

AN INTRODUCTION TO NEUROMARKETING AND UNDERSTANDING THE CONSUMER BRAIN: THEY DO PURCHASE, BUT WHY ? AN INSIGHT FOR REVIEW AND IMPLICATIONS

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Abstract - It is possible to access and track the products and services that consumers do buy however the issue is that why do they perform that purchasing behavior? Neuromarketing has come across after the intersection of marketing and an idea of using neuroscience and its tools together to be able to respond that question. In last decade neuromarketing had an evident advancement and got more steps to comprehend consumer brain and obtained pertinence by private sector after the inefficiency of conventional marketing gauges to analyze consumer motivations, preferences, expectations and behavior in that sense. Neuromarketing is able to predict consumers' unconscious and cognitive activities via neuro imaging and bio-indicators and apply them into marketing while there is still existing concerns about intrusiveness in the science club. Here in this is paper, it is desired to highlight an insight through neuromarketing and shortly present the most harnessed and popular tools, apprehensional approaches about neuromarketing and some future implications are accounted.

Keywords: Neuromarketing, consumer neuroscience, neuroimaging, subconscious, marketing

JEL Code: M31, M39

I. INTRODUCTION

The very first implication or attempt for neuromarketing emerged in 1957, the marketing specialist James Vicary stated that he had provided a soar at the sales of food and drink at a cinema by hiding some subliminal messages into a film with the words "Drink Coca Cola" and "Eat Popcorn" appearing at the screen for a few secs. The study was never published and may have even been a hoax (Karremans et al., 2006). However that failed attempt could entail to the concept that if consumers could be affected by subliminal components or what are the de facto reasons behind their purchasing decisions? Actually, the word "neuromarketing" introduces a newborn field of research bolstered up by both scholars and private sector using possibilities of neuroscience that allows insights into the human brain's responses to marketing stimuli (Renouise and Morin, 2007; Senior et al., 2007). Basically, consumers are immensely motivated by what can make them feel good, particularly when it comes to buying decisions. With this design, many vast companies started to have special interest on understanding how human brain tracking or imaging can give them a better understanding about consumers. People are quite enthusiastic when it comes to explain what they want or how much do they willing to pay for the product. However they are not so good at stating where that intend comes from or to be able to enucleate by which factors that decision affected by such as ads, brands or charming windows (Nobel, 2013). Neuromarketing can unravel those hidden compounds for decision process. Neuromarketing is finding the "buy button in the brain and creating advertising campaigns that

consumers will unable to resist to purchase" (Neuroscience, Nature, 2014). Neuromarketing theories were first explored in 1990s by a marketing professor Gerald Zaltman, initially when he and his colleagues were hired by huge companies such as Coca Cola to investigate neural activity of consumers (Kelly, 2002). However the term "neuromarketing" is believed to be used first by Ale Schmidts, a marketing professor also from Rotterdam School of Management (Ramsay, 2015). In traditional marketing researches, it is considered the accounts of attendants, in qualitative researches it is determinative that the direct answers given by subscriber and controversially in quantitative answers that it is examined the thoughts which lie deep under. To conceive the participants' real thinking depends on willingness of replying and ability of researcher. In self-account based on marketing researches, participant may give the answer which he thinks it would be correct, so the participant may not be aware of his real thoughts or may have tendency to hide the reality. For such problems may occur that the neuromarketing could be the solution to unearth de facto causes. There are plenty of technics used for brain-imaging technics such as fMRI (functional magnetic resonance imaging), QEEG (quantitative electroencephalography) and MEG (magneto encephalography). Among those, fMRI method is the most popular for marketing companies due it utilizes the mainstream technology to create clear images of real-time brain activity (Bridger D., Lewis D. 2005). As could be seen, in neuro marketing, it is used the brain images of attendants not the accounts, mostly. Considering that the personal accounts could be misleading, neuroscience is benefited to study biological reactions of brain. In this paper, it is

intended to give a conceptual point of view and an introductory summary of neuro marketing together with its short history, the tools used and what could be the future implications.

