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A CRITICAL STUDY ON NEUROMARKETING – AN EMERGING TOOL OF MARKET RESEARCH

Joemon M. Chacko[1] and Dr. K. Subashini[2]
[1]Research Scholar, Kerala, India.
[2] Research Supervisor, Bangalore, India.

ABSTRACT:

In this highly competitive world of globalisation, liberalisation and spectacular growth of MNC's & Corporate sector, it has become a very difficult, herculean task to identify the thought process of human and guess the behaviour of the consumer and as such various techniques involved in neuromarketingplays a major role in identification, understanding and predicting the consumer behaviour in a better manner. There is a very important difference between "Consumer neuroscience" and "Neuromarketing". While the first field deals in research on subjects like neuroscience, psychology and marketing; the latter is linked to the functionality of neurophysiological tools, namely eye tracking, skin conductance, electroencephalography (EEG), and functional magnetic resonance imaging (fMRI). Neuromarketing is interested in carrying out market research which is specific to a particular company. In recent years, the emerging field of neuromarketing, which makes use of brain research in a managerial context, has gained increasing popularity in the academic literature as well as the practical world and this study is to evaluate upon the influence of neuromarketing tools on traditional marketing inputs in order to complete the understanding of consumer behaviour

KEY WORDS: *Consumer neuroscience, neuromarketing, EEG, fMRI, Cognitive responses, reflexes, eye tracking, imaging, etc,*

INTRODUCTION

Marketing research methods continuously develop and over the last decadetechnology offered solutions to improve this area. Traditional marketing researchmethods fail at some point in certain cases, and since emotions are mediators of howconsumers process marketing messages, understanding of cognitive responses toadvertisements have always been a challenge in methodology. Neuromarketing is thebranch of neuroscience research that aims to better understand the consumer throughhis unconscious processes and has application in marketing, explaining consumer'spreferences, motivations and expectations, predicting his behavior and evaluatingsuccesses or failures of advertising messages. In this context, this study aims to analyse relatively new alternative techniques in neuromarketing research. In the last decade, neuroscience has informed the marketing science in meaningful ways and the interaction between both of these sciences has helped in generating deeper insights into the consumer behavior. This has led to the emergence of a new field of study, termed as

neuromarketing or consumer neuroscience. This emerging field in marketing literature and practice gives an overview of the applications of neuroscience in addressing marketing and consumer behavior research in which neuromarketing and consumer neuroscience is expected to play in shaping the future marketing practices and some methodological concepts of neuromarketingand are likely to advance this field in turn enhancing the rigor of the neuromarketing studies.

DEFINITION:

Neuromarketing is an emerging interdisciplinary field connecting psychology and neuroscience with economics. The goal of neuromarketing is to study how the brain is physiologically affected by advertising and marketing strategies. In order to evaluate the effectiveness of these strategies, brain activity resulting from viewing an advertisement is monitored and measured using neuroimaging techniques such as functional magnetic resonance imaging (fMRI) and electroencephalography (EEG).

Neuromarketing studies usually measure preference between products in terms of brand familiarity or product preference. In traditional marketing studies, measures such as the product preference for a particular advertisement is sometimes difficult to measure, as a viewer may hold a cognitive bias. However, brand familiarity and product preference have been correlated with neural activity. The field of neuromarketing is still viewed with caution from consumer protection groups as well as many academics due to the possible ethical implications of designing advertisements to intentionally cause specific neurological effects

Neuromarketing is an emerging field in which academic and industry research scientists employ neuroscience techniques to study marketing practices and consumer behavior. The use of neuroscience techniques, it is argued, facilitates a more direct understanding of how brain states and other physiological mechanisms are related to consumer behavior and decision making. Herein, we will articulate common ethical concerns with neuromarketing as currently practiced, focusing on the potential risks to consumers and the ethical decisions faced by companies. We argue that the most frequently raised concerns threats to consumer autonomy, privacy, and control do not rise to meaningful ethical issues given the current capabilities and implementation of neuromarketing research. But, we identify how potentially serious ethical issues may emerge from neuromarketing research practices in industry, which are largely proprietary and opaque. We identify steps that can mitigate associated ethical risks and thus reduce the threats to consumers. We conclude that neuromarketing has clear potential for positive impact on society and consumers, a fact rarely considered in the discussion on the ethics of neuromarketing.

