

NEUROMARKETING

Is there a room for ethics?



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Summary

Neuromarketing is an emerging field born from two branches; neuroscience and marketing. The latest advancements on the brain knowledge have provided unique and powerful insights to develop effective marketing campaigns. At the same time, the growth of this new field has arose many ethical concerns. The worrisome is related to the risk of manipulating the purchasing decisions and jeopardizing the consumers rights. Nonetheless, the limits of neuromarketing have not yet been defined as well as there is no a clear legal framework.

Key words

Neuromarketing, neuroscience, consumer behavior, ethical issues, ethical codes, technological era.

Resum

El neuromarketing és un nou camp emergent nascut de la fusió de dues branques: la neurociència i el marketing. Els últims descobriments rellevants del cervell han aportat al marketing una font d'informació única per dissenyar campanyes efectives. Alhora el creixement d'aquest nou camp d'estudi ha creat greus preocupacions ètiques. Els problemes estàn relacionats amb el risc de manipular les decisions de compra, així com posar en perill els drets dels consumidors. No obstant això, els límits del neuromarketing encara no estàn definits i tampoc hi ha un clar marc normatiu.

Paraules clau

Neuromarketing, neurociència, comportament del consumidor, aspectes ètics, codis ètics, era tecnològica.

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INTRODUCTION

For many years, marketers have pursued different tools to create effective advertising campaigns for products and services. They used traditional techniques to understand and influence the consumer behavior. Surveys and focus groups were the most common to obtain direct feedback from consumers and design marketing campaigns.

Today marketing research studies have moved forward. The application of neuroscience to create effective marketing campaigns has grown exponentially. It's no longer about the decisions of the consumers but how and why do they make these decisions.

What neuromarketing tells us is new and different qualitative information which we couldn't obtain from traditional resources. Therefore, it's not unusual that companies are adding neuromarketing techniques to reinforce marketing research.

The data obtained through neuroscience techniques provide insights of the human brain from both conscious and unconscious level. That is the reason why, ever since the first publications and use of these techniques have arose concern for ethical issues.

The worrisome is basically related to privacy, control and protection of the consumer autonomy. It is argued that the information could be used by malicious parties, using it in an unscrupulous way. For instance, fast food companies or tobacco brands that would jeopardize the society's welfare.

On the other hand, neuromarketing techniques could be applied to obtain favorable outcomes for the society. In the case of children obesity, the University of Yale has started investigations with the objective of reducing this, unfortunately common, disease.

However, it is important that market researchers keep in mind that this research methodology is still in its infancy, and basic research is necessary to facilitate an application of these techniques to marketing.

In conclusion, neuromarketing is an emerging field that present a lot of future opportunities but at the same time has to face barriers. In this project I will conduct an intense analysis on the literature of the topic, which is abundant, as well as real world cases.

1. Objectives

This project aims to provide useful information about neuromarketing and its ethical implications. The issue on ethics seems far to be solved yet and my goal in this paper is to find out what are the major problems or threats of neuromarketing as well as the solutions or outcomes.

2. Hypothesis

As the title suggests, this project questions whether neuromarketing is an ethical practice or not. In other words, with this research I will try to determine if this new field is compatible with ethical issues.

3. Motivation

As a business student, I have always been intrigued by marketing activities. From my personal point of view, it is one of the most dynamic departments and very different in every company. The fact that neuromarketing is emerging caught my attention. Am I a target of neuromarketing campaigns? Is this a right way to adapt products and services? Are companies altering my purchasing decisions? So many things came to my mind and I decided to conduct this analysis to understand how neuromarketing works and of course analyze its ethical implications.

4. Methodology

The method followed to conduct this project was basically the collection of literature on the topic. There is abundant information, which I had analyzed and used for my findings. This descriptive method included papers, publications, books and internet information. Secondary literature like experiments or investigations were also useful to contrast data collection.

This project is divided in three different sections. The first one covers all the aspects regarding neuromarketing in order to fully understand the concept, background, current and future applications. Moreover, it also includes the different techniques used and its costs. The following section aims to support the first one with information about the brain. It is important to know and be aware of neuroscience concepts to understand neuromarketing. With all the above information, section three presents the main ethical concerns of neuromarketing and discusses among the different solutions possible. Finally, the test on the hypothesis and final conclusions are presented.

I. NEUROMARKETING

1. What is Neuromarketing?

Neuromarketing is the formal study of the brain's responses to advertising and marketing stimuli. The objective is to understand the motives behind the consumer's behavior using a method that goes beyond traditional techniques such as surveys or focus groups (Stanton et al., 2016).

Neuromarketing is the emerging interdisciplinary field that combines psychology, neuroscience and economics (Lee, Boderick & Chamberlaine 2007). It is the use of advances in neuroscience to analyze powerful insights into the human brain's responses to marketing stimuli (Renoisé and Morin 2007; Senior et al., 2007). This information helps to understand the relationship between brain and behavior (Plassmant et al., 2012).

According to Solnais et al., 2013 neuromarketing gives insights on the four main areas of the consumer behaviour:

1. Consumer decision-making and preferences.
2. Engagement of the brain's reward system.
3. Consumer's motivational and emotional responses.
4. The neural foundations of consumers attention and memory.

Thus, the primary aim of neuromarketing is to design and present innovative products that are as compatible as possible with consumer preferences and judgements (Kushaba et al., 2013).

In order to dig into the consumers' brain, researchers use technologies such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) to measure specific types of brain activity in response to advertising messages. With this information, companies learn why consumers make the decisions they do, and what parts of the brain are motivating them to do so. Further in this report I will describe how does these systems work and their efficiency.

Finally, to fully understand the potential of neuromarketing we should bear in mind the value added information that we obtain in comparison with traditional techniques such as focus groups, depth interviews or surveys.

In these kind of activities, most of the times people are not expressing all their thoughts or may even be lying. Therefore, results using traditional methods are not always consistent. That is the reason why neuromarketing techniques offers unique opportunities for marketing campaigns (Pop & Iorga 2012).

There are millions of money spend every year in marketing campaigns to approach consumers with products or services. Being able to obtain privileged information should not be overlooked and used to create effective marketing campaigns (Morin, 2011).

