



Implications of Advances In Neuromarketing for Marketing Research

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ABSTRACT

This paper examines the conceptual foundations of neuromarketing which are drawn from social cognitive neuroscience. We explore the relationship between neuroscience and marketing through extant theories in biological sciences that are making neuromarketing an ever evolving field. The paper provides examples of applications of neuroimaging in marketing research and strategy and then proceeds to set an agenda for future research. We conclude by underscoring the need for continued basic research in the area that deals with theories and concepts of neurosciences and neuroimaging, and stressing the management of ethical and social dimensions of this emergent field.

Keywords: *Neuromarketing, Neuroscience, Strategy, Research*



INTRODUCTION

Deciphering wants and needs of customer segments served by a business is of utmost interest to the marketing strategists. It has been a difficult quest that has been addressed and explored using traditional methods and strategies that are now giving way to breakthrough advances in neuroimaging science. The application of neuroimaging technologies in marketing is often referred to as "Neuromarketing." Neuromarketing is an amalgam of neuroimaging science (The Economist 2004) that utilizes medical technologies, such as Functional Magnetic Resonance Imaging (fMRI), and Electroencephalography (EEG) to study the brain's responses to marketing stimuli. Marketing researchers have used the fMRI to measure changes in activity in parts of the brain and to learn why consumers make the decisions they do, and what part of the brain is affecting the decision making in the subject. EEG is a more intrusive neurophysiological measurement technique that employs electrodes to measure electrical activity in the brain as the subject is exposed to decision-making scenarios and stimuli (Brushteyn and Buff 2007). Some other neuroimaging techniques that have found limited use in marketing include, psychophysics (reaction times/detection levels), magnetoencephalography (MEG), Transcranial Magnetic Stimulation (TMS), Skin Conductance Response (SCR), and Positron Emission Tomography (PET).

While marketers have embraced the neuromarketing methodology, there is a dearth of literature that explores the myriad facets of neuroimaging and the underlying science of neuroimaging that is available to marketing scholars. A detailed understanding of the conceptual underpinnings of neuroimaging and neuromarketing is the focus of this paper. We believe that this research will help marketers better understand the conceptual foundations of neuroimaging, thus resulting in most effective and appropriate application of the neuromarketing techniques. Further, we believe that this will lead to other neuroimaging based methodologies that are yet to find applications in marketing. Finally, a detailed understanding of the scientific underpinning of neuromarketing will lead to more ethically responsible application of these techniques.

We begin by providing some background and current applications of neuromarketing in the marketing literature and practice. We then proceed to enunciate some of the theoretical frameworks that are of importance to marketing scholars in order to further enhance and expand the appropriate and efficient use of neuromarketing techniques. We conclude with some ethical, social, and scholarly issues that need further attention. In each section we strive to make the neuroimaging theory more accessible to marketers and underline some of the associated research questions that could form the blueprint of a research agenda in the area of neuromarketing.



APPLICATIONS OF NEUROIMAGING IN MARKETING

Neuromarketing uses the traditional neuroscientific methods to map the brain patterns of consumer participants, to reveal how they respond to a particular advertisement or product and eventually the impact of these stimuli on consumer decision-making. The information is most often used by marketers as the basis for new advertising campaigns and branding strategies. Neuromarketing is predicated on the notion that consumers largely exhibit brand choices based on subconscious thought processes. This means that the marketers need a way to research consumer decision making at the subconscious level to know what they are thinking and why, and Neuromarketing is believed to be the way to get those answers. As the participant is shown a particular stimulus, his or her brain is monitored with a neuroimaging monitor (any from the above motioned alphabet soup – fMRI, EEG, MEG, PET, TMS, SCR). The brain patterns are then interpreted by determining whether or not the participant liked what he or she was experiencing, and to what degree. The empirical data thus obtained is considered to be direct and therefore unbiased - a position which is contested by some (Senior 2007, Briggs 2006).

Successful application of neuromarketing in the practical realm of marketing strategy is popularly attributed to the pioneering work of Gerry Zaltman at Harvard University (Haynes, 2002). In late nineties Zaltman patented a technique called "ZMET" (Zaltman Metaphor Elicitation Method), which uses pictures to help uncover deeply held thoughts and the metaphors they trigger. ZMET combines neurobiology, psychoanalysis, linguistics, and art theory to uncover consumer preferences. Early applications of ZMET used metaphors to elicit unconscious attitudes towards particular products and brands. Findings and results of ZMET are used in advertising strategy to develop emotionally compelling messages arrived through brain scans of experimental subjects. Companies that have reported successful use of ZMET in their marketing communication strategies include GM, Proctor and Gamble, and Coca Cola.

The ZMET is a way to tap into autobiographical memories. The theory supporting the ZMET is that it can tap into the real driving forces behind consumer choices, which are often unconscious, and cannot be extracted by traditional market research methods. Zaltman states that "metaphors are essential to how we think, they're essential for how we process that information, and that it's essential for how we represent to other people what we think, how we feel, why we do what we do" (Haynes, 2002).

Brain scan and brain wave based research had found applications in advertising prior to ZMET in early Eighties. Burshteyn and Buff (2007) and Plassmann (2007) have built upon the work of Weinstein, Appel, Weinstein (1980), Nevid (1983), and Rothschild & Hyun (1990). The most recent study in this stream of literature has applied the neuromarketing EEG technique in determining subject reactions to manufacturer brand when compared to corresponding private-label brands within the conceptual framework of

stimulus generalization (Burshteyn and Buff, 2007).