IMPORTANCE OF NEUROMARKETING:

Neuromarketingfor companies and society is very important since it is assumed that there is potential to discover implicit and automatic processes which determine the decision making process, and that it will reveal secret information about consumer behavior which was not obtainable by the traditional marketing methods (Hubert, & Kenning, 2008; Tusche, Bode, & Haynes, 2010; Ariely, &Berns, 2010; Senior, & Lee, 2008). Although there are also critical arguments against neuromarkertings‘ intervention into the privacy of customers, it is expected that with this method, more effective customer segmentation can be carried out, which in turn leads to improved marketing of products by considering individual product and brand preferences as well as consumer behavior in general (Venkatraman, Clithero, Fitzsimons, &Huettel, 2012).

Finally, let us come to the actual term of neuromarketing. Although there exist several different definitions, we will summarize the most important ones in the following. Neuromarketing can be seen as a sub-field of neuroeconomics, and therewith also of neurosciences, which deals with problems relevant to marketing by making use of methods from brain research in managerial practice (Hubert, 2010; Fugate, 2007; Lee, Broderick, & Chamberlain, 2007; Gang, Lin, Qi, & Yan, 2012; Hubert, & Kenning, 2008; Ariely, &Berns, 2010; Dapkevičius, &Melnikas, 2011; Fisher, Chin, &Klitzman, 2010). Formulated differently by Lee et al. (2007) neuromarketing is the application of neuroscientific methods to analyze and understand human behavior in relation to markets and marketing exchanges

(p.200). Calvert and Brammer's definition (2012) also points to the measurement of non-conscious responses of the brain that can only be observed with neuromarketing techniques.

However, the primary goal is to evaluate upon the influence of neuromarketing on several marketing inputs, namely consumer buying behavior, advertising, pricing, new product development, communication, distribution of products, branding and decision-making. The aim is to figure out which of these marketing inputs are influenced by neuromarketing what this could mean for the future. This new technique and its objective analysis of the brain are expected to produce more feasible strategies to attract consumers (Gang, Lin, Qi, & Yan, 2012). Additionally, since there are very divergent views on the topic of neuromarketing and its effect, the study is necessary to provide the reader with a comprised and objective evaluation of different scientific literature.

Generally speaking, by the further implementation of neuromarketing techniques, it is desired that otherwise unavailable information about customers behavior and their preferences will be revealed, money will be saved and marketing processes will be facilitated, and that the analysis of neuromarketing research results will help to segment humans in such a way that individual differences in decision-making processes can be identified (Ariely, &Berns, 2010; Venkatraman et al., 2012).

Neuromarketingand its importance as a marketing can be structuring into eight prevalent factors: consumer buying behavior, advertising, pricing, new product development, communication, distribution of products, branding and decision-making. Afterwards, a critical evaluation will follow, where the accompanying consequences for customers and users will be explained and critically reviewed. The literature review will finalize with an overall evaluation by presenting a clear overview of the in detail considered components, while it is expected that certain components will emphasize to be more relevant in the neuromarketing process than others.

METHODOLOGY

To identify the influence of neuromarketing on the marketing input tools, we analyze numerous relevant scientific literature concerning the topic of neuromarketing, its mechanisms, namely outside reflexes, input-/output-models and inside reflexes, and its influence on the key marketing inputs.

METHODS TO MEASURE BRAIN ACTIVITIES IN REGARD TO CONSUMER BUYING BEHAVIOR

The Brain

The brain itself can be described as an organ located inside of the skull, which is part of the central nervous system and which makes it possible to control all mental and physical processes of a human being, including thinking and feeling (Minddisorders, 2014; Macmillandictionary, 2014). The brain itself as an organ is responsible for all consumer behavior that is taking place. Interestingly, although it presents only 2% of the whole body, it burns approximately 20% of humans' energy. Another important fact is that about 80% of the human's brain activity is taking place unconsciously in order to sustain the tranquility state, leaving only 20% of the brain activity for conscious purposes (Morin, 2011). Due to the origin of a human as a hunter and collector who is striving for survival, the brain was and still is used to scan the environment for potential dangers, which is mainly done by the part called reptilian brain'. This part is capable of processing all visual stimuli by not making use of the visual cortex, which is the biological argumentation for the fact that human beings in general have a general preference for images over words, or comparably experiences over explanations (Morin, 2011). So, knowing that the brain is one of the most complex and interwoven biological organs existing, including numerous interconnected cells, it should be obvious that the translation and interpretation of its activity is a highly complex procedure (Purves, Fitzpatrick, Augustine, & Katz, 2008). Although it is acquainted that the purchasing decision does not represent a binary social response, meaning that one cannot predict that with using a certain advertisement one will make the purchase for sure, there are still high expectations in the ability of neuromarketing observing and analyzing the entire brain in order to find out new, unpredictable results that give new insights into the field of neuroscience (Lee, &Kacen, 2008; Hubert, & Kenning, 2008).