Another reason could be the fact that in every decision making process, there is at the same time an emotional and unconscious component (Kahneman, 2011; Lee, Broderick & Chamberlain, 2011). In addition, the non-conscious decision is far more important than the conscious decision making process (Ariely & Berns, 2010).

Finally, we could affirm that as a science, neuromarketing is rapidly becoming one of the most useful research tools to provide modern business marketers with insight into human thought processes and how it functions in different situations (Taher, 2006). However, it is important that market researchers keep in mind that this research methodology is still in its infancy, and basic research is necessary to facilitate an application of these techniques to marketing (Plassmann, Kenning, & Ahlert, 2007).

2. Background

2.1 History

The latests improvements on neuroscience during the 1990s provided results to better understand the human behavior in many contexts. The application of this abilities, neuroimaging¹, started being used in fields which are not only medical. Thus, the term of neuroculture was described as new scientific branches that combine neuroscience with other fields. For instance, the application of neuroimaging to economics, resulted in the creation of 'neuroeconomics' (Javor et al., 2013).

Many advertisers and marketers rapidly saw the neuroeconomics potential and started using the merge the merge of neuroscience and marketing resulted on this new field we call neuromarketing (Ronda, 2013).

This term is not usually not attributed to someone in particular but it appeared in the early 2000s. On one hand, The Economist gave credit in 2004 for Jerry Zaltman for proposing a union between brain and imaging technologies. Later on, two companies from United States: SalesBrain and Brighthouse started offering services in neuromarketing consulting. In other words, they started using technology and knowledge from neuroscience to apply it to marketing campaigns (Morin, 2011).

¹ Neuroimaging or brain imaging is the process of producing images of the activity of the brain or nervous system.

One of the first studies to be published was conducted by Mc.Clure et al. at the Baylor College of Medicine in 2004. The investigation scanned the brains of different group of individuals while they were drinking Pepsi or Coca-Cola. The goal of the study was to determine the difference in our brain activity in relation to the brand. As soon as it was published, the investigation raised a strong debate on ethical issues. The procedures and results of this experiment would be deeply explained in the following chapters.

2.2 From Marketing to Neuromarketing

The purpose of marketing, keeping things simple, is to link products and services with consumers (Ariely & Berns, 2010). Marketing has become an essential part of every company due to the globalization, new technologies and communications that have changed the way consumers behave (Pop & Iorga, 2012).

At the beginning, marketing experts were using information from other fields like psychology, sociology, economy, science or anthropology. Later on, with the many discoveries on the brain's functions, marketing experts have had access to more information about their customers (Javor et al., 2013).

They no longer have opinions or behavioral studies, but they have access to a more privileged information where they can find what actually moves people to do things. Most of the classical theories rely on the thought that people are rational and driven only by their own interest. Nonetheless, recent investigations have proven that decisions are influenced by a strong emotional load.

Moreover, applying this new concepts is not as easy as it seems. The techniques used are really expensive and usually only big companies can afford them. Other traditional methods are not expensive but the results are not as effective and reliable as with neuromarketing technologies (Monge & Fernandez, 2011).

2.3 Nowadays

The neuromarketing techniques represent today useful and quality information to develop and adapt marketing campaigns to the consumer's needs. When having access to the brain, they are able to track cerebral activity that give data and insights we couldn't guess with traditional resources such as focus groups, surveys or feedback form consumers. However, it is important that market researchers keep in mind that this research methodology is still in its infancy, and basic research is

necessary to facilitate an application of these techniques to marketing (Plassmann, Kenning & Ahlert, 2007).

Currently, the worst hurdle that this field experiences is related whether having access to this information is ethical or not. Many people believe that this is a threat to privacy because the data is directly obtained from a subconscious level, in a similar way as subliminal messages (Murphy et al., 2008).

On the other hand, according to Hubert & Kenning, 2008 neuromarketing is, precisely, the perfect tool to meet customers needs. In addition, they argue that it is a business activity that should help companies achieve their goals, rather than a scientific field.

Throughout this report I will present the field of neuromarketing and its ethical issues nowadays.

2.3.1 Global context

To fully understand the current situation of neuromarketing we should analyze the environment of the world we live in. The latest advances in technology and medicine are changing everything; the way we do things, how we communicate among us and the reasons why we do things.

In our world today, everything is moving really fast. Robots are being integrated in human jobs and even in domestic environments, drones are going to deliver packages, devices and people and every day more interconnected or the fact that artificial intelligence could be more powerful than humans, just to mention a few examples.

All these rapid changes are affecting the decision-making process of consumers. The expectation on products and services is much higher and the competition is stronger. For that reason, companies are forced to deliver the best products they can to the market.

Therefore, the ability of getting qualitative information through scientific advances is clearly an edge for companies. Neuromarketing is a relatively new field that has emerged in the last years in this technological society and should not be overlooked. Likewise, it is expected to keep growing in an exponential way.

2.3.2 Challenges

The neuromarketing field has to evolve and grow together with this rapid growth and context we live in.

One of the main challenges for the future of neuromarketing is the ethic debate for the use of these new techniques. The rapid growth needs to be combined at the same time with a regulatory framework or standards in order to protect consumers.

At the same time, one of the proposals for neuromarketing is that is used to benefit the society overall welfare with campaigns to reduce number of smokers or children obesity, as the University of Yale is currently doing.

The neuromarketing challenges will be further analyzed in the following chapters of the project.

2.4 Application

This last section is destined to give real cases of companies that applied neuromarketing so as to see the efficiency of the combination of neuroscience with marketing campaigns.

