

A Critical review of Neuromarketing: Evaluating Effectiveness and Application in Marketing

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Abstract

In this paper, we took a look at the best neuromarketing strategies now in use and the tangible outcomes they've produced. The goals of this study are as follows: To catalog the most popular definitions of neuromarketing; To discuss the field's significance and possible advancements; To show how neuromarketing can improve marketing research over more conventional methods; To catalog the ethical concerns surrounding neuromarketing studies; To catalog the most popular neuromarketing techniques currently used to advance marketing research; To catalog the most common limitations of neuromarketing. The results provide light on the best approaches to design, store, discover and use consumer data, while also advancing neuromarketing as an area of study. Business cases, execution, and accomplishments are covered in this article, along with theoretical justification for neuromarketing.

Keywords: Neuromarketing, Application, Strategies

1. Introduction

When individuals are debating, their unconscious thoughts and feelings play a significant role. Neuroimaging techniques are among the most recent methods for measuring marketing stimuli; these methods provide a non-invasive picture of the patient's brain. Neuromarketing strategies are approaches that have been employed in the marketing field to get a better understanding of consumer behavior in connection to markets and commercial trade (Lee, Broderick & Chamberlain, 2007).

Some criticism has arisen around the use of neuromarketing activities. One school of thought is that this kind of targeting would make people more susceptible to the company's marketing efforts as it would reduce their agency in deciding not to buy the advertised items (Wilson, Gaines & Hill, 2008). However, proponents of neuromarketing strategies like Lindstrom (2009a, 2009b) and Dooley (2010) highlight the method's advantages for businesses and customers alike. Organizations would be able to save a lot of money that is currently going toward ineffective and wasteful campaigns if

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they were to create products and campaigns that were tailored to their specific needs, according to these authors. This would allow them to be more competitive and provide better products and services to their customers. An additional school of thought among academics holds that neuromarketing could never work in the real world due to the fact that no two people's thoughts are ever the same due to the fact that everyone's experiences, values, and character are unique (Hubert, 2010).

Aiming to review the world's primary neuromarketing strategies and the main practical outcomes gained, this article takes the specified background as its starting point. The goals of this study are as follows:

- (1) To catalog the most popular definitions of neuromarketing;
- (2) To discuss the field's significance and possible advancements;
- (3) To show how neuromarketing can improve marketing research over more conventional methods; (4) to catalog the ethical concerns surrounding neuromarketing studies;
- (5) To catalog the most popular neuromarketing techniques currently used to advance marketing research;
- (6) To catalog studies that have made use of neuromarketing research techniques; and
- (7) To catalog the most common limitations of neuromarketing.

High expenses and the need for specialist equipment have resulted in little and inconclusive study in this field, despite studies on the issue dating back to the early 1990s. Nevertheless, neuromarketing presents fresh perspectives that, when combined with other techniques, have the potential to provide intriguing outcomes and broaden the scope of marketing campaigns' impact across various demographics. Neuroimaging methods may help businesses with product creation, channel selection, pricing, and communication choices, all of which contribute to market research.

2. Methodology

According to Morin (2011) and Dinu, Tannase, Dinu, and Tannase (2010), neuromarketing is a relatively young area that scholars in the marketing industry are very interested in. The researchers in this study used the approach to looking at text. Bardin (1977) defined this method as a collection of tools for communication analysis that construct a description of the contents of messages via methodical methods.

Reporting Findings

The article presents the findings from the content analysis technique, which have been organized into the following topics: neuromarketing definition, neuromarketing's significance to marketing

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studies, neuromarketing's benefits over traditional research methods, neuromarketing's ethical considerations, neuromarketing techniques, studies that have used neuromarketing, and neuromarketing's drawbacks and limitations.

What is Neuromarketing?

By June of 2002, word had spread about the utilization of neuromarketing strategies. According to Fisher, Chin, and Klitzman (2010), an Atlanta, USA-based advertising agency called Brighthouse has established a new division to focus on marketing research using functional magnetic resonance imaging (fMRI). Some businesses have been using neurophysiologic methods, such as electroencephalography (EEG), to address marketing issues long before the term "neuro" was even coined (Fisher et al., 2010).

There were two phases to this study. A search for general background material on the topic was conducted in scholarly journals, blogs, and websites of neuromarketing firms as a first step. Among the non-academic periodicals chosen were Forbes, The Guardian, the NYT, the WSJ, the LA Times, and The Times. A blog search technique developed by Google was used to pick the marketing blogs. The blogs that included explanations on neuromarketing in their posts were chosen. Neurosciencemarketing Brandsala, RW Connect, Eulogy, and Fast Company were the blogs in question. The scholarly publications that were selected for this study are introductory pieces on the issue (Lee et al., 2007; Ariely & Berns, 2010; Morin, 2011). At the end of this first stage, we had a good grasp of the topic and had identified several fresh avenues to investigate in the subsequent stage. Defining neuromarketing as a novel approach to market research was a common theme across the pieces.

