to find out why individuals make their resolutions and decisions and what part of the brain urges them (Mallik, 2021). Conceptually speaking, neuromarketing research considers both qualitative and quantitative aspects of research methodology. Qualitative aspects cover issues like the content, medium, and mode of delivery of contents to customers, while quantitative research stresses issues like the duration of exposure of advertisements to consumers (B. Devaru, 2018). Neuromarketing is a branch of study that was previously communicated to focus on the application of consumer neuroscience in the marketplace by employing neurophysiological tools (such as functional magnetic resonance imaging, eye tracking, and electroencephalography) to conduct specific researches with particular focuses on the market. The main objective of neuromarketing is to understand how the different areas of the brain function when consumers are exposed to market stimuli, and to help the marketer highlight and report on the correlation between consumers' behavior and their neurophysiological systems (Iloka & Onyeke, 2020).

Figure 1: Conceptual Framework of Neuromarketing

Neuromarketing explores how emotions affect human decision-making and apply the knowledge to improve marketing. The principle is put into practice while designing products, enhancing promotions and advertising, pricing, designing stores, and generally enhancing the customer experience (Yadete & Kant, 2023). As Neuromarketing is a focus of marketers and consumer behavior researchers, different strategies from marketing have been applied in Neuromarketing and they are being investigated for quantitative assessment from neurological data (Rawnaque et al., 2020). Consumer neuroscience, neuromarketing, and neuroaesthetics are three subfields of neuroscience, and play a key role in the design's products, experiences, or services since they are concerned with how our brain perceives, process and reacts to the various stimuli presented in our environment (Sánchez-Núñez et al., 2021). The neuromarketing phenomenon has led to a makeover in the marketing area, and its application in the business world has generated a better insight into understanding diverse consumer behavior. Neuromarketing can facilitate sustainable products and practices by understanding consumer behavior (Singh et al., 2023). Neuromarketing is a promising and emerging field with tremendous potential for application in the functional areas of marketing, brand management and advertising. It has emerged after bringing together applicable concepts from the field of neural-science, psychology, human neuro-physiology and even neurochemistry. Some popular definitions of neuromarketing by authors are listed here:

Table 1: List of Neuromarketing Definitions

Author	Definition of Neuromarketing
Lee, Broderick, & Chamberlain (2007)	"Neuromarketing is an academic area that applies neuroscientific methods to analyze and understand human behavior in relation to marketing exchanges, rather than using neuroimaging techniques to sell products or services."
Hubert & Kenning (2008)	Neuromarketing is a business activity rather than an academic area.
Kenning & Plassmann (2008)	Neuromarketing, in combination with classical marketing research theories, can add crucial insights into humans' decision-making processes, as "functional brain imaging techniques allow real-time observation of the underlying brain processes during pre-purchasing, purchasing, and post-purchase stages of the consumer's decision-making process in a laboratory environment.".
Ciprian Marcel, Lăcrămioara, Ioana, & Maria (2009),	"Neuromarketing is to understand how the brain determines consumers' behavior, and it implies the study of the process of choosing different brands as well as the identification of the factors determining the choice."
(Kumar, 2015)	Neuromarketing is defined as a new branch of marketing that makes use of technology to determine a consumer's internal, subconscious reaction to products and brand names in order to plan effective marketing strategies.
(Daugherty & Hoffman 2017)	Neuromarketing is the application of neuroscience measurement techniques to understand how consumers respond, both consciously and unconsciously, to marketing.
(Harrell 2019)	Neuromarketing also refers to the measurement of physiological and neural signals to gain insight into customers' motivations, preferences, and decisions, which can help inform creative advertising, product development, pricing, and other marketing areas.
Gurgu (2020)	Neuromarketing refers to the use of techniques developed by cognitive neuroscience and psychology specialists to analyze and understand people's reactions to products and promotions, which allows refining marketing efforts to make them more effective.
(Kiran & Prabhakar, 2021)	Neuromarketing is a method of marketing that uses brain recording techniques to monitor electric, metabolic, and non-brain activity such as facial, skin, heart, and eye-tracking movements to extract business insights.
(Royo-Vela & Varga, 2022).	Neuromarketing is the union of cognitive psychology, which studies mental processes; neurology and neurophysiology, which study the functioning and responses of the brain and body physiology to external stimuli; and marketing, which studies valuable exchanges, to explain marketing effects on customers' and consumers' behaviors and on buying and decision processes.

Neuromarketing is defined as the direct use of brain imaging, scanning, or other brain activity measurement technology to measure a subject's response to specific products, packaging, advertising, or other marketing elements (H. Kumar & Singh, n.d.). According to Hammou, K.A. et al. (2013), the most comprehensive definition of neuromarketing today is likely this: "Neuromarketing is widely defined as the science that uses MRI, EEG, TMS, MEG, fMRI, and other brain wave tools to view the human brain's responses to marketing stimuli to figure out what customers' thoughts are toward a product, service, advertisement, or even packaging to perfectly construct marketing campaigns that are based on the human brain's response." Conceptually, neuromarketing

encompasses three primary disciplines or fields: neuroscience, marketing, and psychology, with its core function being to explore and understand consumers' subconscious minds for a meaningful decision-making process (Javor et al., 2013).

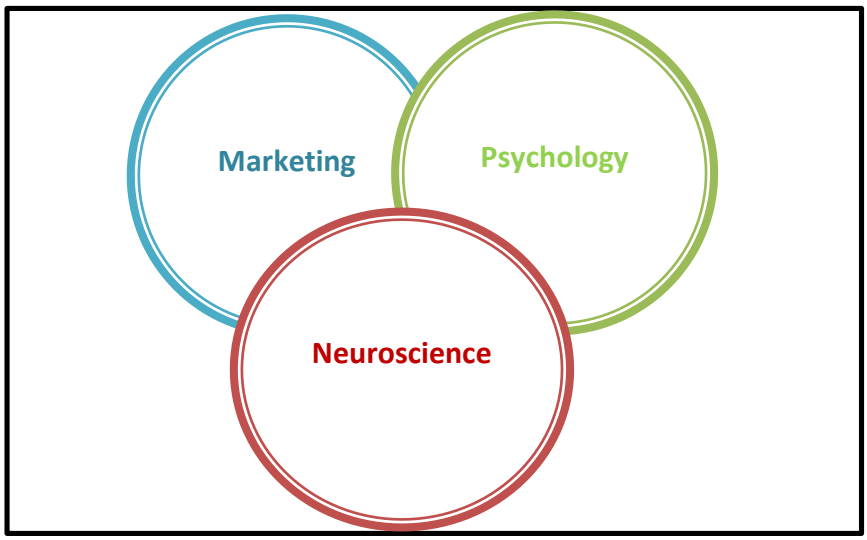

Figure 2: Basic Areas in Neuromarketing

It is possible to observe that some notions about neuromarketing are convergent. Among the most recurring themes in the category "definition of neuromarketing" were the understandings of neuromarketing as the measurement of brain activities; a research tool; research on consumers' behaviour; a field belonging to neuroscience; a marketing tool; the measurement of emotions and psychological processes; a commercial technique; the analysis of physiological and cognitive processes related to the nervous system; and a form of representing behaviours in images and colours (Fortunato et al., 2014). Neuromarketing can be defined more comprehensively as follows:

Neuromarketing is an interdisciplinary branch of knowledge that is predicated on the use of neuroscientific concepts, theories, and methods (or tools and techniques to record brain and neural activity during behavior) to study the brain and nervous system in the pursuit of understanding instinctive (or natural) human behavior, in terms of cognitions and emotions, conscious and unconscious, in response to a marketing stimulus (e.g., markets, marketing exchanges), whereby the knowledge resulting from a neuromarketing investigation contributes to the development and advancement of marketing theory and the planning and implementation of marketing strategies, with (e.g., to make a sale) and without (e.g., to influence behavior for a social good) commercial marketing goals (Lim, 2018).