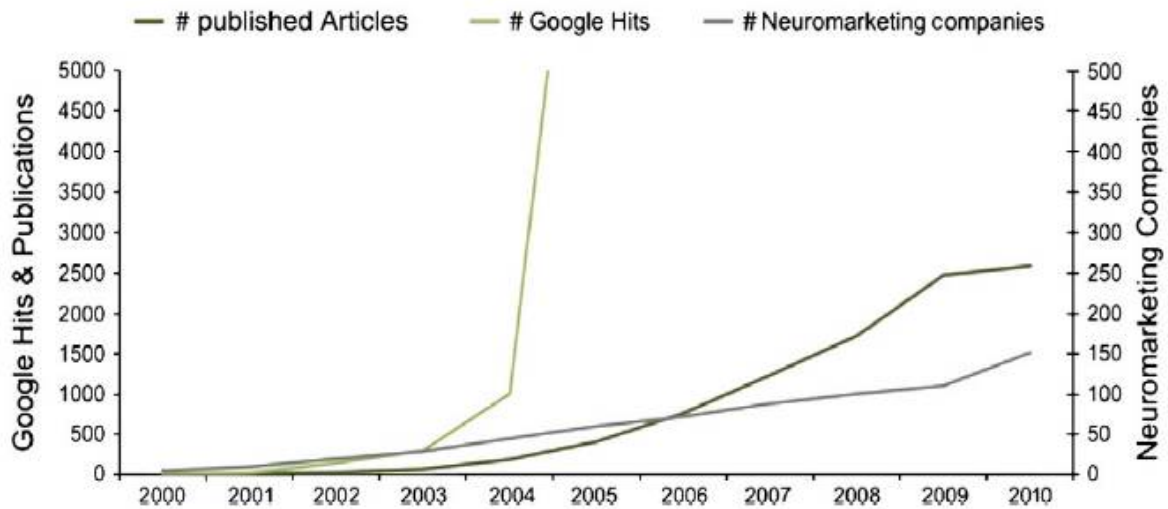


Figure 1. Neuromarketing over the years (Plassmann, Ramsay, Milosavljevic, 2012)

II. WHAT IS NEUROMARKETING

Neuromarketing is a bursting area that brings together the study of consumer with neuroscience. Contentiously, when it first emerged in 2002, the area was just getting a quick legitimacy and embrace among advertising and marketing professionals. Every single year, over 400 billion dollars is rolled over in advertising campaigns. However, traditional methods for testing and estimating the effectiveness of those investments have usually failed due to they hinge upon consumers' willingness and ability to describe how they feel when they are subjected to an advertisement. Neuromarketing offers forefront methods for directly investigating human brain without requiring exigent cognitive or conscious participation. (Morin, 2011) Like objections to all scientific advancements, neuromarketing is also a research and scientific comprehension tool into consumer decision process being rather than a brain controlling or exploiting gauge, like market expert Martin Lindstrom said that "basically a tool which assists us to decode brain when we -as consumers- confront with a product or brand" however neuromarketing does not get interested in simply what makes shoppers to buy a certain product when they at a supermarket but much work of neuromarketing is done before they step into that door. (Hannaford, 2013)

Dr. Steve Sands, who is owner of a consumer neuroscience research lab, states 76 percent of US supermarket shoppers make their decisions during shopping at store and those who pays with non-cash methods tend to make impulse purchases which brings the shelf-placement under spotlight and of course eye-tracking tools also. Researchers analyzed

