

What is Neuromarketing? A Proposal for a Broader and more Accurate Definition

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Abstract

Purpose: The aim of this theoretical paper was to provide a broader and more accurate definition for Neuromarketing, after analyzing a 10-year time frame of research studies on the subject.

Design/methodology/approach: This paper has analyzed the conceptual evolution of the Neuromarketing term over a 10-year time frame, through a theoretical review in the Web of Sciences and Scopus database, by addressing and discussing the current state of definitions.

Findings: It was considered the Neuromarketing definitions declared by several authors and their understanding of what is the research domain of the discipline. The results demonstrate that there are still many difficulties in defining this discipline and its application field.

Practical implications: An important consequence of the definition developed in this article is that Neuromarketing research studies can and should take advantage of traditional marketing research and still remain the Neuromarketing area.

Originality/value: The authors propose a broader and clearer definition, in an attempt to achieve greater coherence of its comprehensiveness and scope, which considers both neurofeedback and biofeedback measures, and metabolic processes.

Keywords: Neuromarketing, definition, marketing research, terminology

Introduction

The interest in the topic of "Neuromarketing" (NM) has grown exponentially in recent years and the myriad of different definitions indicates the need of a deep theoretical discussion. The potential of this new discipline has drawn the world's attention, which can be verified through a query on Google Trends. Google is the world's leading search engine of the internet and accounts for about 90% of searches performed. It serves as a fairly reasonable proxy of interest for a specific topic (Mellon, 2013). The Google algorithm index shows a significant increase in the interest by the public in general about the subject from 2004 to 2014, from close to zero in May 2004 to 100 in October 2014 (<http://www.google.com.br/trends>).

The year 2004 was chosen as the basis for this trend analysis because it was the year in which NM appeared in public for the first time in various media through the famous article by McClure et al.

(2004) published in *Neuron*. This article marked the academic community and put the spotlight on the NM potential both among researchers and businessmen interested in the practical results of new discoveries for their own companies. The search goes until 2014 in order to show a picture of a 10-year time frame.

The above mentioned study sought to understand consumer behaviors with the use of MRI. The idea was to verify the impact of the subjectivity of preferences over the objectivity of the preference *per se*. The results show that when subjects were informed of the brand they were experiencing, brain dynamics and preferences were completely altered in relation to the blind test. This basically showed the logics of branding in what was considered to be a black box, the human brain (McClure et al., 2004). The year of 2004 certainly represented an inflection point with respect to the attention given to this new research area.

The definition and scope of NM was something that has instigated the interest of people at that time: "What is neuromarketing" was the second term most sought in the USA in this 10 years period (2004-2014). In addition to the patent interest, the difficulty in understanding the meaning of NM also stands out.

The rise in NM popularity occurred to the extent that its potential applications demonstrated by researchers began to appear in scientific articles and in the popular media. In very didactic terms, these potential applications have been translated into the possibility of using clinical information and complex biometric indicators, translating them into the possibility of better understanding what for many is considered a black box: the consumer's mind. Another way to translate this potential for marketing is the possibility of understanding, through this black box, what the consumers' "buy buttons" are (Fugate, 2007 p. 385).

However, a few years before, in late 1990s, new and sophisticated neuroscientific diagnostic equipment for marketing purposes began to effectively be used. Professor Gerald Zaltman, from Harvard University, was the first to carry forward and identify that these new equipment could bring great insight to the marketing area. In a joint study with the Massachusetts General Hospital, they used PET scanners to understand the impact of three alternative marketing stimuli: anxiety, confidence and comfort. For the first time in history, there would be the possibility of measuring, in a marketing study, the mental events in individuals with a very high quality precision (Zaltman, 1997).

As the broad interest in the area was evident, the interest of the scientific community and the efforts of studies were also very significant (as seen in a Scopus database search). The number of publications grew rapidly between 2004 and 2014 and the trend is to continue to the extent that scholars perceive its potential for decision-making analysis, consumer behavior, pricing, among other areas of interest of marketing and business strategy.

A survey at the Web of Science database identified a similar pattern between 2004 and 2014. The amount of citations, which was zero in 2004, rose to 33 in 2010 and 141 in 2014. Among the most cited articles, the first two refer to the general theme of understanding about the subject. In the second place with 59 citations, the study by Lee, Broderick, and Chamberlain (2007) seeks to decipher exactly what is how to define NM, as the article title implies (What is 'neuromarketing?': The discussion and agenda for future research). The first most cited article, "Neuromarketing: the hope and hype of neuroimaging in business" by Ariely and Berns (2010), with 64 citations, also follows the same line in the search for definition and understanding of the NM potential.