Such a definition has five main upshots. **First,** it clarifies the nature of knowledge relied on and developed in neuromarketing—i.e., interdisciplinary. **Second,** it explains the type of methods used in neuromarketing—i.e., neuroscientific methods. **Third,** it elucidates the outputs of using those methods—i.e., studies on the brain and nervous system. **Fourth**, it makes clear the outcomes of those outputs—i.e., understanding of instinctive human behavior in applied marketing settings. **Fifth,** it delineates the impacts of those outcomes—i.e., conceptual and managerial implications for marketing theory and for planning and implementation of marketing strategies.

Neuromarketing practices a mixture of marketing and neuroscience methods with the aim of observing the nervous and mental procedures that control a person's choices and actions. Neuromarketing can involve various detectable subjects. Daugherty and Hoffman (2017) introduced a reorganized and updated taxonomy, including six different classifications to frame existing research in terms of desired marketing outcomes. The categories are consumer attention/arousal, brand extensions, product/brand appraisals, purchase behaviors, memory, and product/brand preferences (Daugherty & Hoffman, 2017).

Table 2: Neuromarketing Taxonomy

Category	Focus
Attention/arousal	Features stimuli eliciting attention and emotional arousal.
Product/brand appraisal	Neurological correlates of various marketing-based judgments.
Product/brand preference	Differences between preferred and non-preferred brands.
Purchase behavior	External and internal influences on consumer behavioral and intentions.
Memory	Factors contributing to the future recall and recognition of marketing stimuli.
Brand extension	Neural indicators of successful and non-successful brand extensions.

Nilashi (2020) said there are two major reasons for the marketers' enthusiasm. Firstly, marketers anticipate that neuroimaging will demonstrate a more efficient interaction between cost and benefit. Marketers' enthusiasm for brain imaging stems from their expectation that it offers a precise marketing research technique, even before the product's launch (Nilashi et al., 2020). Meyerding and Mehlhose (2020) researched the value of using neuromarketing as a marketing tool. When using tools such as neuroimaging besides traditional marketing research techniques, the aim is to provide data that is not obtainable through common marketing approaches (Meyerding & Mehlhose 2020). Neuromarketing offers cutting-edge methods for directly probing minds without requiring cognitive or conscious participation. If neuroscience is considered to be in its infancy, neuromarketing is clearly at an embryonic stage. Marketers are just awakening to the possibilities offered by unveiling the brain circuits involved in seeking, choosing, and buying a product (Morin, 2011). Neuromarketing, a field that combines neuroscience and marketing, helps businesses understand consumer behavior and how they respond to advertising stimuli. Its aim is to investigate consumer purchase intention and preferences to improve the brand's marketing management based on neuroscientific tools such as emotional arousal using Galvanic Skin Response (GSR) sensors, eye- tracking, and emotion analysis through facial expression classification (Zeng & Lobo Marques, 2023).

4. ORIGIN OF NEUROMARKETING ORGANIZATIONS

Neuromarketing is considered a symbiosis of separate disciplines: psychology and psychophysiology, traditional marketing and economics, neurobiology, econometrics, etc. Organizations like Singapore Airlines, Nike, Starbucks, automotive companies, and universities have demonstrated the application of neuromarketing technologies and behavioral economics (Plakhin et al., 2018). Neuromarketing has experienced rapid growth, leading many startups to adopt it as their primary service offering. Companies are using outsourcing services to improve the outcomes of marketing and marketing studies (Mallik, 2021). Here are some examples of neuromarketing companies that are influencing the marketing mix of renowned marketers:

- **Bright House**

The American advertising company Bright house was the first to introduce the word neuromarketing in a press release in 2002.

- **NeuroFocus (Now Nielsen Consumer Neuroscience)**

NeuroFocus was an American neuromarketing company, which was acquired by the worldwide market research company The Nielsen Company in 2008 and was thus renamed Nielsen Consumer Neuroscience. Millward Brown Millward Brown, was founded in Britain and now has several locations in Europe, America, Asia, Middle East and Africa. (Millward Brown 2014c).

- **Neuroscience**

London-based Neuroscience was founded by Gemma Calvert and was allegedly the first to conduct fMRI scans for commercial use (Neuroscience 2013a). Neuroscience lists several famous brands among their clients, i.e. BBC, Coca Cola, Ford, Heinz, Intel and L'Oreal (Neuroscience 2013b).

- **Neuro-Insight**

Neuro-Insight was founded by Professor Richard Silberstein in 2005, operates in the USA, UK, Germany and Australia and offers neuromarketing services specializing in the field of marketing communications (NMSBA 2013).

5. THE WORKING PROCESS OF NEUROMARKETING

Neuromarketing is a discipline that studies the various reactions and actions that consumers have in the market. Advertising and marketing serve as its origins, but what sets it apart are the brain responses that trigger consumer impulses. Neuromarketing focuses on three main aspects: emotion, attention, and memory. Based on these three concepts, neuromarketing first seeks the attention of the person viewing the ad, then sends some emotion to the product. Eventually, the product comes into view when the viewer is already attentive to it, allowing them to recall the brand in the future (Gurgu et al., 2020).

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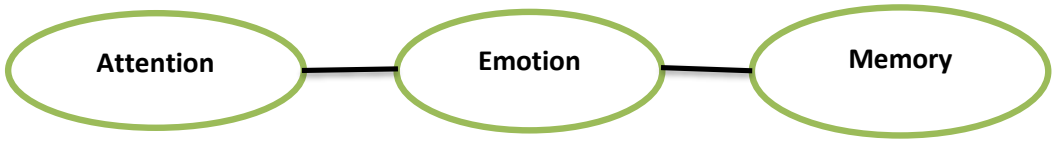

Figure 3: Three Aspects of Neuromarketing

Neuromarketing investigates brain imaging and clinical psychology to understand people's thoughts and emotions when they view print, encounter messages from various brands, watch TV, shop, browse the internet, play video games, or receive training in various activities.