a group of volunteers took part in a study and 80.000 eye movements as big 3 terabyte data included and they concluded that a single eye movement takes 200 milliseconds and which is an enough time for a shopper to buy the product and only again one single eye movement may change this decision to buy or not. Twenty percent of eye movements are about what consumer is going to buy and rest is just alternatives and he concludes that "the brain always look for something simple, making confusing and colorful packaging is not the best so visual clutter is really important." (Hannaford, 2013) So those implications are an illustration where neuroscience and neuro marketing meets. At this point it would be beneficial to make a demarcation between neuroscience itself and neuromarketing. Neuroscientists basically study from very primitive creatures (plankton, cockroaches or fruit flies) to big and complex mammals (primates, human beings etc.) and their brain structure and regarded ailments their neural system have. However, A considerable proportion of consumer neuroscience studies and analyses upon human brain activities and responses to marketing stimuli and also a few selected ones study upon non-human primates and small animals such as monkeys or other close to human organisms as target group due to working on animals allow to setup causal relationships between brain and specific behaviors also it allows to apply more incursive technics to mental systems upon animals and humans as jointly have. Additively, those researchers using evolutionary theories to account consumer behavior using animal sample assist them to make evolutionary deductions. (e.g behavioral biases and going back in evolutionary series). So vital distinction is between clinical and non-clinical neuroscience (consumer neuroscience) is that the clinical neuroscience known

as neurology studies and try to treat nerve system disorders, brain traumas, mental disorders (such as epilepsy), tumors and disorders affect cognition, emotions and behavior on patients while consumer neuroscience studies upon only healthy experimental objects and their brain responses.

The last distinction belonging to consumer neuroscience which divides neuromarketing than consumer psychology and neuroscience is that it implies a way of applying and commercialized harness upon physiological tools, such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), eye tracking, skin conductance and rendering to accompany benefited and commercial market research. Recently, neuromarketing took a considerable attention over last decade (see figure 1) (Plassmann, Ramsoy, Milosavljevic, 2012). Neuromarketing and its predecessor, neuroeconomics, harnesses clinical information about brain functions and mechanisms to assist to explain what is happening inside of the “black box” which prevails in many explanations of consumer behavior. Thitherto, most explanations of market behavior are based on logical entailment. If neuromarketers can use science to “locate consumers buy buttons” then we have obtained a closer approach to the opening the “black box” of the consumer’s mind” (Fugate, 2007). To give some illustrations from “black box” is that why people can be lack of foresight is depend of if people use their rational prefrontal cortex to make choices or not. However, the potency of spontaneous rewards or penance activates the impatient limbic system of the paleopallium (old animal brain), often leads to have foolhardy choices. Another finding is that why people change their behavior suddenly is that the anterior cingulate takes monition from the rational prefrontal cortex and the limbic system, then chooses which to follow. A bitty change in conditions can cause it to topple from one selection to other (Coy, 2005)

In a famous brand exercising experiment, scientist desired to comprehend what is the intention for brand preferences while choosing a specific brand. This was the first time that neuromarketing came to foreground. Scientists observed that although the Coke and Pepsi have similar tastes and recipes, consumers prefer one over to another. Then they saw a need to investigate how cultural messages and habits can affect even our beverage choices on daily based. (McClure et al., 2004)

The test was quite primitive, there was one group which is not aware which soda is which and another group is totally aware what soda they will drink and all in all, researchers are ready to check related brain activity during soda experience. When the group which are unaware what they are drinking was experiencing Pepsi Cola, fMRI device monitored an

activity at ventromedial prefrontal cortex which we can define as a “reward center” during experiment. However when other group which are aware what drink they do taste, the fMRI device again monitored an activity but at another part of brain which is hippocampus, midbrain and the dorsolateral prefrontal cortex (which basically corresponds to memory and emotions) for experiencing the Coca Cola. Basically, people like the taste and flavor of Pepsi but they were tend to believe that they actually chose the Coke due to traditional image of Coke and effects of advertisement campaigns. So, the researchers concluded that the “a predilection upon Coke is more about brand image than taste itself.” (Bridger D, Lewis D, 2005)