The following table provide some examples of neuromarketing applications in different companies or sectors:

Company or Sector	Objective	Results
Google	User response to video advertisements on YouTube	Overlays are more effective than pre-roll advertisements.
Frito-Lay	Study of the female brain to position its advertising	Avoid talking about 'guilt' and put emphasis on 'healthy' instead.
The Weather Channel	Relaunch of 'when weather changed' history series	Refine its strategy for maximum impact
Microsoft	Understand users interaction with devices	Data that comprehends feelings when users use their devices such as satisfaction, happiness or frustration
New York editor	Analysis of long sentences, repetitions, redundancies, information flows and other literary aspects	The launch of the book was a best-seller in a record time
German Airline	Minimize pilot mistakes	Optimization of the pilot cabine
Banking sector	Maximize market share	Redefinition of images, forms and stile of messages

Table 1: Data Extracted from del Blanco, R.Á. and Winer, R. (2011) *Neuromarketing: Seducir al cerebro con inteligencia para ganar en tiempos exigentes*. 2nd edn. Madrid [etc.]: Pearson
Own elaboration

Other authors, like Ariely and Berns 2010 proposed other applications of neuromarketing according to the sector of the product or service.

Food and beverages

The perception and understanding of flavor is a difficult process for marketing companies because it implies sensory factors such as taste or smell, which depend on each customer. Neuromarketing has proved to be successful giving insights to design new products adapted to all consumers.

Architecture for designing a new building

Even if it seems unlikely, architecture building can be closely related with the brain. Neuronal activity can scan the impressions of specific aspects of a buildings and guide the architectural design process.

Movie industry

It helps predict how the lighting, the set or music should be used in order to engage more the viewer. In addition, neuromarketing techniques are also used in film making by scanning the brain of different subjects to determine which cut is the most accepted by the public and add it to the movie, instead of another one.

Political candidates

Political campaigns are considered, in marketing terms, a product that must be sold to the public. The marketing of politicians is not new at all, and the use of neuromarketing techniques could be beneficial to design a trustworthy profile. It has been tested that different regions of the brain activate towards politicians, such as reputation or fairness. Having information of these facts before-hand would be useful to design effective marketing political campaigns.

3. Techniques

One of the questions that marketers ask themselves is how consumer's think. When asked, most of them are probably going to say something they don't actually do or think. It has been proven that 95% of the purchasing decisions are done by the subconscious² part of the brain and that is why science plays an important role to get inside the consumer brain and determine which emotions drive decisions.

² Extracted from book: del Blanco, R.Á. and Winer, R. (2011) Neuromarketing: Seducir al cerebro con inteligencia para ganar en tiempos exigentes. 2nd edn. Madrid [etc.]: Pearson

Besides, the use of the the following techniques allows researchers to extract information from the consumer that wouldn't be possible using only traditional methods. These techniques can be used individually or combined. Plus, it is common to use them in addition to traditional methods.

For the scope of this project, I will not analyze all the existent techniques but provide clear explanations on the most common ones in order to understand how neuromarketing works and its applications.

3.1 Non-Invasive techniques

The following techniques are commonly used by neuroscientists and considered non-invasive because the body is not invaded. In other words, it is not submitted to any surgery or operation.

The objective is to analyze the brain activity given marketing stimulus. The most common techniques are the following: Electroencephalogram (EEG), functional Magnetic Resonance Imaging (fMRI) and Magnetoencephalography (MEG)

Electroencephalogram (EEG)

This is one of the oldest techniques in analyzing brain activity but considered to be effective. The first studies are dated from 1979 by Davidson.

The neurons inside our brains are the cells responsible for our cognitive responses. We must bear in mind that our brain has more than 100 billion neurons than given specific stimuli react in many different and multiple ways. When responding to a marketing stimuli, for instance a TV spot, these neurons produce a tiny little electrical current that can be amplified and, therefore, these are associated with different responses (Morin, 2011).

Specifically, to study how a marketing campaign affect our brain, a helmet or band is placed in the subject's scalp with electrodes to record all of the information. Brain activity is recorded to understand the speed and impact of our thoughts as well as which areas there is more activity towards stimuli in real time (Pop & Iorga, 2012).

One of the drawbacks of this system is that it does not have good spatial resolution, which means it cannot tell exactly where those neurons connections have been made. Therefore, it could be that those brain electrical current come from another stimuli. That is because the EEG only gets information from the cortex and not deeper enough in our brain. Nonetheless, the data given by these studies could be useful to record electrical patterns in the brain. Usually, the activity in the left frontal

lobe indicate positive emotions and those related with negative emotions happen in the right frontal globe. Moreover, this technique has lower cost than the rest (Morin, 2011).

One of the main advantages of the EEG technique is the fact that it offers a really fast and accurate record of the changes in the brain activity. Furthermore, it is not very expensive and easy to carry with. Therefore, it is comfortable to transport and make studies, not only for scientist but for the subject as well (Costa and Cabral, 2000).

Nowadays, there are even wearables EEG that send the information via WiFi and allows scientists obtain information from anywhere and in different scenarios. This permits expand the horizons of neuroscience of the consumer (Wang, Wang & Jung, 2011).

To sum up, this technique is used to understand the effects on advertising but fails to determine the cognitive process responsible for such activity. However, it is very popular among neuromarketing studies due to its low cost.

Magnetoencephalography (MEG)

Similar to the EEG, Magnetoencephalography (MEG) is another technique that uses sensors to form an image of magnetic fields produced within the brain. The main difference is that these fields can be amplified and mapped in an excellent resolution. Therefore, it has a better a better spatial resolution that EEG (Monge & Fernandez, 2011).

Nonetheless, MEG analyzes only the activity in the surface in the brain and the important data is usually located in deeper areas of the brain (cognitive functions in the cortical area and emotions in the subcortical area). That is why, this method is quite limited and sometimes considered not good enough to conduct marketing research studies. In addition, this method is rather expensive (Morin, 2011)

Functional Magnetic Resonance Imaging (fMRI)

The background of this technology is the Magnetic Resonance Imaging (MRI), which is usually used as a noninvasive test that through a strong magnetic field and radio waves creates detailed images of the body (Morin, 2011).

In the case of neuromarketing, this technique returns a sequence of images of the cerebral activity by measuring the blood flow, showing which areas of the brain are active while trying a new product.

The fMRI works with the Blood oxygen level dependent (BOLD) a system which measures the neural activity with blood flow (Tank et al., 2009).

The running of this system is complex and purely scientific but at the same time really easy to implement. The subject is placed into a magnetic field, which is neither harmful or invasive, and the machine scans the brain while the participant is watching at marketing advertisements, for example (Senior et al., 2007)

However, the main idea is that neural activity is increased in front of specific stimulus and an fMRI scan can detect it in milliseconds. According to researches a purchase decision usually lasts 2,5 seconds (Witchalls, 2004).