5.1 Theoretical Neuromarketing Procurement

A theoretical framework is always necessary before getting into further details of literature reviews. Previous studies need to be introspected, which had analysed the different parts of human brain as they played a significant role in emotional and cognitive functions (Solnais et al., 2013). Neuromarketing, uses investigation of brain imaging and clinical psychology to discover what people think and feel when they look at prints, are exposed to messages from different brands, watch TV, shop, and browse internet, play video games or are trained in various activities. often called consumer neuroscience, neuromarketing is a sub-area of neuroscience that addresses relevant marketing issues with methods and perspectives from brain research. The essence of this science is to explore the human brain with images that bring positive emotional responses and which at the same time activate the stimuli on which a subsequent acquisition is based. So, the goal of neuromarketing is to discover exactly what people want, studying how the brain is physiologically affected by advertising and marketing strategies (Gurgu et al., 2020). Theoretical neuromarketing gives us a new theoretical framework to understand consumer behavior and decision-making processes, especially the procurement process. We can focus on how unconscious reactions influence people's behavior and purchasing decisions. The new patterns of human action explain the phases that people encounter before acting, which consist of two unconscious and conscious phases:

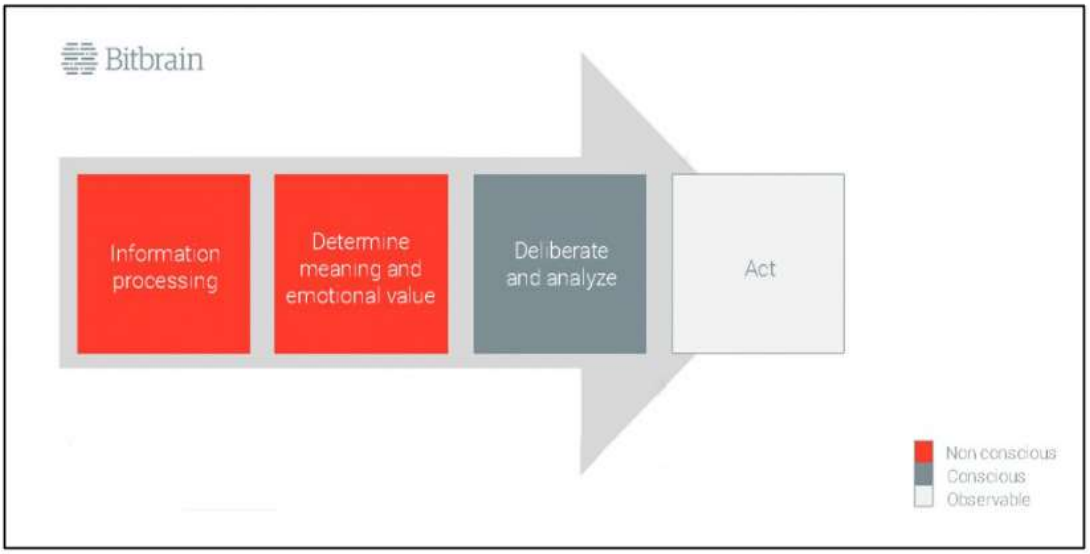

Figure 4: Neuromarketing Procurement Phases (Gurgu 2020)

a) Information Processing

Attentional and unconscious processes are responsible for choosing what kind of stimuli attract our focus or not. This depends primarily on: (i) whether these stimuli are different (attention from bottom to top); or (ii) whether our brain thinks these stimuli are important (top-down attention). Attention processes play a crucial role in the decision-making process by considering various options.

b) Identifying the Meaning and the Emotional Value

Our brain recognizes the information received by our senses non-consciously, and provides it with meaning and emotional value. That's why, when we make an unconscious decision, we already have a preferred option.

c) Deliberation and Analysis

It includes conscious cognitive tasks, such as recovering memories, interpreting the past, anticipating the future, planning, intentions generation, evaluation and judgment, simulation, problem solving, calculation and reasoning. This phase can make us choose an option, which is not necessarily the most attractive one from an unconscious point of view.

5.2 Applied Neuromarketing Procurement

Many neuromarketing "experts" try to transmit the idea that neuromarketing can substitute and provide more rigorousness than traditional research techniques. The truth is that neuromarketing does not have a substitutive role, but is complementary. By combining traditional research techniques with neuromarketing, it is possible to obtain a holistic vision of the consumer's reaction. The main advantage of applied neuromarketing is that it provides an additional layer of information that cannot be obtained with other traditional market investigation techniques. Performing an applied neuromarketing study is not just about putting the technology on the participant and demonstrating the stimulus we want to evaluate. The steps required for the correct study are:

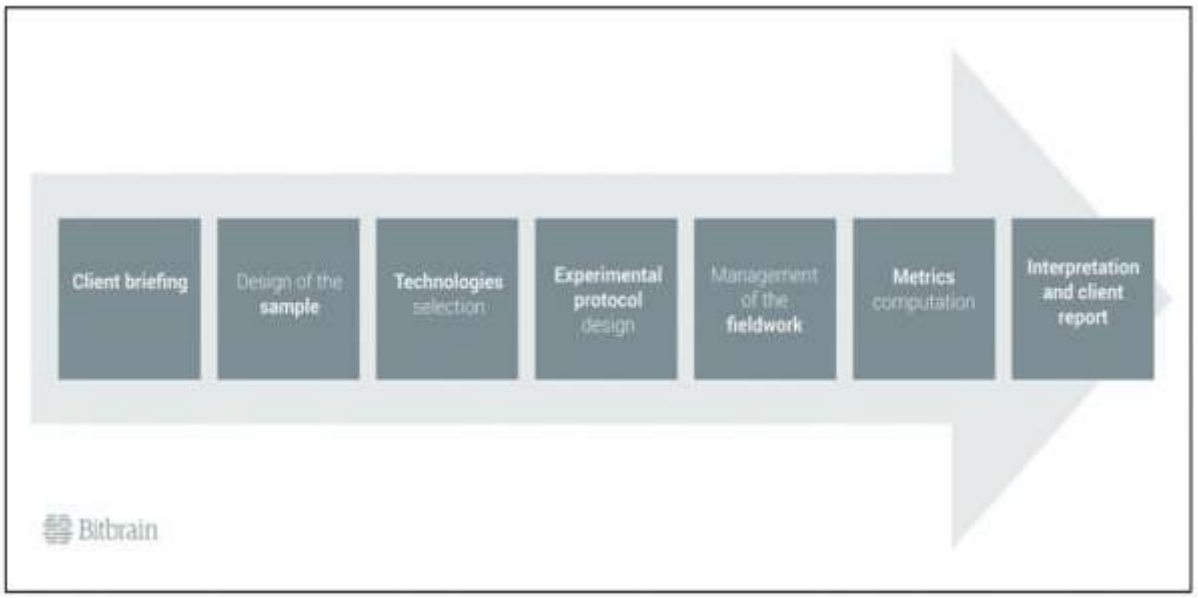

Figure 5: Applied Neuromarketing Procurement (Gurgu 2020)

a) Client Briefing

Fundamental to understand the client's real goals and needs in order to design a value-giving study.

b) Definition of the sample to be included

The type of sample depends on customer information, no further considerations (if decoding computing models) other than those included in the traditional market study are required. As far as sample size is concerned, ideally at least 40 people should be included.

c) Technologies to include

Again, this depends on customer information and objectives, it is interesting to obtain specific values and therefore certain techniques are preferred. It is also very important to use high quality technologies to avoid a low reliability of results.

d) Designing the Experimental Protocol

A neuromarketing study is a neuroscience study, and therefore the design protocol must control many aspects and take many design decisions: what stimuli should be shown? For how long? In what order? Should be included rest periods? Is the study developed in a controlled context or in a real context? What kinds of tasks should the participants fulfill? How can the researcher control learning or order bias, etc.? This is one of the most complex steps to become familiar with neuroscience.

e) Organize and execute field work

Depends on the objectives of the study, but a researcher can usually perform all field work related to a sample of 40 people within a week. Not to forget to prepare the informed consent form and dedicate an additional week to recruitment, implementation of the study (it is very important to have a good laboratory) and to carry out a small pilot study with 2-3 people to validate the procedure and train the staff.

f) Get Values

In the context of neuromarketing, it's convenient to rely on technology that delivers the desired values. It is important to know how to select a lab with good decoding algorithms.

g) Interpret the results

This is a key and difficult step because it means you can extract valuable information from your values and answer customer questions during the briefing. If more information is available (and from other sources), more value can be obtained from the study. The information should be synthesized to provide a positive outcomes report.