III. NEUROMARKETING TOOLS

Using EEG tests (essentially a plastic swimming cap gathers electrodes from brain signals), functional magnetic resonance imaging (fMRI, that measures brain activity by examining blood flow where it accumulated) eye tracking technology and more totally revolutionized the marketing and advertising world. (Hannaford, 2013)

As a science, neuroscience’s capability and its tools originate from at least two ways that can provide a more clear understanding of the psychology underlying brand decisions. First of all is that bringing together the statistical models from computer sciences to neuroscience data and enabling a possibility to neuromarketers to apprehend the consumer behavior in a more precise way than relying on traditional techniques of marketing such as self-reports and surveys. Secondly, by featuring different neuroscientific tools together we can launch brain-behavior relationships that are significant for understanding psychology underlying consumer choices. (Plassmann, Ramsoy, Milosavljevic, 2012) Neuromarketing is a relatively young branch and still have a way to develop theoretical, empirical and practical capacity (Garcia, J.R., Saad, G., 2008). As it was stated above, theoretically the establishments of neuromarketing researches based on neuroscience. Neuroimaging techniques are used to test hypothesizes and marketing stimuluses and how those affects consumer brains. Researches and brain images indicates that the cognitive and behavioral processes are related to eachother. (Alwitt, 1985) Via using tools, researchers compare a specifically determined task and its vivification during control task with neuroimaging technics which provide an enhanced knowledge about consumers by applying different stimuluses to reach decisions. (Reimann et al, 2011). As Lindstrom states that with traditional marketing tools it is only possible to reach a small part of brain processes of consumers and consumers are not able state real causes of their buying behavior even most of them are not conscious while making buying decisions and also he remarks that the most of

the brain is under control of automatic processes than conscious thoughts and brain processes are fairly emotional than being cognitive. (Lindstrom, 2013) So that is why neuromarketing uses the objective neuroscience tools. Together with the ones above we can count heart rate indicator, blood pressure, skin conductivity, facial coding, eye tracking can be counted as non-brain imaging tools and as brain imaging tools above we can count Positron emission tomography (PET), Magnetoencephalography (MEG), Transcranial magnetic stimulation (TMS) and Steady State Topography (SST), functional Magnetic Resonance Imaging (fMRI), electroencephalography (EEG) as neuromarketing tools however here below the most used and widely known tools are presented only.

3.1 Functional Magnetic Resonance Imaging (fMRI)

The fMRI technique uses an MRI scanner to measure the oxygen levels in blood signals. (BOLD-blood oxygenation level-dependent). Blood level transitions are generally correlated to underlying synaptic activity. Spatial resolution ranges 1-10 mm, and temporal resolution is 1-10 seconds. Generally, the higher the spatial resolution, the lower the temporal resolution. fMRI is the most advantageous among neuroimaging tools in resolution of small structures and deep inside of brain while EEG stays on surface. (Ariely D, Berns G., 2010)

The fMRI uses huge magnets often 3 Teslas strong to monitor blood flow across brain during the subjects

reacts to the visual, audio and taste cues. The more desirable an object is the more substantive changes happen in blood flow in that related part of brain. An fMRI examination may cost up to \$1000 which is a bit pricey while EEG can cost much lower and EEG allows subject to move around room during testing while fMRI requires subject to lie down very still inside of a hole which could be daunting. (Carmen N., 2013) A research made by Kable (2011) indicated that 60% to 70% of observational studies applying neuroscience to behavioral decision-making theories use fMRI. fMRI is the most prominent tool for neuromarketing society when it comes to neuroimaging. (Plassmann, Ramsoy, Milosavljevic, 2012) To illustrate, a research was done by Gregory Berns and Sara Moore from Emory University who took neuromarketing to music industry to show neural activity and success in music industry. In a laboratory experiment, adolescents listened to a new series of music albums which is unknown while lying inside of fMRI device. The researchers discovered that teenagers' pleasure centers correlated with whether a song succeeded in market as commercially. The song named 'apologize' which showed a good performance at market had a significant correlation between brain responses of youngsters and number of songs sold. This comparative analysis uncovered that the neuroimaging data had a statistically significant rate for prediction for popularity of songs from sales numbers measured between 2007 and 2010. (Berns, G.S., Moore, S.E., 2012)