For instance, this technique was used in an experiment³ to determine whether consumers preferred Coca-Cola or Pepsi beverages. Meanwhile, there had an fMRI machine analyzing its brain activity, which showed that some parts of the brain light up when they are aware or not of the brand they consume (Mc.Clure et al., 2004)

The results obtained in this experiment clearly stated that there is an irrational connection with the Coca-Cola brand due to its marketing campaigns, which are always full of emotions and positive messages. On the other hand, even if Pepsi has the same taste and quality consumers prefer to buy Coca-Cola instead. (Pop et al., 2014)

This is considered one of the most important techniques for neuromarketing purposes because it gives information on both conscious and unconscious information. These are complex thoughts that help researchers measure the effectiveness of marketing tools by recording the brain activity of the subjects (Ariely & Berns, 2010).

³ Experiment conducted by Mc. Clure, et al. at the Baylor College of Medicine in Houston in 2004. Available at <http://www.sciencedirect.com/science/article/pii/S0896627304006129>

To sum up, the most common non-invasive techniques in neuromarketing are EEG and fMRI. In the *table 2* you can see the main differences among them:

Comparative analysis of EEG and fMRI

Characteristics	EEG	fMRI
Temporal resolution	Very good, records brain activity milliseconds after stimulus exposure; allows for correlating the neural activity with the respective stimuli	Poor - signal delay 2 seconds after stimulus exposure and reaches max. value 10 sec later
Spatial resolution	Poor, captures only subcortical neurons' activity	Very precise - cerebral activity can be accurately localized, even in deep structures
Neural activity localization	Often impossible; records superficial, sub-cortical neuronal activity involved in the frontal lobe's decision making process	Allows for locating deep structures involved in complex processes (emotions, long-term memory encoding)
Other characteristics	Easy to use, portable, non-invasive	Strict protocols, not portable
	Cost of use and equipment rather cheap	Equipment is very expensive
	Recordings are blurred by adjacent movements: eye movements, blinking, cardiac beat, etc.	Considered the "Golden standard" in Neuromarketing research
Types of research	Allows for real-life shopping environment studies: in-store shopping	
	Studies mainly the neural activity of frontal lobes (decision making studies)	

Table 2: Comparative analysis of EEG and fMRI
Source: Pop & Iorga 2012

3.2 Invasive techniques

The following technique is not very common but still used in some neuromarketing investigations.

Electromyography (EMG)

This medical technique consist on small electrodes -with low voltage- inside the subject through needles. The goal is to measure the response on different parts of the body and the connectivity among them. This is typically used to motorize the facial muscles that move involuntarily. We have to bear in mind that some of these expressions and changes in our face muscles are really fast and hard to see from our own eyes. That is why EMG helps capture all these small and rapid responses.

The results usually indicates us whether a marketing stimuli produced negative or positive outcomes (in general terms, like or dislike). The most common researches that use this technology are for products with visual, auditive, olfactory or tasty characteristics (Monge & Fernandez, 2011).

3.3 Biometric techniques

The following methods are not considered technologies to base neuromarketing researches entirely but to help complete and understand information. These are related to emotions and consumer behavior as well and that is why is commonly used as a plus to marketing researches (Monge & Fernandez, 2011).

Emotional Facial Coding

This technique analyzes the movement of the facial muscles to detect emotions towards marketing stimuli. The process is simple, the face of the subject is recorded and at the same time a facial system codification code registers the changes and the muscles active during a period of time.

With the support of the code developed by Paul Ekman⁴ and his analyses of our facial expressions, marketers have been able to discover the first react reactions on consumer's when they see or interact with a product (Ekman, Friesen, 1978).

Nowadays, there's an automatic software that codifies automatically this facial emotions and they can study them easily. Azcarate, Hageloh et al., 2005; Salah, Sebe et al., 2009)

Eye-tracking

This method is used to determine the attention or the impact towards marketing stimuli. This information shows what is the first thing we look at or what things we look at more carefully (Perrachione & Perrachione, 2008).

For instance, in an a promotion of tobacco eye-tracking would help us see whether the consumer focuses on the health advertisement or just the cigarette itself (J.H.C de Oliveira, 2015).

Galvanic Skin Response

This technique analyzes the tiny alternations on the electricity of skin caused by automatic responses, which can be related with marketing stimuli (J.H.C de Oliveira, 2015).

It is the same procedure as polygraph techniques, where the the resistance of the skin to the electricity depends on the experiences of the subject (Monge & Fernandez, 2011).

⁴ Developed Facial Coding System in the 1970s.

Other biometric measures

There are more biometric techniques that proved to be useful to understand consumer behavior, such as heart rate, tone voice or the rhythm of breath. These are not scientific techniques or methods but there are some patterns that could help indicate what the consumer is feeling during the purchasing process. That is why, in almost every neuromarketing research these are studied to complement the study.

4. Costs

One of the most common barriers of neuromarketing is the high costs associated with these techniques. Commonly, big companies that spend millions on marketing campaigns can afford the use of these innovative techniques but for small companies is not affordable.

The real costs of a neuromarketing study cannot be exactly predicted because it depends on the kind of company (external neuromarketing consultancy or a company doing a neuromarketing study internally). As mentioned earlier, the different techniques can also be combined among them and as well with traditional techniques.

Nevertheless, according to Moore, 2005 a medium-sized neuromarketing study could cost between \$94,000 and \$188,000. This figure is not far from a traditional marketing techniques such as focus groups.

For other authors, operation costs using fMRI machines would oscillate between \$100,000 and \$300,000 (Monge & Fernandez, 2011).

Due to its high costs, these studies are done with a very little number of participants. This small sample leads to a higher probability of committing a type II error. So, that is why sometimes the validity of neuromarketing tests are questioned. However, it can be argued that these tests are valid because many scientists and researchers from different nationalities have obtained similar results.

In conclusion, to determine or calculate the exact costs of a neuromarketing study is difficult and the real costs of using the above mentioned techniques are not open to everyone. This kind of information is not accessible at all and, therefore, it is complex to make a proper estimation.