6. PRACTICAL EXAMPLES OF NEUROMARKETING IN THE BUSINESS WORLD

A new marketing research tool, i.e., neuromarketing, which makes use of brain research in a managerial context, has gained increasing popularity in the academic literature as well as in the practical world. Almost all industries, including the automobile, IT, FMCG, and entertainment sectors, have incorporated neuromarketing (H. Kumar & Singh, n.d.). Large corporations such as Microsoft and Google have been known to use insights from neuromarketing techniques in both market analysis and product development. In developing SEO structures, Google used neuromarketing techniques to compare websites and find the content that is most relevant and engaging. Google rewarded websites that had strong visual appeal, unique content, and the ability to deliver emotional engagement that increased retention. Both of these examples indicate that companies working with neuromarketing are using the techniques for different purposes and in different areas. Below, we list some of the best-known examples of companies using neuro-insights in recent years.

6.1 Frito-Lay

Frito-Lay has used neuromarketing in both their TVCs and package designs. A few years ago, prior to a product launch in the potato chip segment, they did some product design testing, and the results yielded some crucial findings. They discovered that shiny bags with pictures of chips triggered negative responses compared to bags with a matte design. These findings, in conjunction with in-depth interviews, eventually resulted in changes regarding color, typing, imaging, and so on. This marked the end of shiny Frito-Lay bags on store shelves.

6.2 Cheetos

Frito-Lay also tested a Cheetos commercial using a combination of focus groups and EEG. The advertisement for Cheetos featured a woman performing a prank on another person by putting orange snacks in a dryer full of white clothes. Participants in the focus group initially stated that they disliked both the prank and the commercial. When running an EEG study on the same participants, they found positive brain activity, showing people actually loved the ad. Participants stated otherwise in the initial interviews because they didn't want to appear mean-spirited in front of other group members.

6.3 Hyundai

Hyundai and their prototype tests are another famous example of neuromarketing in design. Hyundai used the EEG technique to evaluate its design. While letting consumers examine car prototypes, Hyundai used the EEG to understand preferences and what kind of stimulation can lead to a purchase decision. Hyundai later made some exterior design adjustments, according to the findings.

6.4 Yahoo

Yahoo used neuromarketing to evaluate a 60-second television commercial. The ad featured happy, dancing people from all over the world and was part of Yahoo's new branding campaign with the goal of bringing more users to the search engine. Yahoo ran some tests using EEG- techniques before airing the ad on TV and online. The ad performed well in the neurotests, stimulating areas controlling memory and emotional thought.

6.5 Pay pal

Ebay's PayPal used neuromarketing to get more e-shoppers to use its online payment service. PayPal discovered that commercials focusing on USPs such as speed and convenience triggered a significantly higher response in

the brain compared to promoting functions such as safety and security. Pay Pal used these insights to create new advertising for their online payment service.

6.6 Microsoft

Microsoft is using EEG data to demonstrate how engaged gamers are when they use an Xbox. Working with EmSense, Microsoft put EEG caps on gamers and showed them ads on the videogame system. The system monitored the areas of the brain that the ads stimulated.

6.7 Ford Motor

DaimlerChrysler, Ford of Europe, and other automakers are using medical research tools to examine the way consumers think in order to make sales messages more effective. Among the provocative early results from electrodes-on-the-scalp and magnetic resonance imaging scanner research: images of sports cars affect the pleasure center of the male brain in the same way as sex, cocaine, and chocolate.

6.8 Media

The media industry frequently uses neuromarketing. **For example,** to test consumers' reactions to movie scripts or trailers, to see which parts of a website attract the eyes of visitors, or to see how people react to certain songs, it is, however, rare that movie studios, moviemakers, or others in the business willingly admit to using the practice (Randall 2011).

6.9 Procter & Gamble

P&G is utilizing neuromarketing tools to revitalize the Febreze air freshener product concept, with the aim of enhancing its sales performance. The company filmed several hours of people cleaning their homes, looking for clues that could help connect Febreze to people's daily habits. Febreze has since developed dozens of home fragrance solutions, selling over a billion dollars a year. The new concept has made Febreze one of the best-selling products in the world.

6.10 Coca-Cola vs. Pepsi

We compared beverages from two popular brands to explore the cultural and emotional factors that influence consumers' choice between the two beverage brands. Applying FMRI, surveys have confirmed that people make their decisions primarily on an unconscious level, based on their own memories or impressions of a particular brand, and only later are they guided, for example, by the taste of a drink.

7. NEUROMARKETING TECHNIQUES AND TOOLS USED BY MARKETERS

According to Antoniak (2020), neuromarketing technologies provide invaluable information on the subconscious mental processes influencing the customer's behavior. Consumer neuroscience uses neuroscientific tools for quantitative evaluation of marketing stimuli, for example, advertising communications, brand images, pricing decisions, and value preference evaluation (Harris et al., 2018). Neuromarketing applies neuroscientific techniques to analyze the reactions of consumers when they are exposed to marketing stimuli. By measuring these reactions, researchers are able to quantify emotional, behavioral, and cognitive states that are not accessible to the reflexive mind. Neuromarketing techniques complement traditional marketing research methods such as focus groups, surveys, and interviews, by providing an essential layer of information on the motives that shapes and drives consumer's behavior.

7.1 Functional Magnetic Resonance Imaging (FMRI)

Functional magnetic resonance imaging is a noninvasive neuroscientific technology using radio waves and magnetic fields to measure neural activity (function), whereas magnetic resonance imaging measures brain structure (Ahlert et al., 2006). An fMRI records signals and variations of blood-oxygen-level-dependent activity in various brain regions of interest. We use an MRI scanner to measure the blood oxygen level, which can

indicate increased brain activity in certain regions (Ariely & Berns, 2010). The magnetic field can detect blood oxygen levels in the brain. Therefore, if neural activity in a certain brain area increases, oxygen-rich blood increases too, because oxygen is required by the brain to work. Marketing primarily uses FMRI, a form of non-invasive neuroimaging technology.

7.2 Steady- State Topography (SST)

SST, originally called steady-state probe topography, is a variant of EEG, which measures the speed of information processing in the brain. Due to its fast temporal resolution, TV commercials commonly use SST for testing. Researchers have utilized SST to assess the memory and engagement effectiveness of advertising, focusing on the long-term memory encoding of the key message and branding image as a potential predictor of future behavior. Another area where SST is used is in processing emotional faces with moving and still images; telling the difference between genders more accurately than emotions; the Williams card sorting test of the prefrontal lobe during decision-making; and attention visually evoked potential topography (Harris et al., 2018).