In the second stage, we limited our analysis to scholarly papers that had been peer-reviewed. We utilized the EBSCOhost research platform, which gave us access to more than 375 databases, to read the papers. We adopted the terms "neuromarketing," "marketing research," and "consumer behavior" because, according to our definition, neuromarketing is a powerful tool for studying customer habits. The total number of articles read was.

After selecting the papers to analyze, the next step was to code and classify them (Bardin, 1977). We have now classified the papers according to the semantic components that were found inside them. Based on the criteria of exclusivity, homogeneity, relevance, objectivity, and productivity, seven groups were developed after reading the papers (Bardin, 1977).

Technology has allowed for the application of neuromarketing approaches to learn about customer preferences, nevertheless (Murphy, Illes & Reiner, 2008). Market research firms were very interested in this possibility of analyzing customer preferences. Not only did businesses want to cash in on this market segment, but the topic also piqued the attention of academics and made some people feel uneasy (Murphy et al., 2008; Fisher et al., 2010; Lee et al., 2007).

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Numerous ideas for neuromarketing were discovered in the literature that were examined. The following terms have been used to describe neuromarketing: research field, neuroscience, field of study, part of marketing, interconnection of perception systems, scientific approach, subarea of neuroeconomics, separate discipline, and research (Murphy et al., 2008; Perrachione & Perrachione, 2008; Lee et al., 2007; Eser, Isin & Tolon, 2011; Fisher et al., 2010; Butler, 2008; Senior & Lee, 2008; Senior & Lee, 2008; Senior & Lee, 2008; Senior & Lee, 2008; Humbert & Kenning, 2008; Garcia & Saad, 2008). Regarding its purpose, some authors see neuromarketing primarily as a way to gain scientific knowledge (Lee et al., 2007; Murphy et al., 2008; Fisher et al., 2010; Butler, 2008; Senior & Lee, 2008; and Eser et al., 2011). On the other hand, there are authors who see neuromarketing more as a tool for commercial marketing (Perrachione & Perrachione, 2008; Hubert & Kenning, 2008; Fugate, 2007; Orzán, Zara & Purcarea, 2012; Green & Holbert, 2012; Vecchiato, Kong, Maglione, & Wei, 2012).

Even if the authors have different opinions, there are some shared ideas concerning neuromarketing. Among the most common interpretations offered under the heading "definition of neuromarketing" were the following: neuromarketing as a tool for research, consumer behavior research, a subfield of neuroscience, a marketing strategy, a commercial technique, an analysis of neurologically-related cognitive and physiological processes, and a way of visualizing behavioral patterns.

Even in its origin, the connection between the study of brain activity and neuromarketing is clear. Nonetheless, a large body of literature confirms this connection. One example is the claim made by Murphy et al. (2008) that brain-based customer preference data is being made available by new enterprises.

However, neuromarketing is linked to a neuroscience method that pinpoints the specific cortical areas that influence customer behavior according to & Kenning (2008) and Morin (2011). Another definition of neuromarketing is a method of studying consumer behavior that involves monitoring how the brain responds to marketing stimuli (Hubert & Kenning, 2008). Research has shown that consumers' emotions and preferences are hidden in the brain (Marci, 2008; Javor, Koller, Lee, Chamberlain & Ransmayr, 2013; Fugate, 2007 and Green & Holbert, 2012). Neuromarketing, on the other hand, acts as a window that reveals and gives access to these emotions (Ohme & Matukin, 2012; Fisher, Chin & Klitzman, 2010). According to Fisher et al. (2010), Hubert & Kenning (2008), and Perrachione & Perrachione (2008), researchers may get valuable insights into customer behavior by studying their brain processes.

According to some sources (e.g., Babiloni (2012) and Ohme & Matukin (2012), neuromarketing is also known as consumer neuroscience. The distinction between the two domains is, nevertheless, highlighted by certain writers. Neuromarketing is the straightforward application of these findings to administrative procedures, according to Fisher et al. (2010), who characterize neuroscience more generally as a neuroscientific area that analyzes consumers. The difference between the two is

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outlined by Lee et al. (2007): neuromarketing is the study of consumer behavior in relation to marketing and markets using neuroscientific methodologies.

A different school of thought sees neuromarketing as an emerging discipline that emerged from the merging of other scientific disciplines. The field of marketing research grounded on social science, economics, and psychology is known as neuromarketing (Senior & Lee, 2008). According to Page (2012), neuromarketing is the meeting point of neuroscience, experimental psychology, and experimental economics. On the other hand, Garcia & Saad (2008) and Hubert & Kenning (2008) link neuromarketing to the fields of cognitive neuroscience and consumer behavioural sciences, respectively, meaning neurobiology and consumer behavioural sciences. Brainert & Keening (2008), Garcia & Saad (2008), Lee et al. (2007), Ohme & Matukin (2012), Senior & Lee (2008), Fugate (2007), Butler (2008), Morin (2011), Page (2012), Perrachione & Perrachione (2008), and Vecchiato et al. (2012) are among the articles that primarily focus on neuromarketing as the link between neuroscience and marketing.