II. NEUROSCIENCE

The key to understand better the effectiveness of neuromarketing and its meaning is, as mentioned earlier, inside the brain of the consumer. These two fields -marketing and neuroscience- have merged to combine knowledge and evolve.

In this chapter I am going to introduce the main concepts of the brain and how it works, from the marketing utility point of view. First of all, I am going to describe the different parts of the brain from the scientific point of view. Nonetheless, the descriptions are not meant to be scientific but understandable for marketing purposes. Then, I will explain how these regions can be related with marketing stimulus.

1. The Brain

The brain is known to be the most complex organ in the human body and it is an organ of the central nervous system. It is formed by the Central Nervous System (CNS) and the Peripheral Nervous System (PNS). The brain and spinal cord are located in the CNS and the neurons and fibers represent the PNS.

The brain has 4 lobes, 3 layers and 2 hemispheres that are joined by the corpus callosum. In figure 1 you can see the different parts of the brain.

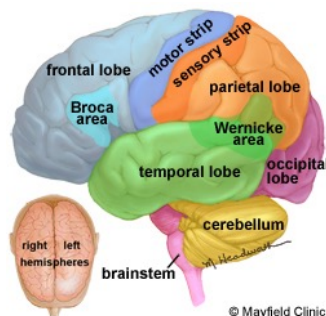


Figure 1

Source: <https://www.mayfieldclinic.com/PE-AnatBrain.htm>

Cerebrum

It is the largest part of the brain and it is located in both hemispheres. It includes the four brain lobes.

The surface of the cerebrum -not appreciated in the picture- its called cortex. It contains folded layers with nerve cells that allows higher functions such as hearing and vision, speech, reasoning, emotions, learning and movement control, among others. The neurons inside (about 70% of the total nerve cells) are located in the

grey matter and interconnected with other brain areas through axons, called white matter.

Cerebellum

This area controls and coordinates muscles movements, maintains the posture and balances the body.

Brainstem

It includes the midbrain, pons and the medulla. This area controls automatic and basic functions such as breathing, heart rate, temperature of the body or sleeping cycles.

Hemispheres

As you can see in the left bottom side of the figure, the brain is divided by two different hemispheres with different functions but connected at the same time. Each side of the brain controls the opposite side of the body.

The right one controls functions such as creativity, spatial ability, artistic and musical skills, perceptions, subjectivity and so on which can be sum up in emotions, sensations and special skills.

On the other hand, the left side of the brain controls the rational and logical thinking, including numbers, analytic processes, languages, maths and other organizational skills.

Sensory system

The sensory system is the one that processes our five senses: hearing, touch, sight, smell and taste. The neurons in the brains transmit, the neurotransmitters, the different reaction depending on the sense.

2. Applications of neuroscience to marketing

As seen in the previous sections the brain is a complex engine responsible of everything we do, think and feel. Scientists have made important discoveries in the last years and now marketers are using this information for business purposes.

To understand the applications of neuroscience concepts to marketing, we ought to focus on the cortex because the techniques mentioned above are the ones that scan this area in order to get images of the brain.

When the brain's orbitofrontal cortex lights up, the neuronal activity is increased and the particular stimuli has created a positive feedback. These situations can arise

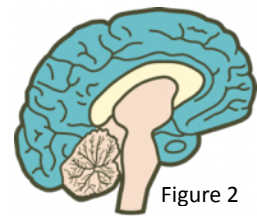
when consumers like the taste of a product, look and listen to pleasant images or music, receive money or social recognition, among others. In addition, when the prefrontal cortex is activated when consumers decide how much they are willing to pay for a product or service (Ariely and Berns, 2010).

Besides the general description of the brain above, for neuromarketing studies we can also analyze the human brain according to the physiological theory of the three brains.

That is, the organization of the brain in three different layers with unique functions that are connected among themselves.

New Brain

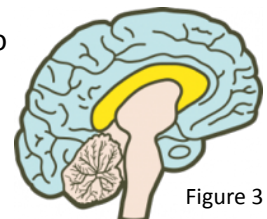
As you can see in the picture⁵, the new brain is the blue-painted part in the new cortex of the brain. This area is the most evolved part of the brain and responsible for the rational thinking, which include our logic, learning, language, conscious thoughts and our personality.



The role of the new brain is at the beginning of the decision process, where we ask ourselves the reason why we are going to buy or not an specific product. It processes the rational information so, it does not make a final decision but shares that information with the other two brains.

Middle Brain

The middle brain is the area highlighted in yellow. It is also known as the limbic system, which is responsible to process our feelings, emotions, mood, memory and hormones.



In the second phase on the decision process we analyze how buying a product or not would make us feel. Once again, this part is not the one making a decision but a decision influencer that shares the information with the other two regions.

⁵ Figure 2,3 and 4: <http://www.salesbrain.com/neuromap-overview/3-brains/>

Reptilian Brain

The orange-painted area is the most old and primitive⁶ part of the brain. It is called the reptilian brain due to the fact that we share the same with all vertebrates (from reptiles to mammals).

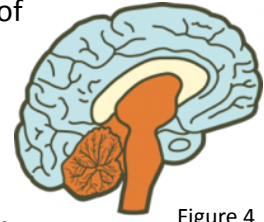


Figure 4

In this region the final decision is made. This part of the brain collects the information from the two other brains and makes the ultimate decision. That is why the goals of neuromarketing focus on how to impact the primitive brain of consumers.

The reptilian brain is driven the survival instinct, making ourselves self-centered and only focused on avoiding pain. These primitive impacts also avoid complex messages. One of the things that characterizes this region of the brain is the ability to process visual stimuli without using the visual cortex, that is why we always prefer images over words or experiences over explanations. From the neuromarketing point of view, this information is useful to understand that the messages ought to be clear and visual rather than complex. The objective is to reach the reptilian brain directly.

If you are able to understand what is going on inside the reptilian brain you will understand the motives behind every thinking process. Besides, the buying decisions that happen in the reptilian area are sometimes not of our conscious awareness (Morin, 2011).

According to different scientists⁷, the following insights are important to understand how marketing activities affect our primitive brain.