7.3 Electroencephalography (EEG)

The EEG is a widely used tool that examines brain activity. The electrical activity is recorded on the scalp by evaluating the voltage variations from neurons firing in the brain. Several electrodes positioned directly above the cortex on the scalp record these electrical activities over time. The EEG has the following key benefits: it is non-invasive, portable, cost-effective, and relatively simple to use, and it has an exceptional temporal resolution (up to milliseconds). The international 10-20 system is a method used to name electrodes based on their location on the scalp (Aldayel et al., 2020). EEG recordings can be highly susceptible to internal (endogenous) artifacts such as eye movements, speech, perspiration, and upper-body muscle contraction and movement (Harris et al., 2018).

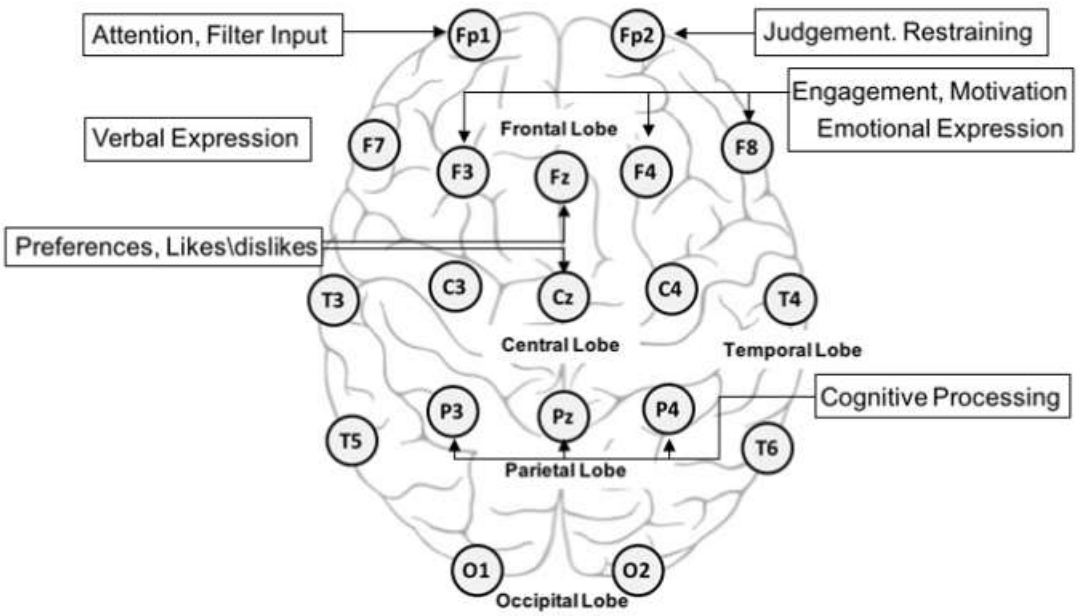

Figure 6: EEG electrodes and related neural functions

This brain scanner is nowadays used by neuromarketers to look at people's brains in order to create alluring ads, websites and packaging that press the customer's buy buttons.

7.4 Eye-Tracking (ET)

ET is considered the most popular physiological tool to record eye movements, attention, visual stimuli, fixations, saccades, and pupil dilation. The major advantages of ET are its portable, low-cost, and non-invasive nature. Testing ads (e.g., picture, videos, color, brightness), product (e.g., brand, label, position instore), and design (e.g., product, website, package, usability of the website) are major eye-tracking measures (Alsharif et al., 2021). Eye-tracking systems have become more accessible with technological advancements that can perform automated analyses, even integrated with Google Glass, allowing subjects to move freely while wearing the lightweight gear and to record what they are looking at and focusing on. ET also assesses the effectiveness of advertisements, the valence or pleasure of some stimuli, attention, memory, and information processing. It can be used to analyze decision speed, visual saliency, and communication (Isabella et al., 2015).

7.5 Galvanic Skin Response (GSR)

The basic principle of GSR, the most widely used physiological indicator, is the measurement of continuous changes in the electrical characteristics of the skin, which manifest as a consequence of the variation of the individual stages of skin perspiration (Pluta-Olearnik & Szulga, 2022). An emotionally relevant stimulus causes an objective excitation, which this technique measures. This method directly connects the central nervous system to the reactions recorded on individuals' hands, identifying the neural responses that precede certain emotions like happiness, sadness, fear, anger, disgust, and indifference (Banks et al., 2012). Skin conductance is used to identify and measure psychological and physiological arousal. Its most common use is in lie detection technology. The galvanic skin response also measures the pulse rate. The fluctuations in the pulse reveal the level of excitement or stress that the person experiences as a response to certain triggers (H. Kumar & Singh, n.d.).

7.6 Neurotransmitter (NT)

Neurotransmitters (NTs) are chemical substances that enable transmission of neurological signals from one neuron to another target neuron. They are released from vesicles in synapse and received by receptors of the target neuron. Most NTs are produced from common precursors, such as amino acids and peptides, and require minimal biosynthetic steps for conversion. The ways of stimulating these substances in neural systems are available, such as overloading or depleting a specific NT (e.g., phenylalanine, serotonin, tyrosine) through dietary controls. When used together with other neuroscientific methods that record neural activity inside and outside the brain, neuromarketers will be able to test for the necessity, sufficiency, and association of neuropsychological processes and consumer behavior(Lim, 2018).

8. MANAGERIAL APPLICATIONS OF NEUROMARKETING IN MARKETING MANAGEMENT

According to Deb (2021), neuroscience can reveal the interdisciplinary side of marketing strategies and consumer behavior. It provides a comprehensive understanding of complex information processing and thought processes such as selection, decision-making, reasoning, attitude, emotion, and memory, all of which have a significant impact on marketing management. It has a great impact on various topics such as segmentation, targeting, positioning, brand equity, brand loyalty, product development, pricing, decision-making, and advertising (Deb, 2021). According to Kiran and Prabhakar (2021), neuromarketing techniques possess the capacity to understand the consumer's mindset, thereby creating opportunities for new business innovations. The application of tapping into the client's mental experience in marketing encourages them to delve deeper into research and evidence, leading to the emergence of neuromarketing as a novel tool in market research. Companies such as the BBC, Coca-Cola, Ford, Heinz, Intel, L'Oréal, P & G, Hyundai, Microsoft, Yahoo, and eBay have used neuromarketing as a market analysis tool (Mallik, 2021). Managers must also embrace this evolving trend of marketing, advertising, and marketing to establish their brand in the subconscious minds of their customers.

8.1 Neuromarketing and Branding

According to Baalbaki and Guzm (2016), a brand is one of the most valuable assets for companies and organizations. Currently, brand management has shown a growing awareness among consumers as emotional and less rational choice makers. Functional Near-Infrared Spectroscopy (FNIRS) is an appropriate neuroimaging technique for predicting ‘‘first-choice-brand.’’Guo et al. (2018) investigated the effect of disclosures on viewers’ brand responses using ET and EEG, which have largely impacted cognitive and emotional responses (e.g., awareness, recognition, and attitude) toward brand placement. Marketers can apply neuroscience tools to gain insight into consumers’ intentions towards their products and services, which can help them test their branding and marketing strategies before actually implementing them in the target market. Marketers can choose the best strategies for promoting their product, such as celebrity endorsements or associations with social or environmental causes (Agarwal & Dutta, 2015). Through an evoked response potential test, Intel has achieved more effective brand positioning worldwide and redefined the company's image in line with consumer perceptions and expectations. There are significant differences between men and women's thinking that go beyond cultural boundaries. As a result, advertisers create and develop new campaigns with clear brand repositioning (Pluta-Olearnik & Szulga, 2022).