Neuromarketing has been referred to as "study of brain imaging" (Hubert & Kenning, 2008; Perrachione & Perrachione, 2008; Babiloni, 2012; Reynolds, 2006; Garcia & Saad, 2008; Green & Holbert, 2012), "study of neuroimaging" (Eser et al., 2011 and Vecchiato et al., 2012), and "neuro-technology" (Murphy et al., 2008 and Fisher et al., 2010) to describe neuromarketing (Perrachione & Perrachione, 2008; Green & Holbert, 2012; Javor et al., 2013; Orzán et al., 2012; Fugate, 2007 and Morin, 2011). Although the neuromarketing studies found in this paper use more than just brain imaging, the fact that fMRI is the most well-known method in both academia and the business world undoubtedly contributes to its widespread use.

Several writers provide more thorough descriptions of neuromarketing in this comprehensive approach to definition. For instance, according to some writers (Lee et al., 2007; Murphy et al., 2008 and Butler, 2008), neuromarketing may provide light on the cognitive and emotional processes (fear, motivation, recognition, well-being and reward) that make up human conscience. There are two ways that Fugate (2007) handles the issue to explain neuromarketing: simply and elaborately. According to him, neuromarketing is a method that demonstrates the interdependence of the physical and psychological aspects of a person by recording their intellectual and emotional reactions to marketing stimuli via visuals.

Despite the fact that neuromarketing is an open-ended discipline, there is clear evidence of interconnectedness across the many definitions. Thus, from the readings, one can deduce a thorough description of recurrent neuromarketing that enumerates its key aspects. As a result, neuromarketing may be defined as an area of study that brings together marketing and neuroscience (Butler, 2008; Senior & Lee, 2008 and (Hubert & Kenning, 2008). The purpose of this study is to establish connections between marketing stimuli, the brain regions that processed them, and the physiological consequences related to the nervous system. The goal is to understand the consumer

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better by associating these regions with cognitive, psychological, and emotional processes (Lee et al., 2007; Murphy et al., 2008; Senior & Lee, 2008).

How Neuromarketing Contributes to Marketing Research

According to Eser et al. (2011), neuromarketing gains insight into the purchasing process by using cutting-edge brain scanning technology. According to Schneider & Woolgar (2012), neuromarketing is the most recent tool for marketing researchers to analyze customer behavior. Among the evaluated literature, the most common goal is to comprehend customer behavior. Second, neuromarketing research has helped us better comprehend the decision-making process of buyers. According to Lee et al. (2007), neuromarketing has recently gained popularity as a tool for determining the likelihood of purchase choices.

Another method that has been shown to influence marketing strategy is neuromarketing (Eser et al., 2011). Some have claimed that neuromarketing has been most effective in the advertising and publicity sectors of the marketing industry. According to several studies (Senior & Lee, 2008; Fugate, 2007; Ohme & Matukin, 2012), neuromarketing enables the identification of ad components that elicit favorable emotions. Further, it aids in avoiding things that shouldn't be in the message, such things that make people dislike the merchandise. In addition to assisting with media scheduling and selection, it aids in the selection of visual and auditory elements (Fugate, 2007). Additionally, neuromarketing can learn what people want, which allows them to create goods that are both practical and enjoyable (Eser et al., 2011).

Neuromarketing may also be used to enhance branding or brand positioning tactics. According to Hubert and Kenng (2008), researchers in the field of branding study the impact of brand information on decision-making. Neuromarketing research may shed light on this mystery by identifying the specific brain regions activated when consumers engage with brand information (Hubert & Kenning, 2008). Both Senior and Lee (2008) and Lee et al. (2007) show how neuromarketing might change pricing and product development methods.

At last, neuromarketing is a collection of methods that aims to pinpoint the specific regions of the brain that light up in response to a marketing stimulus, the specific cognitive processes that take place there, and all the relevant biological markers. Thus, neuromarketing shows promising results in determining the origins of compulsive buying disorders (Senior & Lee, 2008; Garcia and Saad, 2008; Fugate, 2007 and Fisher et al., 2010). The creation of more efficient social efforts, such those aimed at getting people to stop smoking or wear seat belts, is another potential use of neuromarketing (Orzán et al., 2012).

Conventional and Neuromarketing Approaches to Research

An innovative and crucial method of marketing research, neuromarketing comes highly recommended. Neuromarketing is evaluated by Fisher et al. (2010) as a qualitative research method

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that yields visual and quantitative outcomes. According to Bercea (2013), researchers in this emerging field have challenges when trying to categorize their work as qualitative or quantitative. Ultimately, the choice of methodology and the specific tools utilized will determine how this study is categorized. In any case, neuromarketing's strength is in the emotional processes it can evaluate. According to many studies (Murphy et al., 2008; Hubert & Kenning, 2008; Eser et al., 2011 and Page, 2012), this method outperforms more conventional research methods like surveys, focus groups, and qualitative research when it comes to gaining objective marketing insights.