The primitive brain is driven by emotions

It has been proven that a product will be much more effective if we can associate it with emotions and sensations such as the ocean breeze or the smell of coffee. The reptilian brain in this case will automatically respond to that creating consumer loyalty for an specific product.

The effect of fear

Our primitive brain is skeptical and fearful of the unexpected. This fact can be used to *force* consumers to buy, for instance, offers that last an specific

⁶ It is thought to be 450 million years old according to Ornstein, Robert (1991): *The evolution of Consciousness: The origins of the way we think*, Touchstone, New York.

⁷ Extracted from: <http://www.salesbrain.com/neuromap-overview/6-stimuli/> and LeDoux, Joseph (2012) Rethinking the Emotional Brain, Neuron 73

period of time and you have a small counter next to it or when there are only few, but always mentioned, units available. The fear of not having the option to buy it in the future makes us buy it at that precise moment.

Ego in our reptilian brain

Decisions are most of the times made for one's best self-interest. That is why some companies use messages that addresses directly to the consumer such as Uber using the following quote: "Your drive, on demand". This makes us really think that the service is made for us and is the best we can take. On the contrary, if the message was the following: "Private cars, on demand" it wouldn't be as effective because the final benefit is not directly addressed to us.

Tradeoff balance

Most of the decisions that happen in the old brain are based on the basis of gain versus pain. Unconsciously we always react to seek pleasure and avoid pain. That is why products are designed to create and facilitate life to users offering them a pleasure they wouldn't have without the product.

Contrast and comparisons

Whether we like it or not, the reptile brain is constantly comparing everything on a daily basis. That is why some companies use data from different periods of time to show, for instance, how much money you saved in a saving accounts. Another example could be the *before and after* kind of pictures.

Perceptions

The first impression does really matter. Our primitive brain analyzes every experience from the beginning until the end, having a bigger impact always at first. If you address a marketing campaign that is well-accepted from the beginning you will have a greater impact.

Visual messages

The visual images of a product have to be compelling to our customers in order to catch their loyalty. You need to elaborate a good and visual image to engage them. The old brain will retain this first appearance and become loyal customer.

Pricing

Our old brain responds to the prices of products in a very simple way, its either fair or unfair. That is why we need to be careful when setting different price strategies. The old brain is usually more active when analyzing the price.

Culture

The reptilian brain acts different according to our culture and education. It is not the same in Americans or Germans. Every country has their own cultural treats and therefore the decisions made have different purposes. According to Clotaire Rapaille⁸ the american culture is much more reptilian that the german, for instance. That is because in America people seek immediate pleasures rather than long term satisfaction. On the other hand, the germans are prone to think twice and be more control-oriented to get long term perks. That is why it is highly important to adapt neuromarketing concepts according to the different cultures.

⁸ Source: <http://www.businessknowhow.com/marketing/neuromarketing.htm>

III. ETHICAL CONCERNS

As we seen throughout this report, neuromarketing helps understand the relationship between the brain and behavior (Plassman et al., 2012). The primary aim of neuromarketing is to optimize products to make them compatible with consumer preferences (Khushaba et al., 2013). In other words, this new field of research allows to apply the latest neuroscience discoveries to the human brain's responses towards marketing stimuli (Renvoisé and Morin 2007; Senior et al., 2007).

The fact that the merge of neuroscience and marketing is generating data which is much more reliable and give insights of information non reachable with traditional methods, has dramatically increased the number of companies dedicated to neuromarketing, publication of journals about the issue and references (Plassman et al., 2012).

At the same time, according to Ulman, Cakar & Yildiz, 2014 this phenomenon has created a greater debate about the applications of neuromarketing and its ethical limits. That is the reason why according to Solnais et al., 2013 believes that more conceptual frameworks on the field are needed in order to advance in research.

In the following chapter I will conduct an analysis on the ethical concerns of neuromarketing, providing information about the criticism of these new practices, the current legal framework and codes of ethics that aspire to propose a solution for ethical dilemmas.

1. Criticism towards neuromarketing

The use of new technologies for marketing purposes has raised a range of ethical issues. (Emily R. Murphy et al., 2008). There are many whom rejected the use of this techniques because the ability of consumers to make one purchase decision or another is going to be comprised (Wilson et al., 2008).

According to (Zigenfuss, 2015) the use of neuromarketing ought also be prohibited for companies that represent a danger for public health, such as tabaco or alcohol producers as well as fast food chains.

Moreover, Lewis & Bridger, 2005 also argue that the information extracted from neuromarketing techniques could lead to a manipulation on the purchasing decision. The analysis of Wilson, Gaines & Hill, 2008 shares the same concern regarding manipulation of consumers. Besides, we are very close to reach the concept of a "buy button" due to the latest neuromarketing techniques discoveries. This would help marketers manipulate consumers as well (Lindstrom, 2008).

On the contrary, there are no clear evidence that we *are or will be* able to push the “buy button” neither influence the purchasing decision of consumers. That is because this procedures depend on a lot of different factors and not only one part of the brain activity. (Ariely & Berns, 2010). The promises of finding how to “open the brain” or access the “brain’s black box” are also increasing in promises that lack of scientific rigor. (Fisher et al., 2010).

Background

The worrisome of the ethical aspects on neuromarketing is not new at all. Marketing techniques have been at the spotlight of critics for a long time ago. It is considered to be a field characterized by dishonesty, intrusivity, manipulation and even abuse of vulnerable groups (Jamnik, 2011).

That is the reason why I’m going to introduce some literature on the ethical aspects of marketing.

A major phenomenon that increased the overall concern about marketing was the James Vicary’s experiment in 1957. He affected the people’s purchasing decisions by including hidden messages that went directly to the consumer’s subconscious. He affirmed that he was able to increase the sales for Popcorn and Coca-Cola in a movie theatre by adding flashing images, so fast that it was not possible to see consciously. When the movie ended, most of the people went to buy food. This study proved that manipulation over the brain was possible at that time and the society showed strong concern about it. That is probably why the study never got to be published.

Ever since, marketing has always been criticized from an ethical perspective (J.H.C de Oliveira et al., 2015).