8.2 Neuromarketing in Advertising

Neuromarketing is a relatively new technique for designing marketing strategies, particularly advertising campaigns. With the application of artificial intelligence and neuromarketing, it is possible to determine consumers’ reactions to a product or brand they watch in an advertisement or see where their brain is moving (Ahmed et al., 2022). Neuromarketing has aroused considerable interest in scientific research about consumer behavior in the advertising industry, which is searching for an alternative to traditional techniques for measuring efficacy. Neuromarketing provides more objective data and is closer to what really happens to consumers when they are exposed to an advertising message (Baños-González et al., 2020). Each advertisement transferred a different emotion (e.g., disgust, anger, surprise, rationality, and sadness). Calvert et al. (2020) utilized the impulse test to investigate the emotional reactions, such as joy, happiness, and sadness, to dynamic visual stimuli like movie clips or TV ads. Physiological techniques such as ET are employed to measure and record consumers’ visual attention (e.g., eye movements, fixations, and pupil dilations) toward advertisements such as YouTube videos, trials, and images (Alsharif et al., 2023). Paul McLean, a neurologist, suggested a model of the human brain composed of three imbricate structures, such as the primitive, emotional, and rational brains.

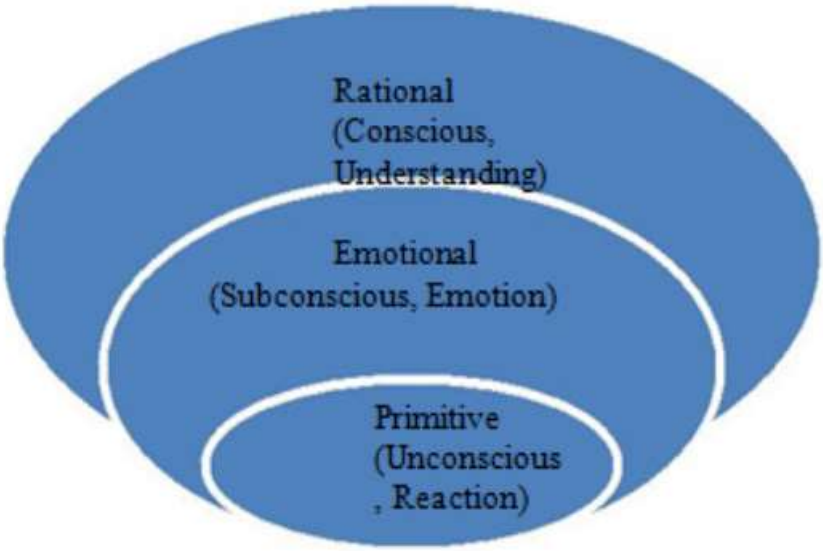

Figure 7: Model of Human Brain

To be effective, advertisers initially need to target the emotional brain and then the primitive brain, which leads them to open the channel of attention, which then transmits information to the rational brain. Many researchers

assumed that the right side of the brain stores and processes nonverbal, holistic, and pictorial images (S. Kumar, 2015). Brain imaging focuses on the investigation part of the brain, which responds to emotionally engaging ("affective") and reason-engaging ("cognitive") advertising stimuli. In order to understand how advertising works (Ambler et al., 2000), four phases must be considered: the original reception of the ad, storage, and then how it impacts brand choice and usage. According to Balcony (2014), there is a strong relationship between the explicit evaluation of the consumer's preference in terms of the favorite commercial and brain activity. It is evident that there is a strong coherence between the explicit (consumer's preference) and implicit (EEG measurement) responses of consumers, which support cognitive and emotive processes in evaluating consumer goods (Balconi et al., 2014). Baraybar-Fernandez (2017) discovered a correlation between the emotions induced by audiovisual advertising messages and their impact on the subjects' memories. Researchers use neuromarketing techniques like the electrical activity of the heart (ECG) and the electrodermal activity (EDA) of the subjects to gauge their performance in commercials that represent emotions such as joy, surprise, anger, disgust, fear, and sadness. These techniques also measure the subjects' remembrance of the transmitted message and the advertiser's activity (Baraybar-Fernández et al., 2017). In general, promoters view NM as a strategy to modify their messaging and determine if an advertisement will successfully penetrate the initial stage. Ford Motor Company and Pre-Diction, a UK-based research firm, have performed limited car promotional ads. The multinational British company Unilever, in collaboration with Brainwave Science, tested a TV commercial using an EEG. Now, neuromarketing can demonstrate its potential for positive impact if it demonstrates its effectiveness as a tool for promoting change (Al Abbas et al., 2019).

8.3 Neuromarketing on Consumer Buying Behavior

To satisfy consumers' needs and demands, marketers must know their purchasing behavior. Neuromarketing experiments use the frontal cortex (FC) and prefrontal cortex (PFC) to identify customers' attention, according to Biswas (2022). PCF plays an essential role in cognitive control functions influencing attention, emotional reactions, and cognitive flexibility. According to Burgos-Campero (2013), Neuro-marketing allows us to know the customer's reactions in terms of brain activation without having to appeal to his conscious experience report. As a result, the firms will be able to develop capacities and valuable resources to create focal strategies. To understand where neuromarketing can begin, it is vital to investigate human consumption and buying behavior. We can use the stimulus-organism-response (S-O-R) model by incorporating internal processes such as emotional states, pleasure, arousal, and dominance in the organism (Sultan et al., 2021).

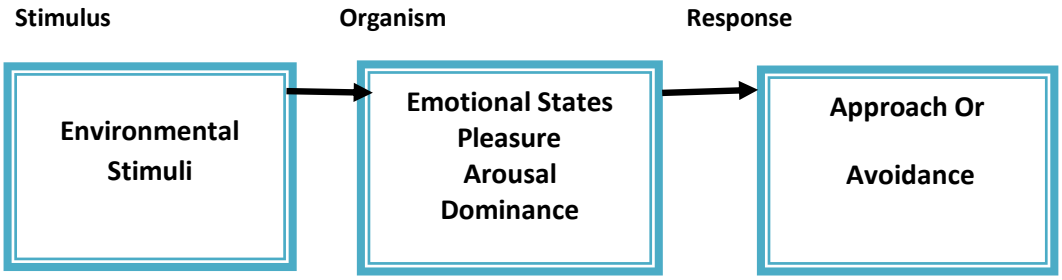

Figure 8: Stimulus- Organism Response Model (SOR)

Frontal Alpha Asymmetry (FAA) and Late Positive Potential (LPP) are the most consistent markers of emotional responses to marketing stimuli, consumer preference, and purchase intention. They have improved the predictive accuracy of customer preference in neuromarketing through the use of machine-learning prediction, especially when combined with eye-tracking or facial expression analyses (Byrne et al., 2022). Celebrities or attractive people influence consumer preferences, leading to a purchasing decision. This result allows companies to modify and choose their ads to include elements that help the brand be more easily maintained or help retain consumers' attention (Fortunato et al., 2014). Endorsements can play an important role in attracting consumer

attention. It can be used as an effective strategy in order to attract the attention of consumers and encourage them to buy sports products (Izadi et al., 2022).