The difficulty of defining and understanding the term can be a result of the multidisciplinary nature of the area, which makes scholars with different backgrounds to eventually define the

discipline under different lenses. Of the research areas defined by the Web of Science, the first two are representative of this diversity: the area called "Neurosciences Neurology" has 23 articles of 95 on this database (24%) and the area "Business Economics" has 35 articles of 95 (36 %). Other areas also have related articles such as Psychology, Behavioral Sciences, Computer Science, among others. Such different areas involved in NM definition clearly show the difficulties in delimitating the area.

As a result of challenges of a multidisciplinary area and scholars with so different backgrounds, it is necessary to more closely analyze the current definitions of the theme. The search for a more suitable definition is part of a larger effort for the understanding and delimitation for further studies, allowing identifying the area in order to find resources for further studies, the appropriate direction of scientific papers to referees and the correct identification within the general and specific public. This is the objective of this paper: to provide a broader and more accurate definition for NM, by analyzing the conceptual evolution of the term over the years. The next section addressed the discussion of the current state of definitions.

Current definitions and interpretations of Neuromarketing

There is a difficulty in defining the scope of action of this new area of research study. Certainly, this is something natural to occur, especially taking into account that NM started to be "formed" as a science area in early 2000s, when scholars working with neuroscience began to see the possibilities of its application to marketing. Although MRI technology for this purpose began to be used in late 1990s, the term was probably used for the first time by Dutch professor Ale Smidts, from Erasmus University in the Netherlands in 2002 (Phan, Wager, Taylor, & Liberzon, 2002).

Table 1 shows some of the main NM definitions in the period of one decade. There is a clear difficulty in the delimitation and scope of the theme. Statements expressed in these articles were formulated by the cited scholars. Interpretations of definitions were also included, i.e., readings made by some authors and subsequently cited. The inclusion of interpretations is due to the fact that even based on clear definitions, they carry specificities of the author's reading and certainly express a choice of what the author considers to be the correct definition. Therefore, a high level of subjectivity is perceived in Table 1.

Table 1: Definitions and Interpretations of Neuromarketing

Study	Year	Definitions and interpretations from other authors
Neuromarketing: Beyond branding	2004	NM is the use of cognitive neuroscience techniques, such as fMRI or EEG, to assess whether a person will respond favorably to a brand name or product.
Lee et al.	2007	NM as study field can simply be defined as the application of neuroscientific methods to analyze and understand human behavior in relation to markets and market changes.
Fugate	2007	NM and its precursor, Neuroeconomics, uses clinical information about brain functions and mechanisms that help explain what is happening inside the black box, resulting in explanations about consumer behavior.
Sutherland	2007	NM is an applied extension of neuroscience
Wilson, Gaines, and Hill	2008	The authors consider NM as a line of research that uses neuroimaging and proposes two models (Collective NM Persuasion Model and Individual NM Consumer Persuasion Model) in which both necessarily use this specific technique called screening phase of the consumer behavior paradigm.
Zurawicki	2010	NM is the area of science investigating the brain and neural responses to stimuli related to market change.