One of the first studies on marketing ethics proposed a theory model based on ethical judgments and dilemmas and how to resolve them. This was not only for marketing but for all departments in businesses. Anyway, this theory did not affirm what was ethical or not but just proposed ethical ways to solve it (Hunt and Viell, 1996).

According to the American Marketing Society (AMA, 2013) “*marketing is the the activity, set of institutions, and processes for creating, communicating, delivering and exchanging offerings that have value for customers, clients, partners and society at large.*”

This attempt aimed to improve the image of marketing among society, which lately has seen as major issue for companies. In the last years, most of the companies have applied measures of Social Corporate Responsibility to improve brand image.

2. Current Situation

This section aims to provide information regarding the current situation of neuromarketing ethical aspects. First of all, I will conduct a brief analysis on the technological era we live in to understand what neuromarketing is facing in the real world. Then, I'm going to provide an analysis on the actions of the neuromarketing field regarding ethical issues. In order to understand how it works I will present different actors involved in the neuromarketing field.

2.1 Technological era

Nowadays, we find ourselves in a globalized world where everything is changing really fast. New technologies are being developed and quickly immersed in our daily life. A clear example is the Japanese massive production of humanoids⁹. There are many companies designing and creating robots for the next step, which is integrating robots in every home doing helpful or errand jobs.

Of course, this is going to change the current scenario of job positions. These robots are taking away jobs that were traditionally done by humans. For instance, a company from Japan has already replaced 34 administrative jobs by robots¹⁰. The application of this technology will make the company save over a million dollars in salaries. Up to this point, if this is only the first step of a total digitalization what are these people going to in a few years?

With this scary scenario, the European Parliament has decided to impose a tax on robots in order to regulate the ethical aspects related with robots. This proposal stated that machines or robots should have similar rights and obligations as workers in order to balance the labor market.

Moreover, this approach does not only apply to robots but to all technological advances such as Artificial Intelligence.

2.2 Codes of ethics

The current situation of the ethical implications of neuromarketing is being discussed by many authors, institutions and even governments.

⁹ Humanoids: Robots or machines with human appearance that are programmed to make our lives easier.

¹⁰ Source: <http://ingenieriainformatica.cat/?p=20056>

The Neuromarketing Science and Business Association (NMSBA, 2013) is an independent society that proposed a code of ethics¹¹ to control the conduct of those who apply neuromarketing techniques.

The aim of this organization is: *“to build a solid community of like-minded people around the topic of neuromarketing. To reach this goal the NMSBA:”*

- *Shares knowledge sharing*
- *Builds a strong international network*
- *Promotes neuromarketing on a global scale*

The members that form this association are companies that do market research through neuromarketing techniques and wish to do so in an ethical and respectful way for the consumer.

Besides, the International Chamber of Commerce (ICC) together with the European Society for Opinion and Market Research (ESOMAR) published a code of ethics¹² to provide a self-regulation framework for companies using market research techniques.

The objectives that the use of this code intends to full full are the following.

- *To set out the ethical rules which market researchers shall follow;*
- *To enhance the public’s con dence in market research by emphasising the rights*
- *and safeguards to which they are entitled under this Code;*
- *To emphasise the need for a special responsibility when seeking the opinions of children and young people;*
- *To safeguard freedom for market researchers to seek, receive and impart information (as embodied in article 19 of the United Nations International Covenant of Civiland Political Rights);*
- *To minimize the need for governmental and/or intergovernmental legislation or regulation.*

As presented above, these codes of ethics are not mandatory and elaborated by third parties. None of the associations mentioned carry their own neuromarketing research but try to apply ethical measures to regulate it. That is the reason why these are seen as trustworthy institutions.

¹¹ Available at: <http://www.nmsba.com/ethics>

¹² Available at: https://www.esomar.org/uploads/public/knowledge-and-standards/codes-and-guidelines/ICCESOMAR_Code_English_.pdf

Last but not least, France had an important role in the field of ethics and neuromarketing. In 2004, the french parliament decided to revise the regulation on bioethics. It was not until 2011 that pursuing any commercial research and any act of commercialization by using neuro imaging is banned (Civil Code, 2011). However, this only includes brain-scanning techniques and, therefore, biometric techniques such as eye-tracking or galvanic skin response are allowed (Y. I. Ulman et al., 2014)

2.3 Internal ethical codes

In contrast with the previously above mentioned measures, some companies or neuromarketing consultancies decide to apply their own code of ethics. They may want to apply a code of ethics to serve as a defense mechanism when accused of irresponsible behavior. Moreover, it would help them justify the company in moral grounds (Murphy et al., 2008)

Another important factor regarding private companies that use neuromarketing techniques depend on the industrial sector (Lindgreen et al., 2011). The credibility and acceptance of these companies lay on the kind of activity that they perform. For instance, an oil, tobacco or arm company is believed to be a controversial sector. Thus, neuromarketing techniques will be more difficult to be accepted (Lertzman et al., 2013).

On the other hand, sustainable companies are believed to have an easier path to gain society's acceptance when applying neuromarketing techniques. That is because the activities they develop are prone to be more ethical and contribute to society's overall welfare (Tonelli et al., 2013)

3. Controversies

Throughout this report we have been analyzing the different ethical concerns regarding neuromarketing. In this section I'm going to decompose the aspects or major issues that worry the most.

The neuromarketing involvement in ethical issues should be revised by neuroscientists, anthropologists, marketing professionals, business owners and governments (J.H.O de Oliveira 2015).

In practice, the main topics that neuromarketing ethics discuss are the following¹³:

¹³ Note that the order of the aspects is not relevant.

Privacy

Subjects involved in experiments shall be informed of everything at all times. The data obtained shall not be freely distributed but just for scientific purposes in an anonymous manner. Moreover, research findings are not allowed to be sold to other parties. (Slowther & Kleinman, 2009).

At the same time, the NMSBA code of ethics article 6 and 7 state the same rights for participants. It also includes the right to abandon the experiment at any time, without any consequences.

Safety of the subject

The most common techniques used in neuromarketing researches, as explain previously in this paper, are usually not harmful for participants. However, the safety of the subjects should be primordial. Participants must be informed of all the procedures and risks at every moment, being protected when needed (Murphy, Illes & Reiner, 2008).