8.4 Neuromarketing on Product Development

NM is helping to design and develop customers' desired products that are able to meet consumers' needs and demands by attracting, engaging, and sustaining its targeted customers. Neuromarketing has created a channel between marketing products and consumers' minds, which provides companies with their desired sales, uplifting their product demand (Biswas et al., 2022). Neuromarketing provides new approaches to understanding customer behavior; it addresses such issues as the consumer's reactions to products, advertisements, and special offers, as well as ways of purchasing products and services. This knowledge enables marketers to plan marketing activities and launch new products in more efficient ways (Antoniak, 2020).

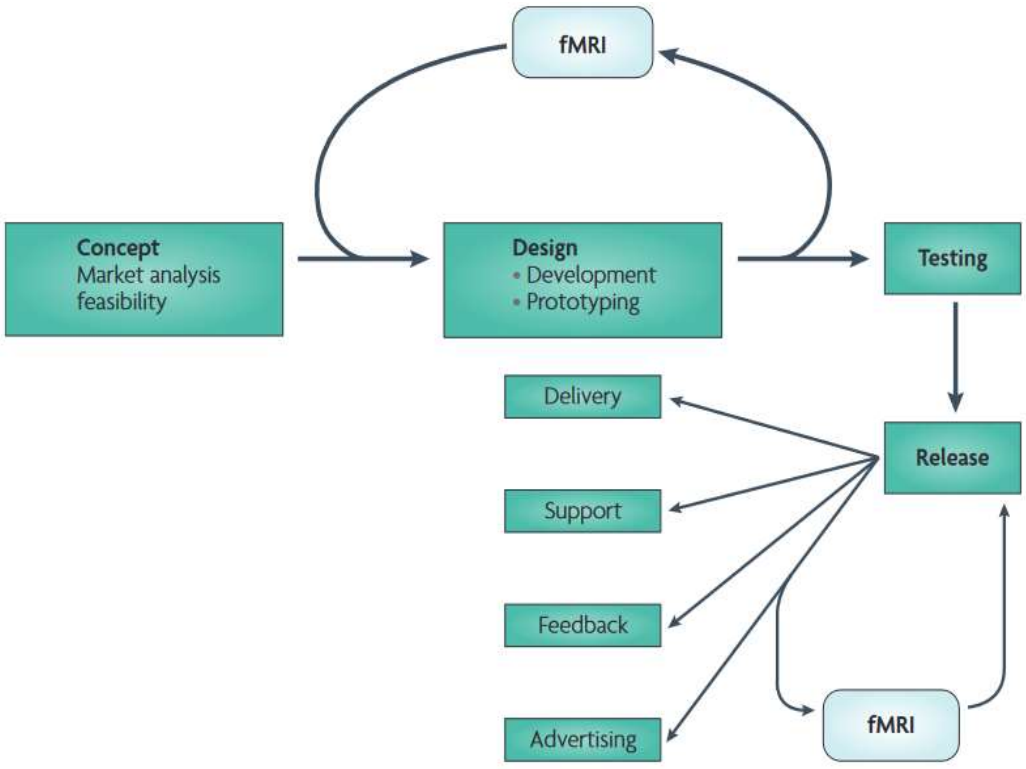

Figure 9: Product Development Cycle

Functional MRI (fMRI) in neuromarketing applications can potentially enter the product development cycle in two places. Firstly, we can incorporate fMRI into the design process itself. Neural responses could serve as a tool to refine the product prior to its release. In the second scenario, once the product design is complete, we can utilize fMRI to gauge neural responses, usually as a component of an advertising campaign to boost sales (Ariely & Berns, 2010).

8.5 Neuromarketing on Packaging

We've all been interested in packaging; this is especially appealing. Advertisers have long understood that topics aren't always what's on the outside, but neuroimaging has taken this understanding to a whole new level. Manufacturers such as Campbell's and Frito-Lay have utilized neuroimaging to reimagine their packaging. Experiments have proven that customers respond positively, poorly, or neutrally to packaging. Furthermore, they have been very curious about color, text, and imagery. According to this report, customers responded poorly to smooth packaging but positively to matte packaging. Frito-Lay then ditched the glowing packaging in favor of a modern, matte design. PepsiCo has developed new packaging to make the product more attractive

and relevant to the target segment under consideration, using eye-tracking and EEG (Pluta-Olearnik & Szulga, 2022).

8.6 Neuromarketing on Product Layout

The layout of a product, its appearance in the market, or the use of packaging are the initial data that build schemas in the customer ‘s cognition. As a result, the layout of a product, as well as its illustration, must be carefully considered and elaborated upon. Neuromarketing equipment, such as fMRI and EEG, is useful when considering product layout, as it can pinpoint which parts of the brain trigger at specific times. Presenting a client with numerous exceptional product designs allows the mind to assess which design yields the best results. Since this method takes place implicitly inside the subconscious, it is more reliable than respondents providing verbal explanations of their interests. It is often the case that purchasers' expressions no longer adhere to their true desires and tastes.

8. 7 Neuromarketing on Decision- Making

Decision-making is defined as the evaluation of a situation and the selection of an appropriate action. For consumer research, understanding this decision-making process is essential because consumers have to make specific decisions, for example, for a brand, in almost every shopping situation (Hubert & Kenning, 2008). The neurosciences, in conjunction with cognitive science, psychology, and marketing, have entered the business arena by providing new ways to observe and analyze consumer behavior and how it makes decisions (Burgos-Campero & Vargas-Hernandez, 2013). Understanding and analyzing consumers' perceptions and unconscious responses is critical to understanding their preferences, choices, and selections. Neuroscience techniques enable market researchers to understand and analyze consumers' thoughts and experiences, as well as their entire decision-making process (Deb, 2021). In terms of consumers' decision-making processes, neuroscience tools help to explore consumer brain responses to marketing stimuli. Eye movements are possible to gain a deeper understanding of consumers’ decision-making (A. A. B. Mansor & Isa, 2018). The main goal of neuromarketing is to figure out what is affecting the subconscious level, which plays a crucial role in decision-making (Kiran & Prabhakar, 2021). Neuromarketing highlights the client's perception and emphasizes the importance of internal psychological factors that affect each person and their decisions in almost all real-life situations. This will elaborate on the behavior of consumers and their decision-making process, with a focus on favorites, determinants of choice, and purchases (Ismajli et al., 2022).