TECHNICALITIES OF NEUROMARKETING:

The overall goal of using neuromarketing techniques is to understand the interconnection between marketing activities and the response upon that from consumers (Kumlehn, 2011). It is expected that by doing so, next to the subjective self-assessment methods, an objective perspective of brain activity can be assessed (Hubert, & Kenning, 2008). The various methods available in this field range from Body Language, Facial Coding, Empathic design, Eye tracking, over fMRI, EEG, MEG to galvanic skin conductance and heart rate (Calvert, &Brammer, 2012), with the most advanced being EEG (Electroencephalography) and fMRI (functional Magnetic Resonance Imaging) brain imaging (Kumlehn, 2011). These technicalities are methods expected to offer an inside view into the black box, which is the brain (Kenning et al., 2007). The primary reason for making use of these more established methods is that the data can be captured without conscious manipulation by respondents, while at the same time being able to record the unconscious processes taking place in the human body. Therefore, neuromarketing measures can be a supplement to the self-report measures. However, one always has to keep in mind that neuromarketing measurements mostly take place in an artificial environment instead of an accustomed surrounding, which might bias the test results (Dimoka, Banker, Benbasat, Davis, Dennis, Gefen, & Weber, 2012).

OUTSIDE REFLEXES:

Due to the fact that people are mostly not able to reconstruct and express their thoughts and feelings in a valid and reliable manner, self-report measures are constantly contrasting the actual inner state (Bagozzi, 1991). Therefore, in the following, we differentiate between outside reflexes, Input-Output models and inside reflexes.

Body language:

One should keep in mind that outside reflexes are activities originated in the body, which are hardly suppressible and basically reflect persons‘ emotions. An analysis of these biological reflexes such as body language can offer access to the brain, just as an fMRI scanner. The main difference though is that with body language, one is concerned with the non-verbal communication, or more specifically, with the contraction or relaxation of muscles. The amount of communication taking place via body language is oftentimes underestimated, since an immense amount of communication is actually expressed by this. Body language, as a form of non-verbal communication, can be expressed in form of conscious or unconscious ways, specifically in gestures, mimic, posture and other body movements. It is considered to have a key impact on the actual statement being made. Obviously, in order to analyze body language, no devices are necessary and therewith the procedure is extremely simplified (Postma, 2012).

Empathic Design:

Another method where human beings are being analyzed without making use of any devices is called 'empathic design'. The meaning of the word 'empathic' can be also referred to as sensitive. Within this method, observation is made in the consumer‘s own environment so that it can take place in the normal course of daily routine (Postma, 2012; Leonard, &Rayport, 1997). Additionally, possible areas of improvement can be figured out. Empathic design is an attractive method to potentially identify consumer wants and needs because it is a low-cost and low-risk method (Leonard, &Rayport, 1997). However, one can make the suggestion not to make use of this technique in isolation, but rather use it as a supplementation to other techniques like facial coding and eye tracking in order to bring out its full potential (Leonard, &Rayport, 1997).

Facial Coding:

Facial coding is a specialized form of body language where facial expressions are systematized and coupled to emotions of a human being. An important researcher of this method is Dan Hill, who established 24 combinations of muscle movements, which can be traced back to seven basic emotions.

The method is said to be universally applicable since researcher Darwin found out that people from different nations actually have the same inherent facial expressions. Well-known business case examples are Toyota and Capital One, since they are extensively making use of facial coding as an analysis of consumer behavior. Further Dutch companies who are experienced in using this method are for instance C1000 and KPN. In practical terms, test persons are basically confronted with the stimulus while at the same time their facial expression is determined, interpreted and analyzed. During that procedure, the test person is aware of the fact that he/she is being observed (Postma, 2012).