Study	Year	Definitions and interpretations from other authors
Hubert	2010	A neuroeconomics sub-area that investigates marketing-relevant problems is called “neuromarketing” or “consumer neuroscience”. The notion of “neuromarketing” poses an impractical ambiguity. The term “consumer neuroscience”, therefore, is a more appropriate appellation for the new research area that uses neuroscientific methods and findings to better understand the (neuro-) physiological fundamentals of consumer behavior.
Fisher, Chin, and Klitzman	2010	Neuromarketing, can be tentatively defined as marketing designed on the basis of neuroscience research. (...) the academic foundations of neuromarketing as a field are difficult to identify. It is unclear at present whether neuromarketing qualifies as an academic field, and if it does, what distinguishes it from neuroeconomics.
Ariely and Berns	2010	The authors define NM as “the application of neuroimaging methods to product marketing”.
Eser, Isin, and Tolon	2011	Neuromarketing uses the latest advances in brain scanning to learn more about the mental processes behind customer purchasing decisions
Morin	2011	Neuromarketing is an emerging field that bridges the study of consumer behavior with neuroscience.
Kenning and Linzmajer	2011	The sub-discipline of consumer neuroscience that has resulted from that interest belongs to the innovative approach of neuroeconomics. Consumer neuroscience investigates problems of consumption and marketing through methods and findings from neuroscience.
Pop and Iorga	2012	NM is the knowledge of the mechanisms of information processing in the human brain that can generate ideas for improving the decisions of entrepreneurs in their communication with customers.
Orzan, Zara, and Purcarea	2012	NM is a new marketing discipline that uses medical techniques to understand how our central nervous system reacts to marketing stimuli.
Gang, Lin, Qi, and Yan	2012	NM is a sub-area of neuroeconomics that addresses marketing relevant problems with methods and insights from brain research and further advances the integration of neuroscientific findings into the marketing sciences.
Babiloni	2012	The most accepted definition of consumer neuroscience or neuromarketing is that it is a field of study concerning the application of neuroscience methods to analyze and understand human behavior related to markets and marketing exchanges.
Schneider and Woolgar	2012	NM is a relatively new form of market and consumer research that applies neuroscience to marketing by employing brain imaging or measurement technology to anticipate consumer’s response to, for instance, products, packaging or advertising.
Plassmann, Ramsøy, and Milosavljevic	2012	The goal of consumer neuroscience is to adapt methods and theories from neuroscience – combined with behavioral theories, models, and tested experimental designs from consumer psychology and related disciplines such as behavioral decision sciences – to develop a neuropsychologically sound theory to understand consumer behavior.
Venkatraman, Clithero, Fitzsimons, and Huettel	2012	Recent neuroscience research provides a potential new tool to address the challenge of understanding consumer decision making. Neuroscience has generated significant advances in identifying the neural mechanisms underlying decision-making process, commonly grouped under the term neuroeconomics. In parallel, marketing research has indicated that consumer behavior can be predicted by determining the likely decision processes consumers will employ in a given context. The authors argue that neuroscience can help in market segmentation.
Senior and Lee	2013	At its core NM is essentially the application of neuroscience to understand decision-making within a market context.

Study	Year	Definitions and interpretations from other authors
Kong, Zhao, Hu, Vecchiato, and Babiloni	2013	Neuromarketing is a novel application of neuroscience to consumer psychology, especially for advertising.
Khushaba et al.	2013	Consumer neuroscience is an emerging interdisciplinary field that combines psychology, neuroscience, and economics to study how the brain is physiologically affected by advertising and marketing strategies.
Javor, Koller, Lee, Chamberlain, and Ransmayr	2013	The authors argue in favor of a terminology that distinguishes neuromarketing, not treating it as a scientific method but rather consumer neuroscience as a scientific method.
Koc and Boz	2014	The term psychoneurobiochemistry has been coined by the authors of this study to refer to a group of often studied factors in the disciplines of psychology, neurology, biology and chemistry.

Analyzing some of the definitions in Table 1, such as that of Pop and Iorga (2012) and Zurawicki (2010), they many seem too restrictive, delimiting NM as only the study of the brain in conjunction with marketing or some marketing aspects. It seems more appropriate the delimitation that seeks to contemplate the brain and the central and peripheral nervous system, in addition to physiological processes influenced by them. If the study restricts only the brain analysis, it may exclude other important body reactions that are indirectly linked to the brain and cognitive neuroscience, such as: pupil reactions, heart beats and other biological parameters. These indirect responses are important proxies of conscious and unconscious reactions.

Therefore, it would be interesting to extend this definition to include biofeedback markers within a systemic approach, in which responses to external and internal stimuli (personal motivations, interests, desires, etc.) can be measured by devices that are traditionally used for medical purposes and correlated areas. In this context, a wider range of physiological processes such as temperature, galvanic skin response, blood pressure, heart rate etc. could be included. All these variables are physiological responses with a significant potential for use for better understanding of marketing and should not be separated or excluded from the scope of this new area.

Other definitions such as those of Fugate (2007), Morin (2011), and Venkatraman et al. (2012), focus on delimitation the consumer behavior area of application. Thus, there is a limitation on NM scope, because the potential of applications is much wider than just on consumer behavior and consumer decision-making. For instance, other marketing areas that could be considered for NM application are: strategic marketing, internal marketing, brand equity, pricing, communications management, new products development, innovation, sustainable marketing, and socially responsible marketing, among many other surrounding areas.

On the other hand, several authors have defined NM as neuroeconomics. Gang et al. (2012), Hubert (2010), and Kenning and Linzmajer (2011) used in their definitions the idea of NM is a sub-area of neuroeconomics, emphasizing that the term generates difficulties of interpretation, thus returning to the idea that NM should be considered "consumer neuroscience". This type of confusion is more due to the multidisciplinary character of the theoretical background of scholars than to the difficulty to differentiate economics and marketing, at least for professionals in both areas. Although marketing has its origin related to economy, the differentiation of objectives, scope, leading theorists, professional field, problems and solutions are already secular. Marketing is marketing and economics is economics and so should be considered any scientific line that has one of the two areas as a background, such as neuroscience application for these areas.