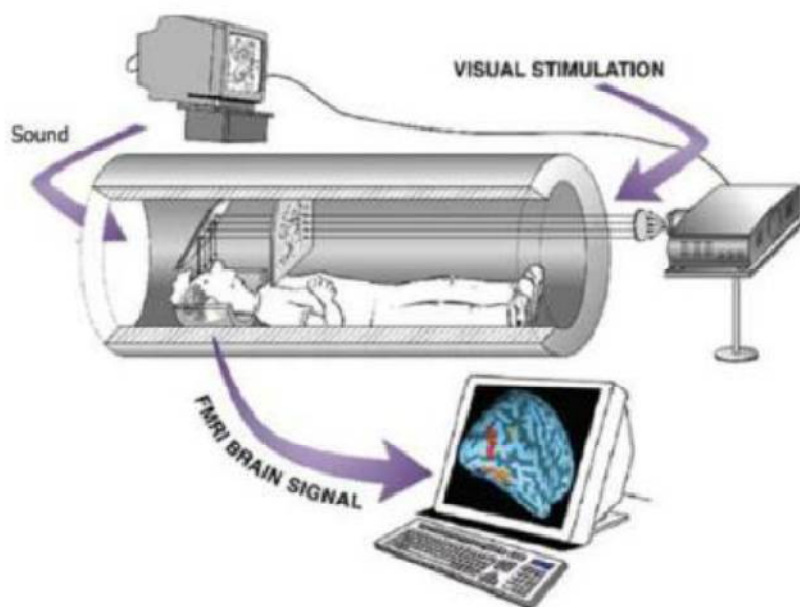


Figure 2. A setup to have subject watched film during fMRI test (Hasson et al., 2008)

fMRI is still a method and a technique that requires huge knowledge and experience. fMRI labs host engineers, physicists, MDs, IT experts and so on. When assessing and doing an fMRI scan, a deep understanding of brain, scanner, magnetic resonance physics are needed and fMRI results requires a firm

understanding to analyze. fMRI is enormously strong method to get through inside of consumers' minds when done properly. (Ramsøy, T.Z., 2015)

3.2 EEG (electroencephalography)

EEG harnesses electrodes applied to scalp and gauging conversions in the electrical field in the brain tissue underneath. We have more than hundred billions of neurons and trillions of synaptic associations which speak for the premise of neural network. Within the sight of a specific stimulus like a bit of advertising, neurons fire and deliver a little electrical current that can be amplified by EEG (Morin, 2011). It captures variations of brainwaves and magnitudes of the received brain signals which represents the certain mental activity such as wakefulness (beta waves), relaxation (alpha waves), calmness (theta waves), and sleep (delta waves) (Morin, 2011). EEG has very sensible high temporal resolution (milliseconds) and can detect even small neuronal events. A common technique is to gauge the left-right asymmetry of the frontal EEG. (Davidson, R. J. et al, 1990) Due to skull distribute the electrical field, EEG has low spatial resolution (~1cm) that depends on how many electrodes are used. The number of electrodes can be a few or hundreds in high density spectrums. Of course, the greater the number of electrodes that connected the higher spatial resolution we get. However EEG has low detection skills for deep brain layer. (Ariely D., Berns G., 2010) and due to electrical conductivity show difference from person to person, it would get hard to obtain exact location for each recorded signal. (Zurawicki L., 2010) Even though that EEG still one of the most used tools in neuromarketing researches after fMRI due to its low cost (Plassmann et al. 2011; Ariely, D. and G.S. Berns. 2010).