Eye Tracking:

The final form of the discussed outside reflexes is the eye-tracking method giving inside information about internal brain activity that is a non-suppressible reflex. The method itself is not new to the world, since it was already executed during the 1980's for relatively simple methods. Nowadays, the entire eye-tracking process is computer-controlled, and therewith the range of possibilities is enlarged. The method is relatively easy to apply to commercials, mailings, webpages and online games, since with these things it is easy to track what a person actually sees and to which things he/she pays special attention. The chronological order in which things are being looked at can be determined as well. In the specific case when the eyes fix a certain point for a longer time period, there are two different interpretations than can be made. On the one hand, one can assume that the person has to focus a spot for a longer time period because it is not directly understandable. On the other hand, it could be possible that a person looks more intensively because he/she is so attracted to it. The eye tracking method cannot differentiate between these two ways of looking at something (Postma, 2012).

INPUT-OUTPUT MODELS:

With the input-Output model one does not get access to the brain by analyzing inside or outside reflexes, but by systematically establishing the result, which is yielded by a certain stimulus. This means that you do not look at the "motor", which is the brain, in order to see how the performance is being built, but you insert certain inputs in order to elaborate the resulting output like certain behavior. An example can be that one pushes the accelerator pedal (input) and records that you are going faster (output). By this method, it cannot be revealed which areas are being responsible, but it becomes explicit what actions lead to what reactions. So, in the Input/output Model the brain can be considered as a "black box" because you do not get any insights. When making use of this method, one precondition is that there is a measurable output in regard to marketing, for example an order or a payment. Until some years ago, neuroscientists only considered the input and output without understanding the process in between. Specifically, they were looking at how the inputs were processed by the sense organs and what kinds of outputs are related to that. The brain activity itself as a measurable process only received attention later on (Postma, 2012).

INSIDE REFLEXES:

The third approach mentioned by Postma is doing the same as the previous two approaches, only in a different way. Specifically, the "Inside reflexes" approach drags in technological advanced methods originally developed for the medical area. By making use of this approach, one is looking inside the brain self. This is done properly by using EEG or fMRI-scans, which will be explained in the following sections. One significant difference between the input-/output model and the inside reflexes is the applicability: Neuromarketing in inside reflexes is about advertising, packaging, and association with brands. No one is being asked to actually make a purchase, but you can determine what a person experiences during an advertisement and if the desire can be determined neurologically. Neuromarketing in the input-/output model is more about the buying processes themselves (Postma, 2012).

EEG:

EEG is the abbreviation for Electroencephalography, which means an electrical reproduction of brain activity (Postma, 2012). Although the technique of EEG is a relatively old method, it is still considered to be an appropriate way to measure changes in the electrical field in certain brain regions (Ariely, &Berns, 2010; Morin, 2011; Camerer, Loewenstein, &Prelec, 2004; Madan, 2010). It makes use of numerous electrodes attached to the skull that recognize electronic signals which represent current brain activity (Postma, 2012; Morin, 2012; Ariely, &Berns, 2010; Madan, 2010). Usually a short-period recording of approximately 20 to 40 minutes can be made. The responsible cells for all our cognitive responses are called neurons. Therefrom, every human being has more than 100 billion at its command, which are interconnected with trillions of synapses (Morin, 2011). These neurons have relatively long extensions where electricity runs through. Therefore, if a certain stimulus like advertising is presented, neurons fire some electric current that can be perceived by the EEG (Morin, 2011). Put differently, if multiple neurons are "communicating" to a certain spot, more electricity is produced than normal, which can ultimately be measured with the EEG on the scalp. If upon that, neurological knowledge is applied, the recognized electricity can be attached to certain function-areas in the brain, which in turn can provide relevant insights to marketing (Postma, 2012). In practical terms, a researcher can simply put on the electrodes attached to a helmet or cap on a person‘s head, and then present certain products or services from which the attractiveness in form of brain activity can ultimately be measured and recorded (Morin, 2011; Postma, 2012). An advantage of the method is that EEG is very precise in regard to timing since its temporal resolution is in milliseconds. Therewith, short neural activity can be easily detected (Ariely, &Berns, 2010; Camerer, Loewenstein, &Prelec, 2004). Additionally, one should keep in mind that the equipment necessary to carry out an EEG measurement is relatively light and portable, which facilitates the act of measurement (Madan, 2010). Thus, the person being studied is not being stressed during the measurement since he/she can move freely, although the measurement will mostly take place in a laboratory (Postma, 2012). A drawback of this method is that with using EEG, undesired electronic activities in the brain, which one does not want to measure, will be recorded (Postma, 2012). Therefore, the spatial resolution is relatively imprecise (approximately precise to one centimeter), which can be increased by the number of electrodes attached to the skull (Ariely, &Berns, 2010; Camerer, Loewenstein, &Prelec, 2004; Morin, 2011). These disturbances have to be filtered out at the end. An effective method can be also to combine the EEG method with the eye tracking method, since then brain activities can be recorded more specifically (Postma, 2012).