The examined publications overwhelmingly highlighted the benefits of neuromarketing compared to more conventional forms of advertising. The most often mentioned subject in most papers was neuromarketing's capacity to acquire and evaluate data beyond the human awareness level. The capacity to subtly influence consumers' decisions to buy (Butler, 2008; Hubert, 2008) is what sets neuromarketing apart from other study methods.

The second most common issue in this group was people's lack of self-evaluation skills. People have a hard time putting into words how they really feel and other subjective aspects, according to Lee et al. (2007). Furthermore, due to the complexity of emotions and the fact that people are frequently unaware of their motivations, it is uncommon for individuals to be unable to explain where and why they behave a specific way (Hubert & Kenning, 2008). Even more problematic for marketers is the possibility that consumers are blissfully unaware that they are feeling any particular emotion at all (Murphy et al., 2008).

Unfortunately, people's reluctance to work together on research projects is just as common as their incapacity to accurately evaluate themselves. People are more likely to spread false information when they are trying to fit in with a group or when the subject matter is delicate (Hubert & Kenning, 2008). According to Hubert and Kenning (2008), this means that the answers that are collected are not authentic, but rather shaped by the interviewee's subconscious. Participants in study do not have any say over the data obtained, which poses some ethical concerns (Butler, 2008; Hubert, 2008), however neuromarketing offers a potential solution.

In 2008, Kenning and Fugate published. The rapid and simultaneous gathering of data is another perk of neuromarketing. Consumers' reactions may be monitored in real-time using neuromarketing methods like electroencephalography and magnetoencephalography (Hubert & Kenning, 2008; Lee et al., 2007; Fugate, 2007; Ohme & Matukin, 2012). Researchers may use this function to zero in on which parts of the marketing plan need more attention and which ones can go.

Despite neuromarketing's quirks, most books still recommend it over more traditional methods of market research like focus groups and in-depth interviews (Lee et al., 2007; Murphy et al., 2008; Butler, 2008; Hubert & Kenning, 2008; Eser et al., 2011; Fugate, 2007; Fugate, 2008 and Page, 2012). Having said that, even enthusiasm for neuromarketing, it need to be used with more

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conventional research methodologies. When making both short-term and long-term decisions, people not only follow their gut instincts but also take the prospect of future gain into account. Researchers will learn more about customers' tastes and the buying process when they use both methods together (Hubert & Kenning, 2008).

Neuromarketing's Ethical Considerations

Just as neuromarketing methods generate enthusiasm among firms, they also spark debates about larger ethical concerns. The primary ethical concern raised by the literature we looked at concerning neuromarketing is the potential invasion of personal privacy. According to many studies (Hubert & Kenning, 2008; Murphy et al., 2008; Senior & Lee, 2008; Perrachione & Perrachione, 2008; Fugate, 2007 and Javor et al., 2013), neuromarketing approaches can potentially read customers' thoughts.

This would allow businesses to readily discover and activate the processes that motivate customers to make purchases (Lee et al., 2007; Senior & Lee, 2008; Hubert & Kenning, 2008; Javor et al., 2013). Consequently, consumers would open themselves up to firms, who may potentially pry into their minds at any given time (Fugate, 2007 and Green & Holbert, 2012). Use of neuromarketing for commercial ends raises further ethical concerns (Lee et al., 2007; Senior & Lee, 2008; Eser et al., 2011; Fugate, 2007 and Morin, 2011). Companies gain significant sway over consumers' buying decisions when they study the mental processes associated with their consumption preferences (Murphy et al., 2008; Fisher et al., 2010). The potential for neuromarketing to generate enticing advertisements and goods has been the subject of several publications that raise ethical concerns (Lee et al., 2007; Fisher et al., 2010 and Fugate, 2007). Based on the research conducted by Lee et al. (2007), Murphy et al. (2008), Fisher et al. (2010), Senior & Lee (2008), Eser et al. (2011), and Fugate (2007), neuromarketing poses a significant risk to consumers' autonomy by eliminating their defense mechanisms.

Concerning the ethics of neuromarketing, the points raised above are relevant. Criticism may also be leveled against the institutions that use neuromarketing, the method itself, and the surveyed audience. From the papers that were examined, four (Fisher et al., 2010; Fugate, 2007; Javor et al., 2013; and Dinu et al., 2010) raised concerns about potential ethical issues that may arise from academics and clinicians using neuromarketing or conducting neuromarketing research in university settings.

According to Dinu et al. (2010), many individuals see colleges more as places to learn new things than as venues where neuromarketing might influence consumer decisions. According to some writers, neuromarketing has come under fire due to the presence of doctors and academics employed by marketing research firms (Fisher et al., 2010 and Fugate, 2007). Dinu et al. (2010) states that the findings of marketing research might be skewed due to the possibility of concealed negative features or harm to participants' health.