In an EEG technic used neuromarketing research, Vecchiato measured the effect of soda advertisements upon consumer behavior on TV, newspaper, magazine, billboards, public areas and variety places. In research (Vecchiato et al, 2011), group used coke ad footages. Research group was consisting of 15 people from Italy and 13 attendees from China. Subjects are exposed to watch 24 different ads which lasts 30 secs and during experiment their prefrontal cortex-brain's decision making center-activity was monitored by EEG. For Italian subjects that they remembered the scene while a woman holds a coke bottle at 10th second and at 20th second there is one actor joking around to another which researchers observed high activity at prefrontal cortex and finally there is a decrease at scenes where two males are indicated beside the pool. Chinese subjects' prefrontal cortex showed low activity on 15th second while a singer was showed as singing on his own and soared between 20th and 25th seconds and was remembered truly while a group of people singing together. (Vecchiato et al, 2011) Below in chart,

RMB is the activity indicated during the watching the advertisement that the subjects precisely remembered, and FRG defines the scenes the subjects watched was forgotten and GFP presents the parametrical valuation of map mightiness, calculated as standard deviation of the transient potential worth.

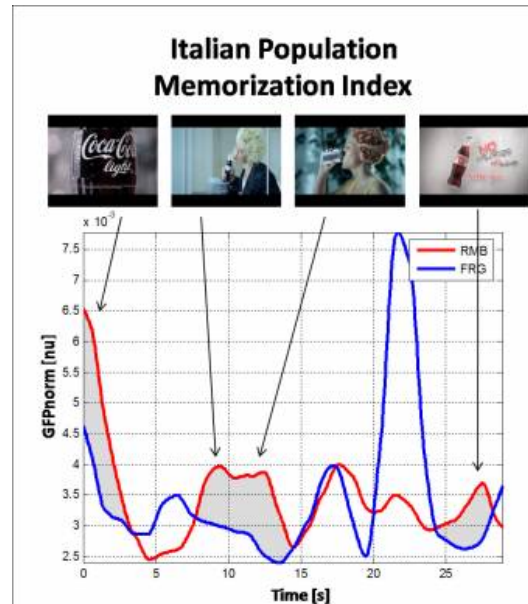


Figure 3. Brain activity related GFP frontal Electrodes at the theta band analyze of Italian subjects during advertisement. (Vecchiato Vecchiato et al., 2011) et al., 2011)

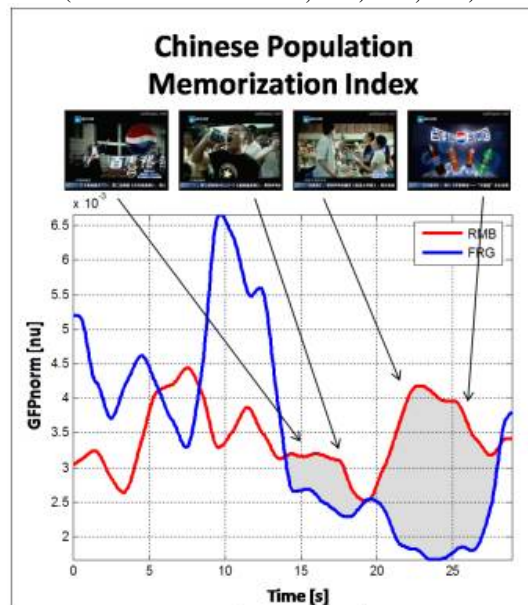


Figure 4. Brain activity related GFP frontal electrodes at the theta band analyze of Chinese subjects during advertisement. (Vecchiato Vecchiato et al., 2011) et al., 2011)

As a result advertisement obtained reaction equally in terms of brand awareness to certain coke brand due to brain activity increased during brand logos and products were seen however key point is that Chinese subjects showed interest on ads which implicates group activities and togetherness while Italians

showed reaction to the individual scenes at the ad. That could be read as cultural code.