FMRI:

The term MRI stands for 'magnetic resonance imaging' and basically describes a tool, which makes an anatomic representation of the brain by making use of magnets (Postma, 2012). An MRI scanner is used to measure the blood oxygen level, which can give an indication of increased brain activity in certain regions (Ariely, &Berns, 2010). The measurement works as follows: The magnetic field is able to recognize the blood oxygen content in the brain. Therefore, if neural activity in a certain brain area is increasing, the oxygen-rich blood increases too because oxygen is required by the brain to work. A sub area of MRI, and also the latest and most popular brain imaging method in the field of neuromarketing used for investigation of brain activation differences is the so called fMRI, where the f stands for 'functional', indicating that it is a process instead of a snapshot being observed (Postma, 2012; Dimoka et al., 2012; Madan, 2010; Vecchiato et al., 2011). The method became practicable during the 1990‘s and enabled scientists‘ insights into the human brain, which was until then some kind of a black box (Kumlehn, 2011). Simply speaking, it displays the blood flow of oxygen-rich blood to different regions in the brain in order to explore human behavior (Eser, Isin, &Tolon, 2011). FMRI is a form of non-invasive neuroimaging technology that is primarily used for marketing purposes. The interest in it has increased enormously during the past years since it makes it possible to isolate certain systems of neurons that are connected with specific functions of the brain (Postma, 2012; Wilson, Gaines, & Hill, 2008). This isolation of the neural system is a highly complex task and is only facilitated by todays advanced technology (Kumlehn, 2011).If a stimulus is presented to a person, the fMRI method is able to

recognize an increase in oxygen-rich blood in certain regions, which indicates increased activity in a certain brain region (Postma, 2012; Camerer, Loewenstein, &Prelec, 2004). Due to the fact that oxygenated blood has distinct magnetic waves compared to deoxygenated blood, this difference can be picked up in form of a signal by the fMRI scanner (Camerer, Loewenstein, &Prelec, 2004). Therefore, during an fMRI experiment, there is first a brain scan made at a personsrest condition or when there is no stimulus being presented (Raichle, &Mintun, 2006). Afterwards, a stimulus is presented for instance in form of an advertisement which in turn activates certain brain areas and increases the oxygen-rich blood flow to certain regions being recognized by the fMRI (Wilson, Gaines, & Hill, 2008; Morin, 2011). A famous example where this method was used is The Pepsi Paradox, where participants were initially presented with the blind taste test, where two glasses were offered without knowing if Coke or Pepsi is inside. Within this blind taste test, the majority of participants decided that the Pepsi drink is the more delicious one. Afterwards, participants were informed about the contents brand, and then an activation in the thinking part of the brain is recognized since the participant remembers the attractive Coke advertisements, which finally drives him to choose for the Coke drink as the more delicious drink (Gang, Lin, Qi, & Yan, 2012, May). In practice, the observed person is lying in some kind of tunnel where the head and the brain are positioned in a magnetic field. As already mentioned in regard to EEG, if you know which brain activities are responsible for which functions, explicit statements about brain activity can be made. An advantage of this method is that it can also recognize the order of brain activities, in case there are several ones going on. A further advantage compared to the EEG method is that the fMRI method enables deeper insights into the brain, especially where the emotional processes are taking place. However, one has to keep in mind that the required devices are relatively expensive and that the situation for the person being observed is not very pleasant (Postma, 2012). An fMRI brain scanner costs approximately $US 2.5 million to buy, and approximately $US 1000 to rent per hour (Eser, Isin, &Tolon, 2011). Furthermore, Moore (2005) states that an average neuromarketing study with an fMRI costs between $94,000 and $188,000, which is only somewhat more expensive than conventional methods. Next to all the advantages of this method, one should keep in mind that there are several critiques going on, stating that this method is the reason why it will be possible to soon create advertising techniques which are impossible to resist and which ultimately harm society (Editorial, 2004).