Finally, some authors such Fisher et al. (2010) and Sutherland (2007) define NM as an extension of Neurosciences, while others follow the opposite path, defining it as an extension of marketing through the use of new tools for this area. Both definitions are disappointing because the peculiarities inherent in NM studies do not fit well in any of these areas. Without the presumption of extending over the definition of what constitutes an area of knowledge, we remember that NM can be considered an interdisciplinary field, in which the overlap of principles and foundations of neuroscience about marketing or the opposite meet the background of scholars involved and the objectives of each research proposal.

NM still uses principles and foundations of other areas (or sub-areas), such as Economics, Sociology, Psychology, Psychiatry, Biomedicine, to name a few common examples. Therefore, it reinforces the idea of considering NM a new area and not a sub-area of those above, where discovered knowledge and those to be discovered will define a set of principles and specific grounds.

Proposal for a New Definition

After analyzing the weaknesses of NM definitions displayed in Table 1, we propose a new definition that could better meet many of the nuances and specificities of this new area discussed in the previous section. The definition is:

"Neuromarketing is an interdisciplinary field of science that uses various tools traditionally used in medicine, psychiatry and psychology on neurofeedback, biofeedback and metabolic processes measures, in conjunction with traditional marketing tools in the search to better understand the most diverse types of emotions, cognitions, physiological reactions, behaviors and thoughts of economic agents, both conscious and unconscious related to typical issues of Marketing and its various sub-areas". (Our definition)

In this definition proposal, it is important to emphasize that neurometric or neurofeedback tools were those who first brought great interest to the NM area, especially functional magnetic resonance imaging (fMRI). This medical equipment allowed for the first time viewing the neural reactions in the consumption of a product or marketing stimuli at specific sites in the brain. This fact certainly brought great interest to marketing scholars, psychologists, psychiatrists and neuroscientists worldwide. More importantly, it has perhaps shown the potential use of medical equipment in marketing research.

However, although MRI has been the center of attention in the early 2000s due to the potential use of diagnostic equipment in marketing, it would be a mistake to consider only this or a few devices primarily because technology changes and evolves constantly. Certainly, the great deed of studies with functional magnetic resonance imaging (fMRI) and similar equipment has been to attract the attention of the scientific community, but many other diagnostic devices, from the reflection of this potential, are of great interest. The NM definition proposed in this work includes the terms "biofeedback" and "metabolic processes" for this reason. The brain responses have many measurement subtleties that can be verified in different parts of the body such as skin energy, pupil dilation, body temperature, heart beats, hormonal variations, neurotransmitters, among others.

Due to the fact that many biological reactions are deeply linked to conscious and unconscious brain reactions, neurometric and biofeedback measures and metabolic processes should be included in this definition. Another point that should be highlighted is that even though some devices attract more the attention of the general public, in scientific terms for NM studies, there is

not exactly a device that is better than another in absolute terms, but rather in relative terms. This means that some devices are better suited to certain types of marketing research and others are more suited to others. At the same time, there are marketing studies that require the combination of devices to be better analyzed by NM, either two neurometric devices or neurometric devices combined with biofeedback devices. Therefore, the advance of NM is more due to the increased awareness of the potential use of equipment than the technology *per se*. This is because various medical devices that have been available for many years or even decades must necessarily be included in the scope of equipment used in this area.

In addition to all these variables, the definition also includes the important idea that NM is an increased understanding and not an absolute breakthrough of marketing science. This is represented in the part of definition that addresses the analysis "in combination with traditional marketing tools". This means that traditional tools should not, in principle, be ruled out. Rather, they are part of the great "puzzle" that means understanding the consumer decision-making and all the underlying areas of strategic marketing and complementarity is what makes NM something special, as it allows multidisciplinary understanding in which obscure points of understanding can be met with other non-traditional tools.

This has been the main problem in the definition and understanding of what is NM. Lay people, including many businessmen, are enchanted with a few results of specific devices, disregarding all that complex and subtle network of causes and consequences, reactions of the human body and their precise and scientific measurement. The measurement of emotions, cognition, reactions to the human senses brings this complexity and need for effective analysis in a laboratory.