3.3 Eye Tracking Tool

Eye tracking tool is used to observe and measure subjects' pupil dilation while subject looks at the stimuli or not, how long subject observing the stimuli and the direction of visual engagement without tracking brain and brain imaging technics. The device itself invented by Mowrer in 1936 which allows automatically recording the eye movements and where it does focus. (Ozdogan, 2008) Eye tracking enables to track eye movement and where attention is given and as a result provides implications about buying behavior. (Laubrock et al., 2007)

It is referenced in a study also (O'Connell et al., 2011) that eye tracking provides more precise information than self-accounts does, as research shows that subject statements are not the same by enabling in data and measurement quality. It is mostly used to measure pupil dilation in shopping malls and supermarket shelves, internet websites interfaces and product package designs. (Bozkurt, 2013) In most cases researchers use eye tracking glasses together with EEG caps which connected to a portable PC at a rucksack and sending data while they do shopping and allowing them freedom of movement of course.

Visual selectiveness and pupil movement extends the quality of research. Stare bias shows that the people who gazing at an object longer time in examining (ie. to fix on) upon choices that they actually incline to choose. (Glaholt & Reingold, 2009; Krajbich, Armel, & Rangel, 2010; Pieters & Warlop, 1999; Shimojo, Simion, Shimojo, & Scheier, 2003) For instance, consumers allocated 54% more time upon ads of business in a telephone directory that they came to an end with purchasing decision. (Lohse, 1997) Another astounding research result is that the reaction of manipulation of what the people are staring at-for example, by monitoring different options one after another while altering the manipulation duration-biases resulting on given choices are the ones the subjects were gazing at longer time. (Armel, Beaumel, Rangel, 2008) Furthermore, by harnessing eye tracking tool to evaluate visual attention, it was found that at the peak of fertility, females are tend to indicate faster and more intense fixations and extended total watching time upon sexual elements in ads. (Ramsøy et al. 2011)

3.4 Skin conductance

Skin conductance is a dependent analysis of elusive changes in galvanic skin responses (GSR) when the autonomic nervous system (ANS) is evoked which gauges the stimulation. (Ohme et al. 2009) It was stated that galvanic responses better at measuring market performance than self-accounts. (LaBarbera, Tucciarone, 1995) Researchers from Nagoya

University indicated in an experiment that 33 women were asked to choose two cosmetics products among four. Researchers measured the anticipatory SCR before subjects account their preferences. It was found that the SCR amplitude of preferred products significantly larger than provided by non-preferred products. (Ohira H, Hirao N, 2015) Skin response exist since 19th century and it is a vital component today still measuring market preference upon consumers.

3.5 Face Coding

Face reading or coding (Facial Action Coding System) was put forwarded by Paul Ekman to analyze the de facto emotions of human beings. People reflect their happiness, anger, loath, sorrow, suffering to their faces. While many expressions are controlled, many of facial expressions are being driven by unconscious emotions. Apart from Facial EMG (facial electromyography) facial coding only requires a camera, a software which can assist to study the facial expressions. (Ramsøy, 2015) However Facial electromyography device gauges and assesses the physiological specifications of facial muscles (Ohme et al. 2011) and again measures the intentional and unintentional facial expressions and muscle motions which can reflect subconscious emotions. (Dimberg et al. 2000, Cacioppo et al. 1986) Facial EMG a bit more precise tool than camera due to it measures the electrical impulses created by muscle activation on face. However, there is an ongoing argument about validity of the camera detection tool that if the facial coding is reliable enough or not in terms of error rate, extent of measurability, quality of measurability etc.

In a recent study by Phil Barden, he and colleagues tested and challenged the camera system and their observations of facial expressions indicated that it varies even when a static face of a doll was put in front of camera and secondly they analyzed real people face expressions and figured out that device measured a happy emotion only in the end of commercial which was shown to subjects and other parts of analysis results were ended up as neutral and other expressions did not play a vital part at all. (Ramsøy, 2015) As can be seen that this device is valid however requires a more validation than currently it provides us.