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In order to protect themselves against claims of careless behavior, several writers argue that businesses should be transparent about their research methods and findings (Murphy et al., 2008; Fisher et al., 2010 and According to Senior and Lee (2008). Prior to conducting research, it is important to gain consent from participants (Senior & Lee, 2008). Several studies have raised concerns about neuromarketing, including those that aim to safeguard vulnerable groups (Murphy et al., 2008; Senior & Lee, 2008; Eser et al., 2011; Fugate, 2008 and Javor et al., 2013). Children, persons with neurological illnesses or pathological problems, ad-sensitive individuals, and legally protected groups are among the vulnerable populations that should be subject to regulations for the use of neuromarketing methods (Murphy et al., 2008).

Lastly, the question of whether neuromarketing induces consumption disruptions came up in a few works. According to Lee et al. (2007), two issues linked to neuromarketing include shopping addiction and overconsumption. Several writers have argued that a neuromarketing ethics code would help the technique become more widely used and regulated (Murphy et al., 2008; Hubert & Kenning, 2008; Ezer et al., 2011; Morin, 2011 and Butler, 2008).

3. Methods of Neuromarketing

A very young scientific discipline, neuromarketing is an interdisciplinary effort to bridge the gap between marketing and neurology (Morin, 2011). Furthermore, neuroscience is an interdisciplinary subject since it brings together research from many other disciplines, including chemistry, computer science, physics, medicine, psychology, and many more. Determining what exactly constitutes neuroscience is a challenging task. Research into brain lesions, the neurological system (including the brain), brain genetics, brain cellular structure, and neural circuits are all part of neuroscience (Pickersgill, 2013).

Therefore, neuromarketing strategies should draw from the wide variety of neuroscience research lines; studies should include all regions and cognitive and physiological processes, not only the brain and central nervous system. The wide range of techniques that can be categorized as neuromarketing techniques reflects this scope. These techniques include monitoring physiological aspects like perspiration and skin electrical conductivity as well as changes in hormones and neurotransmitters, pupil size and movement, and facial and body muscle activity. On the other hand, there are techniques that can be used to understand complex cognitive aspects, like the functional activity of specific brain regions by analyzing electrical waves, cerebral metabolism, and blood flow. Because of the synergy between several branches of neuroscience and marketing, these methods may address a wider range of issues than conventional marketing approaches alone, or even partly.

The methods that relied on brain imaging garnered the most interest out of all the approaches, whether old and new; the findings from these research had far-reaching consequences for both the academic and corporate worlds. In the late 1990s, researchers at Harvard University used PET-SCAN,

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a somewhat intrusive piece of equipment, to undertake one of the first experiments to show this possibility (Zaltman, 1997). Another groundbreaking study that garners a lot of interest employed functional magnetic resonance, an expensive but non-invasive technology (McClure et. al, 2004).

The advertising stimulus deemed ineffective if it failed to elicit any measurable changes in the target's brain region. Nevertheless, it is reasonable to assume that advertisements are associated with the evoked emotion if the stimulus led to biological changes in a specific area (Fugate, 2007). While it's true that various images elicit distinct feelings and consumption behaviors, it's simplistic to assume that the regions of the brain that light up during the examinations are responsible for these effects alone (Marcus, 2012).

When trying to get to the bottom of a marketing mystery, it's helpful to have a toolbox full of different approaches, each with its own set of pros and cons. In order to get the most out of neuromarketing technology, it's smart to apply a mix of approaches wherever you can. There are three distinct schools of thought when it comes to neuromarketing strategies: those that focus on measuring brain electrical activity, those that measure brain metabolism, and those that don't bother with any of these. At the moment, these are the most common neuromarketing strategies:

Functional magnetic resonance imaging (fMRI): this method has a distinct advantage over others because of its high spatial resolution, which allows it to evaluate both larger and smaller brain areas. In the realm of neurological research, it is second only to electroencephalography as a method for measuring brain activity. But this method isn't cheap, the gear isn't portable, and it's hard to do the experiment because of the setting. There is a significant drawback to this method when it comes to various marketing stimuli: the 6- to 10-second lag time required to capture neuronal activity is poor temporal resolution (Ariely & Berns, 2011).

Electroencephalography (EEG): this method involves putting electrodes on a person's scalp in the form of bands or helmets. The waves produced by the brain are then monitored at tiny intervals of up to 10,000 times per second, according to Morin (2011). When it comes to measuring emotional types and detecting psychopathologies, EEG has better validity than other methods, and it's also more accessible, less intrusive, and cheaper (Kline, 2004). The portable apparatus and the potential for synchronization with stimuli are the defining characteristics of this technology. This method's limitation is that it can only capture surface-level electrical impulses, which makes it unsuitable for measuring more complex brain regions. Thus, EEG differs from fMRI in that it has excellent temporal resolution but poor spatial resolution.