MEG:

The Magnetoencephalography is a similar non-invasive procedure in order to investigate neural activity. During the past years this procedure also gained increasingly more attention and is closely related to the EEG method. While the method of EEG conducts the local voltage fluctuations on the scalp, the MEG captures the magnetic fields of neural activity. This method is frequently used in the neurosurgery since it enables the identification of recreation processes after injuries, and therewith the success of treatment. In the practical measurement, highly sensitive SQUID-detectors are used, while actions are being taken to eliminate fields of interference (Braun, 2007). Spectrums of sensors, which are shaped like a cylinder, monitor the magnetic field of the test-persons skull. Therewith, the location and intensity of brain activity in different regions can be determined (Miller, Bentsen, Clendenning, Harris, &Speert, 2008). Although the methods of MEG and EEG both have excellent time resolution, MEG has a better spatial resolution than the EEG method (Morin, 2011). Nevertheless, one should still keep in mind that this technology, as well as the EEG and the fMRI technology, are very cost intensive (Morin, 2011).

INFLUENCES OF NEUROMARKETING:

Neuromarketing‘s influence on marketing tools may result in improved marketing performance, considers the influence of neuromarketing on the marketing inputs such as (1)consumer buying behavior, (2)advertising, (3)pricing, (4)new product development, (5)communication, (6)distribution of products, (7)branding and (8)decision-making and assumes that this will lead to improved marketing performance.

NEUROMARKETING ON CONSUMER BUYING BEHAVIOUR:

Beginning with the influence of neuromarketing on the marketing tool Consumer Buying behavior, the following statements can be made. Due to the fact that dazzling representations of products are growing constantly, an in-depth analysis, specifically by the use of neuromarketing techniques, of consumer-buying behavior can be advantageous (Gang, Lin, Qi, & Yan, 2012, May; Butler, 2008). However, there are certain things that need consideration. First of all, it is significant that consumers are mostly not able to phrase their desires and needs when asked explicitly, which is why it is assumed that the brain itself encloses internal information, which could elucidate true desires and needs. If this knowledge would be available, the buying behavior of people could most likely be influenced and the disadvantage in regard to the cost aspect of neuromarketing aspects would be outweighed by the advantage of the internal information delivered (Ariely, &Berns, 2010). Therefore, neuromarketing techniques are a perfect opportunity (Kenning et al., 2007). As stated by Eser, Isin and Tolon (2011), neuromarketing uses the latest advances in brain scanning to learn more about the mental processes behind customer purchasing decisions (p.854). The criticalstatement about a buy button in the brain, which would in theory be able to determine the buying behavior of consumers by activating the brain area responsible for making the final decision, can herewith be denied since all neural and cognitive processes connected with buying decisions are influenced by several factors, or so called multi factors, and thus cannot be reduced to one single area (Ariely, &Berns, 2010). Finally, one can say that neuromarketing methods in general, and especially in regard to consumer buying behavior, can measure significant influences, and its results can be used as a template for future analysis or product development (Wilson, Gaines, & Hill, 2008).

NEUROMARKETING ON ADVERTISING:

Taking the influence of neuromarketing on the marketing tool advertising into account, one should consider the following viewpoints. As stated by Ariely and Berns (2010), the way of presentation of certain decisions made by for instance role models in an advertisement can have tremendous effects on the actual decision being made by a consumer. Therefore, the topic of advertisement and product presentation to consumers on the market are becoming increasingly relevant. Since the effects of advertising are not very well understood yet, neuromarketing and specifically neuroimaging techniques are considered to be an exiting and helpful instrument for marketers (Ariely&Berns, 2010).