IV. ETHICAL ISSUES IN NEUROMARKETING

Although the neuromarketing is at its early stages as a new scientific field, ethical arguments and barriers already initiated to surround the branch. There is, for sure, no intrinsically problems about using scientific gauges and technology to stir up commercial profits (Eaton and Illes, 2007) however the use of this technology which examines human brain deeply and uncovering the unknown and answering unexplored

questions may bring a discomfort and alienage which could lead ethical issues to the agenda stronger.

Those concerns generally exist into two main headlines, first one is the preserving the any subject or attendee who may get any harm because of neuromarketing studies and preserving the subjects' autonomy. Here what is clear that in case the subjects do not get informed well about their preferences could get manipulated and may find the study intruding to their privacy. Neuroethics in that sense deal with ethical issues about the manipulation of human brain and shows guidance for true and fair procedures and non-intrusive harness of neuromarketing technics. (Murphy et al. 2008) In that regard the consent and informing to subjective is quite vital due to brain imaging researches can only be done in return of informing and willingness of subject. According to US Department of Health and Human Services, federally or governmentally funded scientist, scholar or any commercial purpose based people and institutions have both ethical and legal responsibility to receive informed assent and to preserve the privacy of research subjects those who attended to brain function examinations with imaging gauges, as per related code (DHHS, 1991)

Neuromarketing's only purpose is to study human brain and physiological reactions to get a sight about purchasing behavior and what makes them buy a certain service or product. Why people thinks neuromarketing is intrusive is that it is getting mixed with subliminal advertising and due to neuromarketing uses brain imaging technologies, people thinks it is brainwashing and affecting human mind. (Yucel and Cubuk, 2013, p.173) As Commercial Alarm foundation claims that neuromarketing can be harnessed to capture human mind and use it for commercial goals. Furthermore, they assert that neuromarketing could be used for political purposes and even it may drag the society to totalitarian regimes, civil wars, wars and genocides even. They reported their concerns to US president with petition. Neuromarketing has no motivation to rise up sales or profits at all, in conjunction with it can be claimed that every cutting-edge technology has this potential to be misused and there is an ethical responsibility for neuromarketing also. (Lindstrom, 2013 p.13-14) So, in point of consumers' view, brain imaging technics may assist us to evaluate and reveal hidden and tricky methods used by marketers due to it sorts out our decision-making mechanism in brain. (Renvoise and Morin, 2012, p.3)

CONCLUSION

Neuromarketing, as a science currently that under the spotlight of media and society is a branch that could be defined at its infancy. This quite new field made enormous steps to understand human brain and its working mechanism at a decade which is quite short

time span but there is long way to get and still has ethical questions and which tools to use in future and how much to go deeper at layers of brain remains to be answered. To consider traditional marketing gauges, they are sparing longer time to finalize, less cost effective, limited knowledge payoff in return and most importantly could be misleading. In this context, neuromarketing succor to marketers with time effective, verifiable and trustable outcomes upon consumer behavior however could be a bit pricy depending on tool. For ethical concerns, any technological tool could be used for immoral purposes and exploited. Neuromarketing can serve as an interface or bridge between consumers and businesses by assisting to understand consumers and adding them up to design process or analyze their brain to develop better, more efficient and human-coherent products. Conversely, neuromarketing presents and reveals insights to consumers and cues about how businesses creates their campaigns, designing their products and what do they uncover and know about our brains, so that consumers could be proactive for ill-intentioned marketers and companies, when confront.

We should educate students, academicians even consumers and open institutions, faculties to develop and keep neuromarketing on the track of science. It is that much serious field to not to be left to neuromarketers or fantasy marketing magazines to analyze if advertising "A" works and affects better consumers than "B" or sells plenty. We need to ask deeper questions and bring conclusions indicating underlying causes about neural activities of human being and their preference, purchasing behavior then it will provide useful insights for academic research and marketers also. (Ariely D., Berns G., 2010)

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