Positron emission tomography (PET): a method that's on par with functional magnetic resonance imaging (fMRI) in terms of validity and spatial resolution. Neuromarketing makes little use of this method since it requires the employment of very intrusive radioactive particles (positrons) to acquire data from participants (Lin, Tuan & Chiu, 2010).

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The expansion and mapping of the magnetic field produced by brain processes and electrochemical impulses between neurons form the basis of magnetoencephalography (MEG).

Magnetoencephalography, like electroencephalography, has great temporal resolution; but, compared to EEG, its spatial resolution is superior, though still inadequate, for monitoring regions deeper in the brain and subcortical regions (Morin, 2011). Research using MEG differs from EEG in that it does not involve touching the scalp but rather the use of hyper-sensitive sensors to assess the electromagnetic field. Since magnetoencephalography (MEG) and the associated equipment are somewhat expensive, EEG has become more popular than MEG (Crease & Robert, 1991).

Eye tracking is being utilized more and more in conjunction with other methods like EEG and fMRI. Benefits include the ability to assess microfocus, pupil dilation, focus, and the pattern of visual behavior of fixations of the gaze, as well as the portability of the equipment. One major drawback is that it's hard to tell what feelings are linked to the places that were focused on, as it doesn't immediately assume that concentration equals increased visual attention. Time spent looking at the object of study, pupil size, area and frequency of user observation in the given stimuli, and other metrics are of interest to marketers when it comes to this method (Nenad, 2011).

The technique of facial recognition, also known as electromyography, is still mainly used in neuromarketing. It involves measuring invisible movements of the face muscles, such as the zygomaticus minor and major muscles of the mouth, as well as the occipitofrontal and orbicularis muscles, in order to determine the type of emotion, such as happiness, sadness, indifference, pain, etc. (Melillo, 2006). Its many benefits include the following stand out: excellent geographical resolution, increasing trustworthiness for application in the examination of various emotional responses to visual cues, as well as responses to olfactory, gustatory, and auditory cues, behaviors and interactions amongst humans. One potential drawback is that some facial motions may be restricted by the electrodes that are fastened to the face. The fact that certain expressions may be understood in two different ways renders the idea of standardizing single expressions linked to particular emotions flawed, which in turn limits research on a few more nuanced feelings (Jones & Beer, 2009).

The heart rate and its variability, blood pressure, and other cardiovascular parameters are recorded using this method. Stress, the relationship between cardiac rhythms, and the time it takes for the pulse to change in order to deduce emotional and participants' levels of focus (Lindstrom, 2009b).

The galvanic skin response, which is a method for objectively measuring the excitement induced by a stimuli that is emotionally significant. According to Banks et al. (2012), this technique can detect the brain waves that come before certain emotions including joy, sorrow, fear, anger, contempt, and apathy because of the direct connection between the central nervous system and the reactions observed on people's hands.

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Useful Real-World Examples

Traditionally, neuromarketing has been used to unbiasedly ascertain customer preferences. Despite corporations' reluctance to share their research on marketing strategy improvement, the studied literature did identify a number of practical studies on neuromarketing. Lee et al. (2007) and Fisher et al. (2010) were only two of several research that dealt with marketing communications. Ads featuring famous or attractive individuals stimulate a part of the brain that's responsible for recognition and trust-building, according to another research. Consequently, it follows that buyers' tastes are impacted by the likeness of famous or beautiful individuals, leading to a purchase (Hubert & Kenning, 2008). Images of beautiful women triggered the reward and happiness center of heterosexual men's brains. Pictures of puppies and children also stimulate this region (Hubert & Kenning, 2008).

According to Perrachione & Perrachione (2008), customers are less likely to have a good reaction to a product when they see irrelevant messaging, but they have a positive reaction when they see advertising aspects that make them feel a connection to themselves. Hubert and Kenning (2008) found that when people display signs of danger or fear, it activates a part of the brain that is responsible for eliminating such behaviors. These findings aid businesses in fine-tuning and selecting their advertising. According to research (Lee et al., 2007; Perrachione & Perrachione, 2008; Eser et al., 2011), businesses should include features that make their brands easier to recall or keep customers' attention.

Fugate (2007) asserts that neuromarketing enables businesses to pinpoint the parts of a television commercial that captivate viewers' neural systems. In order to create more engaging advertising campaigns, companies evaluate the words, music, sound effects, and visuals (Fugate, 2007). According to Ohme and Matukin (2012), neuromarketing can be used in three ways to help with ad development: (1) referential analysis, which looks for the most effective ways to talk about products and brands in ads; (2) vertical analysis, which breaks ads down into images and sounds to find the most effective ad elements and the emotions they evoke in consumers; and (3) horizontal analysis, which compares different versions of the same ad and measures the effects on participants' brain activity.