8.8 Neuromarketing in Tourism

As per the Department of Business Management, Faculty of Tourism, University of Malaga, Teatinos Campus, León Tolstoi 4, Malaga, Spain, et al. (2024), neurotourism is the use of advanced psychophysiology techniques, such as eye-tracking (ET) and galvanic skin response (GSR), to study how people think about tourism brands and their personalities. In this context, neurotourism emerges as a pioneering application or integration of neurosciences within the tourism sector, aimed at refining marketing strategies directed towards tourists (Panyik & Gonçalves, 2017; Alsharif et al., 2023). Neuroscience presents itself as a revolutionary interdisciplinary tool and approach that seeks to transform our understanding of tourists' decisions and preferences, offering an objective basis for designing and implementing more enriching and satisfying tourist experiences (Agarwal & Dutta, 2015). Psychophysiological techniques, like eye-tracking (hereafter ET) and galvanic skin response (hereafter GSR), are becoming useful for studying how tourists look at pictures of places they want to visit. This helps us understand the mental and emotional processes that lead to reservation decisions (Boz & Koç, 2022; Kim & Kim, 2024; Xie, Zhang, & Ma, 2023) or even the way people use Travel 2.0 tools to find their way (Muñoz-Leiva et al., 2016). Through the use of ET and GSR related to the dimension of brand personality, we aim to delve deeper into understanding how tourist consumers perceive and react emotionally to destination logos, thereby facilitating a more detailed comprehension of the interaction between the visual presentation of destinations and consumer psychology. We employ cutting-edge neuroscience tools, such as eye tracking and brain scanning electroencephalography (EEG), to evaluate the emotional and cognitive reactions to destination images and

assets. Human tourism behaviors naturally incorporate mental processes, unconscious emotions, and cognitive responses. Words about and names of travel destinations raise cognitive levels, which can aid in the integrated marketing communication process to create a destination image and brand (Michael et al., 2019).

8.9 Neuromarketing in Communication

We will assess the impact of neuromarketing on communication. Due to a lack of explicit literature concerning this topic, some argumentation is based on logical thinking. Given that body language and facial expressions are also forms of non-verbal communication, neuromarketing methods, specifically the external reflexes of body language, can certainly analyze these non-verbal expressions in human beings (Postma, 2012). However, as stated earlier, these measurements are not as accurate as, for instance, fMRI measures or EEG measures. Therefore, one can suggest that verbal communication as such will not be highly influenced by neuromarketing measurements since the statements expressed verbally do not need neuromarketing analysis but can be analyzed in the traditional way.

8.10 Neuromarketing for Academic Institutions

The students' strong participation in knowledge, emotion, and body, as well as activities involved in gaining experience in methods and techniques, can be used to describe educational technology as a marketing technique and marketing mix. Improve the learning process to meet the needs of new immigrants, and get feedback from college students every day. Bracelet electroplating is an example of technology in action. Skin and pore reactions, magnetic resonance imaging (MRI), can detect the link between thinking biology and thought perception, and biofeedback technology can provide direct improvement for less experienced educators and educators (Norman, 2016), which is widely used by everyone. Today's educators engage in a wide range of research fields, including the design of educational websites on the Internet, the creation of increasingly attractive learning materials and brochures, the creation of e-books, and the use of various applications, software, and multimedia.

9. NEUROMARKETING ETHICS

While neuromarketing holds many potential benefits, ethics must not be overlooked. The canonical criticisms of neuromarketing—which arose at its inception and have remained prevalent today—include unethical research practices, unethical applications of technology, and manipulations of consumers. Ethical analysis of neuromarketing has the potential to utilize the lens of specific ethical theories. Some of these fears regarding neuromarketing are widespread, and they carry the trappings of an ethical challenge, but we will argue that most of them do not raise distinctive or realistic ethical issues (Stanton et al., 2017). Any neuroscientist who wants to conduct research in the area of neuromarketing is the primacy of ethical considerations in the conduct of both academic and commercial neuromarketing research. Indeed, the ethical dimension of neuromarketing is one of the largest and most sensitive challenges with respect to the application of neuroscience in marketing (Lim, 2018). Academics and companies using neuromarketing techniques should adopt a code of ethics, which ensure beneficent and non-harmful use of the technology in consideration of both categories of ethics concerns (Murphy et al., 2008) .Strict regulations and transparency are necessary to ensure neuromarketing practices respect individual privacy and autonomy. To my knowledge, there is currently no third-party organization that offers comprehensive neuromarketing regulations, but ethical guidelines and principles from other sources can inform practices. Here are some ethics that should be considered in neuromarketing.

- **Predicting Consumer Choice**

The first commonly perceived, potential ethical issue is the fear that neuromarketing may render consumers' choices completely predictable. Notably, similar criticisms regarding the prediction of consumer choice have been applied to traditional marketing research and practice, but are perhaps most accentuated in neuromarketing.

- **Respecting Autonomy**

Participants in neuromarketing research should give informed consent. This means they should fully understand the purpose of the study, the risks and the benefits. Transparency is key when it comes to the methods used for data collection, the techniques employed and the intended use of the data.

- **Privacy and Data Security**

Brands and agencies must handle neuromarketing data carefully, making sure it's anonymized and secure to protect the privacy of participants. Important is compliance with data protection regulations such as the General Data Protection Regulation in the European Union (GDPR) or other local laws.

- **Disclosure and Transparency**

While it is not mandatory to disclose specific neuromarketing techniques, such as eye-tracking on a website, the principle of transparency is an ethical one. Brands must consider disclosing to consumers their data collection and research methods, in order to ensure transparency regarding the purpose and impact of the research. It allows the consumer to make an informed decision about their participation and builds trust.

- **Quality Certification**

In response to the ethical issues raised, the neuromarketing industry may also benefit from third-party quality certifications that ensure ethical treatment and protection of subjects as well as methodological rigor are being strictly employed. To some extent, the ARF Neurostandards initiatives are a first step in this direction, but more could be achieved. We believe that a third-party group could be organized with the goal of delivering a quality certification that would allow consumers of neuromarketing research to make a more informed choice regarding the product that they are purchasing.

10. CONCLUSIONS

Neuromarketing, in essence, is a revolutionary and new area of marketing with limited empirical discussion. But neuromarketing, like every other emerging industry, has plenty of space for development and testing. Neuromarketing offers an innovative new frontier in marketing. By delving into the inner workings of human brains and deciphering them for effective marketing strategies, neuromarketing offers fresh insight that may drive successful campaigns in the future. Companies that embrace neuromarketing today can emerge as front-runners by harnessing neuroscience's power for customer-oriented campaigns that produce highly efficient and customer-centric offerings. The neuromarketing overview will allow advertisers and marketers to improve their understanding of customer behavior functioning as well as the competitive new marketing environment. We anticipate that the neuromarketing process will enhance customer segmentation, which in turn will improve product marketing by considering individual product and brand preferences and overall consumer behavior. Hence, a neuromarketing strategy is difficult to follow because of a lack of experience, high costs, and a lack of accessibility to resources. On the other hand, studying the human mind is a cutting-edge hobby in this period, which confirms the formation of brand-new advertising studies and consumers' preferences for product characteristics such as labels and brands. The majority of the discussions were also based on a literature review and personal perspectives. We still have a long way to go in Neuromarketing, and undoubtedly, we need to improve many aspects to expand its use and make it a more common research technique among professionals and academics. Only a very limited amount of strictly listed research on neuromarketing is available. With this basic introduction, the perspective of social science will shed light on the need for new researchers to begin their work on neuromarketing. The future of marketing is bright with the implementation of neuromarketing; researchers and marketers will strategize and develop smarter marketing that will increase the efficacy of their marketing activities.

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