Moreover, in the event of finding out an unexpected result such as a health problem in the brain of the subject -the technologies used can predict tumors, brain damage and so on- investigators must warn and communicate it in a smooth way. Subjects must know that these findings could happen before starting the experiment (Gutman, 2013).

Transparency

According to the article 4 NMSBA code of ethics, subjects participating in neuromarketing experiments present another ethical dilemma, which lays in the fully consciousness and understanding of the experiment.

Protection of vulnerable parties

The protection of vulnerable parties includes children, patients with psychiatric disorders and prisoners. All these groups are usually unprotected which makes them easily affected by malicious neuromarketing practices (Luna and Macklin 2012).

Nowadays, the increase of investigations on how to influence children have increased. Researches have seen that the society we live in today -consumerism and materialism- has had a heavy negative impact on children's physical and psychological health. They start drinking alcohol and smoking earlier, obesity has skyrocketed in the last 10 years and so on. All these behaviors are leading these children into health mental problems at a higher rate than in the past. Therefore, the protection of this group is essential in neuromarketing investigations (Kramer 2006)

However, it has been argued that the research on vulnerable parties is ethical when it is related to the group. In other words, if they want to find an effective way to reduce children obesity they could work with this group in order to find answers that eventually will help them. In this context, the Declaration of Helsinki -a code for physicians and biomedical researchers- could also serve as a guide and model for neuro technological applications such as neuromarketing (WMA Declaration of Helsinki).

Furthermore, the participation of children on neuromarketing investigations shall be only done if the parents authorize it according to the NBSMA Code of Ethics and ICC/ESOMAR.

4. Future challenges

Neuromarketing is a new-born field that is growing exponentially. That is because it brings a huge potential to the marketing research industry thanks to the technological advances and neuroscience.

Nonetheless, it has not yet been proven that this information can influence or predict consumer behavior 100% but the simple fact of having access to data of this kind creates a lot of future challenges. To start with, we are not even capable of knowing its full potential or the limits of neuromarketing in the future.

4.1 An ethical framework

There is clear evidence that the neuromarketing field is need of a common framework among those whom wish to apply neuromarketing techniques. For that purpose, Ulman et al., 2014 proposes three different routes for the future of neuromarketing:

1. Regulations on neurotechnology applications for commercial use, as the French parliament did back in 2011.
2. Allow total freedom and no regulations at all, as it is in almost every country of the world.
3. Establish a regulatory framework that provides guidelines, instead of regulations, that provide ethical behavior.

In conclusion, the use of these technologies should be always based and focused on the society's welfare. Professionals have the ethical duty to inform and educate the public, and to shape public policy. (Ulman et al., 2014)

4.2 Society concern

Besides the urgent need of a regulatory and consensual framework, the society perspective should also be in the table. Having analyzed the huge amount of literature on neuromarketing and its applications nowadays I found out that there is an excess of information that come from many fields, which until now were very narrow. In detail, these overflow of information come from psychology, statistics or natural sciences. Analyzing the consumer's brain provide data correspondent not only with marketing factors. Thus, it is considered an heuristic method.

CONCLUSIONS

The following final conclusions are the result of an exhaustive data collection on the literature of neuromarketing and its ethical implications, analysis of investigations done with neuromarketing techniques and other research resources.

Neuromarketing is an emerging field born from two branches; neuroscience and marketing. Put simple, this combination represents the ability to use the data from the brain (neuroscience) to develop effective products and services (marketing).

The understanding of the consumer from a neuroscience point of view gives high-quality information that is not possible to obtain with traditional methods. Thus, it creates a unique source of information.

Besides, these kind of information provides a tremendous potential that helps adapting to the real world. We have to bear in mind that nowadays the technology is moving fast. Increasingly we are immersed in an interconnected world surrounded by high technology devices and everything in our daily lives is changing. Therefore, we can affirm that the purchasing behavior of individuals is changing as well. That is one of the reasons why neuromarketing insights are a powerful tool to understand consumers in this technological era we live in.

At the same time though, it is a new-born field whose limits have not yet been defined. Most authors argue that we are in an infancy level, rather than in a mature phase. However, up until now neuromarketing has proved to be efficient by optimizing and offering products which are best-suited for target customers.

The biggest hurdle of neuromarketing are the ethical concerns linked to this practices. Its misuse can deliver harmful effects to society, such as contributing to children obesity or increase the number of smokers.

Consequently, many people consider that neuromarketing is jeopardizing privacy, control and protection of the consumer autonomy and also vulnerable parties. On the other hand, there is no strong evidence that neuromarketing is specifically manipulating or harming the consumer with the information obtained nowadays. However, just the fact of having this kind of data and the possible growth of the field generates intense debate.

In order to discuss ethical practices I have analyzed some current proposals. These are the code of ethics by the NMSBA, the ICC/ESOMAR or the legislation in France. This helped me understand that these only work as a recommendations or codes of conduct, which is not enough to create a common legal framework. That is one of the reasons why companies usually create their own confidential codes of ethics in an internal level.

Another important aspect to consider is the fact that the public lacks of information. Most of the times, just for name and reputation consumers tend to relate it as a negative business action. That is why companies should have more clear and transparent policies in order to gain consumer trustworthiness in these aspects.

In conclusion, every company decides which ethical path to follow rather than using common ethical standards with the rest of the companies. It would be very difficult or almost impossible to reach a unique solution for this issue. Furthermore, it is clear that neuromarketing is growing and will continue to do so in the future. Thus, at the same time the field evolves the urge for new ethics conducts would be needed.

Finally, the hypothesis raised at the beginning of the project was the following: *This project questions whether neuromarketing is an ethical practice.* We can affirm that it can be an ethical practice but some considerations have to be taken into account and it will always depend on the goal of each neuromarketing investigation.

From my experience doing this research project I would affirm that in order to develop neuromarketing in the future a common legal framework should be developed. The potential of neuromarketing should not be overlooked and there should be investment in the field to gain all its potential. Marketers should use this information only for positive outcomes for the consumer. The quality information of neuromarketing should be used to have a better understanding on the consumer and not for abuse.

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