Consumer demand-driven product and service creation is another well-publicized use of neuromarketing (Fugate, 2008). The Daimler-Chrysler product preference experiment was cited by many writers, including Lee et al. (2007), Fisher et al. (2010), Garcia & Saad (2008), Eser et al. (2011), and Fugate (2007). Products that are often seen as symbols of prestige, wealth, and social dominance were shown to activate regions of the brain associated with the reward system and well-being in this functional magnetic resonance imaging (fMRI) research (Hubert & Kenning, 2008).

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Neuromarketing methods are very efficient for making judgments about pricing, sales, and promotions, according to the literature. When prices are set, a fascinating thing occurs. There are two ways in which a customer might perceive the same pricing point. As an example, according to research by Hubert and Kenning (2008) and Javor et al. (2013), customers may be discouraged from buying a certain category of items if they perceive the price as too high. Another possible explanation is that people attribute higher prices to higher-quality products, which boosts their perceived worth and, in turn, their propensity to buy.

The influence of price on the perception of product quality is shown by an often referenced research that deals with variations in wine pricing. Researchers used functional magnetic resonance imaging (fMRI) to track participants' brain activity while they tasted and rated wines of varying prices. According to research by Perrachione & Perrachione, Garcia & Saad (2008), and Hubert & Kenning (2008), people's reward-related brain regions were more active when they imagined themselves drinking the most costly wines.

Branding techniques have also made heavy use of neuromarketing research. To illustrate this point, research has shown that consumers' reward system regions are more responsive to brands that encourage self-identification (Perrachione & Perrachione, 2008). Neuromarketing may also help with another part of brands: defining the features of logos and brand names (Perrachione & Perrachione, 2008).

In addition, neuromarketing was used to comprehend the workings of consumer loyalty. Participants in an fMRI research were asked to rank their preferred retail brands. Activation of the ventromedial prefrontal cortex occurred when brand loyal customers made purchases (Hubert & Kenning, 2008). The reward system is linked to this region.

Lee et al. (2007) and Garcia & Saad (2008) are two studies that have shown what makes customers choose certain brands and items. Researchers can anticipate customers' decisions by analyzing the brain regions stimulated by various brands and items. This allows them to identify connected sentiments and emotions (Lee et al., 2007).

Neuromarketing's Drawbacks

Neuromarketing faces public skepticism and constraints similar to any other emerging scientific field. The surveys of relevant literature (Murphy et al., 2008; Fisher et al., 2010; Perrachione & Perrachione, 2008; Hubert & Kenning, 2008; Eser et al., 2011; Fugate, 2007; Morin, 2011 and Javor et al., 2013) all reach the conclusion that the lack of reliability of information is neuromarketing's primary drawback. There is a current tidal wave of "neuromania" that is affecting many different areas of study. The prefix "neuro" is used by several fields to exaggerate and justify their findings, according to Javor et al. (2013) and Fisher et al. (2010).

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According to Javor et al. (2013), the word "neuroculture" describes the emergence of new scientific disciplines like neurophilosophy and neurotheology that bring together elements from neuroscience and other scientific, artistic, or humanistic disciplines. Marketing is no different. In the midst of neuromania, researchers attempt to explain certain consumer behaviors by pointing to neurological processes (Javor et al., 2013). But the findings don't really contribute to or alter what was found using more conventional study techniques (Hubert & Kenning, 2008; Senior & Lee, 2008).

(Lee et al., 2007; Fisher et al., 2010; Eser et al., 2011 and Fugate, 2008) There is a dearth of published research and data pertaining to neuromarketing. Most of the data comes from neuromarketing firms or researchers affiliated with these organizations (Javor et al., 2013). This raises concerns about the reliability of the results since they may be skewed in favor of the corporations involved. The approaches used can have an impact on the trustworthiness of scientific findings. Neuromarketing, like other types of marketing research, relies on statistical data to support its validity, according to Senior & Lee (2008). Neuromarketing firms have the ability to persuade researchers to reject certain ideas by using varying statistical approaches (Marci, 2008).

Numerous writers have argued that the study of emotional brain processes is inherently complicated, making it impossible to make broad generalizations or definitive statements (Murphy et al., 2008; Fisher et al., 2010; Senior & Lee, 2008; Hubert & Kenning, 2008). Indeed, the specific areas of the brain that are responsible for processing different emotions are shaped by an individual's unique characteristics (Lee et al., 2007; Perrachione & Perrachione, 2008, Hubert & Kenning, 2008, and Fugate, 2007).

According to Fugate (2007) and Lee et al. (2007), marketing stimuli might be processed differently depending on when and where they are received. If the person is in a quiet place, like a marketing research lab, their brain regions that are activated by the stimuli will be different from those that are activated when they are in a busy shopping environment weighing their options with a lot of other people (Lee et al., 2007). Hence, the absence of a model demonstrating the regions of the brain active concurrently with the individual's emotions is a significant problem mentioned in several works (Butler, 200 and Senior & Lee, 2008).