To illustrate this point, the case of the analysis of an advertisement video can be mentioned. The analysis of an individual in relation to the video has different angles. Identifying specific regions activated when he is seeing the video can be done with more spatial accuracy through MRI, for example. However, MRI has no good temporal resolution, that is, it necessarily has an analysis delay, which impairs or prevents identifying exactly which point the video images generated the reaction in particular. At the same time, the temporal resolution of EEG, which measures brain waves, is much better and allows such identification. Neither allows identifying other body reactions, for example, where the individual was exactly looking the video during the reaction, so other biometric measurements such as eye-tracking are very useful. Khushaba et al. (2013), for example, proposes a model that combines EEG and eye-tracking seeking for the complementarity of these devices for consumer neuroscience studies.

Finally, the new NM definition also includes the issue of what should be measured. Similarly to devices, in this point, one should be careful not to restrict the scope of the analysis. The inclusion of "the most diverse types of emotions, physiological reactions, behaviors and thoughts" becomes quite convenient in that sense. The term behavior was not excluded, but studies on such behavior should not be restricted to "consumer behavior" because it would not cover, for example, the usability of a product. Usability exemplifies a subject in which MN can make important contributions, in this case, development of new products or the improvement of others. Limiting the definition to only one or a few areas of marketing ultimately impoverish the NM field of study and its real potential.

Furthermore, the broader focus proposed in the new definition allows for including other important areas related to marketing beyond the consumer behavior field (such as strategic marketing, internal marketing, brand equity, pricing, communications management, new products development, innovation, sustainable marketing, socially responsible marketing, consumer

experience, among others). In fact, that was a limitation pointed out on the NM definitions of other authors (Fugate, 2007; Morin, 2011; Venkatraman et al., 2012), that is overcome with the new NM definition.

Table 2 shows a summary of the discussion on the categorization of NM research studies. The most important point of this categorization is the idea that NM is defined by the use of medical devices in the measurement of different body "information" in favor of its use in marketing research. This is quite evident when viewing the last column of Table 2.

Thus, both measurement categories, even if they are not unanimous, can be renamed, relocated or possibly have subcategories, but the key criteria for identifying whether it is effectively a NM research remain valid regardless of these variations.

Table 2: Types of measurements analyzed in Neuromarketing

	Measurement Category	What is measured / analyzed
Neuromarketing	Neurofeedback	<ul style="list-style-type: none"> - Metabolic brain responses - Electrical / magnetic brain activities
	Biofeedback	<ul style="list-style-type: none"> - Eye movement and dilation - Electrical conductance of the skin - Heart beats - Body temperature - Energy expenditure - Facial movements - Hormones/Neurontransmitters - Other responses

Source: The authors.

Final Remarks

An important consequence of the definition developed in this article is that NM studies can and should take advantage of traditional marketing research and still remain the NM area. The opposite is not true, i.e., traditional marketing research cannot be categorized as NM without the use of the above tools or the measurement of the aforementioned variables. NM can make use of marketing tools and areas such as Neuroscience, Psychology, Biomedicine, Physics, among others because it is an area that was born with multidisciplinary perspective. The point in common that caused the interest and appearance of the area was, in fact, is the use of equipment traditionally used in medical diagnostics and activities.

Thus, the broader focus of the new NM definition proposed in this paper allows for including different types of equipment and several other important areas related to marketing beyond the consumer behavior, making the NM field of study an actual multidisciplinary one.

Furthermore, a better definition of the topic will also allow a better differentiation with other areas, like neuroeconomics, for example. Although there are similarities among these areas, NM has specificities that deserve attention. The prospect of being a specific area of study will allow for a better development of collective efforts in the academic environment more focused on NM. As a new area of science, the main challenge will be to develop a common basis for the identification and classification of biological emotions and markers, vis-à-vis the replication of experiments and the proof of new discoveries.

The measurement of neurophysiological and biofeedback responses represent the future of marketing research and should be a mandatory complement to traditional marketing research in the coming decades. The potential application of existing techniques already allows the scientific community devoted to marketing to make emphatic statements in this sense. One should take into account that each new technological development in the field of diagnostic medicine, each new discovery about the human brain and its effects on the body and each new understanding of the various interactions among different brain structures will irreversibly have a direct impact on new marketing studies through this new area of study represented by NM.

There is still much controversy about the scope of what should be considered NM or even if NM can be considered a sub-area of marketing or neuroscience. This paper aims to show that it should be neither, but a new multidisciplinary area with peculiarities and specificities that could be very well used by marketing scholars, neuroscientists, psychologists, economists, psychiatrists, businessmen, public administrators etc., who could better understand cognitive processes of everyday experience of human beings, their vices, desires, interests and conflicts.

Considering this broader perspective of NM studies, it is important that future researches consider the development and evaluation of an ethics code for NM procedures, for a better regularization and acceptance of the several techniques that might be adopted.

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