NEUROMARKETING ON DECISION-MAKING:

Coming to the influence of neuromarketing on the decision-making process made by human beings, there is numerous literature which should be considered. First of all, it is important to exactly define what decision-making means. According to Rangel, Camerer, & Montague (2008), there are five different stages in decision making, namely —(a) identifying the decision problem; (b) weighing the possible choices; (c) making a decision based upon the evaluation of the choices available; (d) after carrying out the decision, consider the resulting consequences; and (e) learn from the decision-making process in order to make better decisions in the future (p.39). This decision-making as described above is a marketing tool, which can be analyzed by the neuromarketing technique fMRI (Gang, Lin, Qi, & Yan, 2012, May). It is argued that the decision-making process is highly influenced by the integration of emotions, which oftentimes can provide one with additional information (Plassmann et al, 2012). Still, several researches prove that the use of neuromarketing techniques is able to analyze the decision making process. In order to evaluate if a decision might be positive or negative, the ventromedial prefrontal cortex and the striatum are the brain regions which are claimed and which, in turn, can be analyzed by certain neuromarketing techniques such as fMRI or EEG (O'Doherty, Dayan, Schultz, Deichmann, Friston, & Dolan, 2004; Peelen, Li, &Kastner, 2009; Zurawicki, 2011; Grosenick, Greer, & Knutson, 2008). Specifically, Knutson et al (2007) argue that the actual final decision depends on the overall evaluation of gain and loss in value before and after the decision has been made. Common anxiety in regard to that is the fact that there are certain argumentations that this evaluation and free decision-making can be manipulated (Vohs, &Schooler, 2008; Montague, 2008).

CONCLUSIONS:

As a conclusion, neuromarketing - explained the technical components in detail and evaluated upon the influence of neuromarketing on the eight most relevant marketing inputs. There were several knowledge discoveries made during the development, from which the most important ones will be summarized again. The implementation of neuromarketing and neuroscientific techniques resulted in the attainment of more objective results than without these techniques, which are expected to reveal unknown internal information about human behavior in general (Hubert, & Kenning, 2008; Kenning, &Linzmajer, 2011; Ariely, &Berns, 2010). By making use of neuromarketing techniques, marketers can analyze the effects of consumer buying behavior, advertising, pricing, distribution of products and decision making on a much more scientific basis by evaluating upon the test person as well as the marketing input itself (Fugate, 2007). Neuromarketing itself is frequently described as a tool to determine internal unknown ―secrets‖ of the human brain by making use of imaging technology (Kampakoglou, 2012). This can be influenced by the fact that researchers increasingly pay attention to emotions and unconscious processes that influence human behavior, and that argumentations and ways of reasoning cannot be regarded as rational anymore (Bechara, &Damasio, 2005; Camerer, Loewenstein, &Prelec, 2005; Oehler, &Reisch, 2008). Additionally, the prefrontal cortex has been established to bethe most important region in the brain in regard to the research of neuromarketing since in that area, conscious processes as well as emotions are taking place (Vecchiato et al., 2011). All in all, one can say that if the ethical aspect is taken care of by executing neuromarketing activities in an ethically correct way, it can be argued that the emergence of neuromarketing creates a win-win situation for marketers and consumers at the same time. Marketers can gain internal information which leads to better product commercialization and customers are provided with more customized products (Kenning, &Linzmajer, 2011; Ariely, &Berns, 2010; Lee, Broderick, & Chamberlain, 2007; Madan, 2010). The method combines the commercial part of economics with the psychological part of neuroscience (Madan, 2010).

LIMITATIONS:

Despite, lots of advantages and new insights, there are obviously certain limitations that should be considered. First of all, the time aspect restricts the dimension of the study. This is also the reason why the topic of neuromarketing is not being researched by making an empirical study, but rather a review of relevant existing scientific literature in regard to the topic. An empirical study would also extend the cost factor. However, the very fact that only already published and thus not new-to-the-world information is being investigated, which enormously limits the possibility to actually research the influence of neuromarketing when applied to a human being. An empirical research where several human beings are being confronted with products and then fMRI or EEG measurements are executed would increase the validity of the study. Furthermore, then all the eight discussed marketing inputs could be evaluated upon separately. An additional limitation is that we, as students from the University of Twente, did not have access to all the existing literature about neuromarketing since there are still some journals where we do not get any access.

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