And even if neuromarketing could pinpoint an individual's processed emotion, it still wouldn't tell us why a certain stimulus set it off (Butler, 2008; Perrachione & Perrachione, 2008, Hubert & Kenning, 2008, Eser et al., 2011). The complexity of creating experiments is another restriction. The expenses of neuromarketing and rules governing the conduct of neuromarketing studies are two of the challenges (Hubert & Kenning, 2008). These expenses make it impossible for independent researchers to further their study without corporate funding (Hubert & Kenning, 2008). This fact reduces the number of investigations and makes the data less reliable. It is necessary to get permission from the government in order to do this kind of study in some nations (Babiloni, 2012 and Hubert & Kenning, 2008).

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4. Final Considerations

The goals of this research were as follows: to catalog the most popular definitions of neuromarketing; to determine the field's significance and possible contributions; to show how neuromarketing excels as a marketing research tool when compared to more conventional approaches; to catalog the ethical concerns surrounding neuromarketing studies; to catalog the most popular neuromarketing techniques currently used to advance marketing research; to catalog studies that have made use of neuromarketing research techniques; and to catalog the most prominent limitations of neuromarketing.

One of the most common ways that neuromarketing has been defined is as a branch of neuroscience or, more specifically, a subfield of neuroeconomics. There have been claims that it can be used for both scientific research and commercial gain. Determining what really constitutes neuromarketing research remains a challenging task. Studies that the authors have categorized as neuroeconomic, neurofinance, or social neuroscience show a strong degree of overlap with some marketing-related fields. Neuromarketing is a subfield of marketing research that aims to address marketing challenges by studying participants' physiological and brain reactions, both consciously and unconsciously.

With its promising future in communication and the ability to uncover consumers' subconscious wants and needs, neuromarketing could lead to better brand positioning strategies, more appealing packaging, and more informed pricing decisions. As a whole, the Neuromarketing's strength is in its capacity to supplement more conventional forms of marketing research, such focus groups and in-depth qualitative studies.

One benefit of neuromarketing over more conventional forms of marketing research is that it doesn't rely on customers' willingness or capacity to disclose their feelings. Neuromarketing research also benefits from the fact that it can show the component that triggers a certain feeling thanks to the simultaneous recording of information and the identification of emotions processed in fractions of a second.

The primary concerns about neuromarketing are to the invasion of consumers' privacy and autonomy. The involvement of medical professionals and academics engaged in neuromarketing studies for profit also raises ethical concerns. Another noted ethical problem is the potential exploitation of vulnerable populations, including minors.

Scientists and businesses were especially interested in functional magnetic resonance imaging (fMRI) as a neuromarketing approach. Eye tracking and galvanic skin response (GSR) measurement are two more popular methods. Electroencephalography is another popular method for determining the influence of each element from television advertising. Facial recognition, positron emission tomography (PET), magnetoencephalography (MEG), and the evaluation of cardiovascular

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parameters and neuroimmunoendocrinological activities are among the other methods that have been given; nevertheless, research and consulting organizations employ these methods less often.

These methods have been tested in several marketing contexts, including advertising, public relations, communication, product creation, packaging, pricing, promotion, brand positioning, and consumer decision prediction. And lastly, we found a few restrictions. The findings of many neuromarketing experiments are skewed and incorrect. Experiments with small samples that restrict generalizability are also a result of the expensive expense of doing neuromarketing research. Most importantly, there is no established protocol for correlating marketing stimuli with the feelings elicited and neural regions engaged.

As a marketing research technique, neuromarketing has become more popular and attention to this area of study has grown in recent years. Neuromarketing has the potential to improve product design and advertising effectiveness, and more corporations may join the movement if more research on the topic are published and studied. As a result, neuromarketing initiatives may aid in deciphering various forms of intricate consumer behavior. For instance, it is still not completely clear what kinds of "triggers" cause people to rely on their intuition in certain contexts while ignoring it in others. We may also improve our understanding of the amounts of reason and irrationality that occur in consumer choices. Some of the most pressing questions that marketers have may be amenable to resolution with a deeper comprehension of the brain's cognitive processes made possible by the cutting-edge science outlined in this article.

Managerial Implication

By appealing to consumers' sense of smell, sight, and touch in an effort to persuade them to make a purchase, nueromarketing has emerged as a new instrument in the arsenal of market researchers. Neuromarking is already a part of market research strategies at companies including BBC, Coca-Cola, Ford, Heinz, Intel, L'Oréal, P&G, Hundai, Microsoft, Yahoo!, and eBay. In order to improve marketing outcomes

research Businesses are using the outsourcing services provided by firms such as NeuroFocus, Neuro-Insight, Neurosense, and Brighthouse. Managers should also get on this new marketing bandwagon to place their company in the customers' subconscious minds. Those nueromarketing firms have been hard at work perfecting nueromarketing strategies that use neuroscientific tools like functional magnetic resonance imaging (fMRI), electroencephalography (EEG), eye tracking, global structural resonance (GSR), emapthy design, and cognitive analysis. Therefore, marketers can expect nueromarketing to be quite fruitful in the years to come.

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