An example of how this new technology was put to the test was by the "Pepsi Challenge", performed by Read Montague. This challenge consisted of a blind taste test of Pepsi versus Coca-Cola. Montague gave 6 people a blind taste test of both Coke and Pepsi, and then placed his subjects into the scanner, where the magnetic field measured how active cells were by recording how much oxygen they consume for energy. After the 6 people tasted each drink, all of the volunteers showed strong activation of the reward areas of the brain. The reward areas are associated with pleasure and satisfaction, and the preferences of each brand were evenly split 50% Pepsi, and 50% coke.

Neuroactive Region	Response
Medial Frontoparietal	Emotional
Lateral Frontoparietal	Attitudinal
Medial Prefrontal Cortex	Memory
Ventrolateral Frontal Cortex	Working Memory
Nucleus Accumbens	Pleasant Outcomes
Insula	Painful Outcomes
Amygdala	Emotional
Hippocampus	Memory

Figure 1

Montague repeated the test, but this time informed the subjects what they were drinking, and three out of four people said that they preferred Coke, rather than Pepsi. Their brains showed why this was happening -- not only were their reward systems active, but memory regions in the medial prefrontal cortex and hippocampus also lit up. Most people preferred the taste of Pepsi, but when shopping they bought Coke instead. Montague used neuromarketing to find the cause of this paradoxical behavior, and stated that it "showed that the brand alone has value in the brain system above and beyond the desire for the content of the can". Therefore, the millions spent on active, energetic, healthy, and glamorous models drinking Coke in commercials did achieve the desired results, they managed to leave a residual memory in the brain that left associations so powerful that it could even override a preference for the taste of Pepsi (Park, 2007).

An Oxford-based consultancy, which specializes in the use of cognitive neuroscience to gain insights into human behavior, conducted an experiment by scanning the brains of 20 people and while exposing them to 67 ads using a variety of media. The areas of the brain that were recorded, consisted of the amygdalam (which is the seat of emotions) and the ventrolateral frontal cortex, (the seat of working memory). The results indicated press and outdoor ads were highly effective in communicating messages to people who are already aware of the stimuli within the ad. Print ads offered the benefit of being able to deliver content-rich information, and TV ads were found useful in stimulating long-term memories and emotions, which are important for establishing brand (Wilkinson, 2005).

Brian Knutson, a Stanford neuroscientist, posits that people

assess potentially good things and potentially bad things, and that our brain is naturally attuned to seek survival through good outcomes. It's the match between the value of a product and its price that triggers an anticipation of pleasure or pain. Knutson tested his theory, by giving subjects \$20 each while in the fMRI machine and provided them with pictures of 80 products, followed by a price. They had the option of buying one of the products. Knutson recorded activity in the nucleus accumbens (associated with pleasant outcomes). If the price of the items were too high, there was increased activity in the insula, which is an area involved in anticipating pain. These tests have helped save time for advertisers and marketers because the brain says what the person is thinking, rather than having to study their behaviors to interpret what they are thinking, over time (Park, 2007).

Marketing scholars have focused on practical and often narrow applications of neuroimaging component of neuroscience (Kenning, 2007). While it is commendable that we have made progress in making this largely esoteric science amenable to creative practical applications, one might argue that a broader understanding of the scientific concepts, theories, and frameworks of the underlying science itself will make these applications more useful and perhaps lead to the next level of achievements in the area of neuromarketing.



SOCIAL COGNITIVE NEUROSCIENCE

The conceptual foundations of neuromarketing are largely owed to the broader area of social cognitive neuroscience. Social cognitive neuroscience is a comprehensive integrative theory that includes constructs from Social Psychology, Economics, Political Science, Behavioral Science, as well as Biological Sciences. This section further focuses on relevant constructs and conceptual foundations of social cognitive neuroscience. In the narrative that follows, we discuss the constructs, explore the marketing ramifications of the theoretical constructs, and provide explanation of how the results obtained may be interpreted.

When practicing Neuromarketing it is important to be aware of the two primary goals of research in social cognitive neuroscience: first, to develop scientific theories, which may be complex, and interpret the theories by simplifying the content so that they can be applied towards solving future problems. Second, seeking explanations and possible solutions to problems that occur in everyday life that revolve around difficulties within judgment and decision making. The research needed to be able to understand the various aspects of decision making in individuals is very complex and therefore can often be inconsistent.

All research in the area draws upon three theoretical choices. The first theoretical framework involves the traditional expected utility theories, which deal with individual decision-making and choices. The second framework involves cognitive algebraic theories, primarily concerned with

judgment and estimation that factor into consumer choice. The third framework consists of cognitive computational theories of the mind's perceptual, inferential, and mnemonic functions that further nuance the decision-making abilities of the consumer. The combination of these three theoretical frameworks attempts to provide a general and certain incomplete image of the human mind, a possible explanation of behavioral manifestation of the cognitive processes, and a very rudimentary understanding of the underlying motivation of the decision maker (see Hastie, 2001 for a more detailed discussion).

The focus of neurological research in the field of judgment and decision making is based upon the antecedents of desires, beliefs, and experience that reveal themselves in behavior. The prevailing model used to understand choice behavior relies on three components. The first is choice options and alternatives, the second is beliefs about outcomes from objective experiences of the past. Such experiences include expected outcomes of future events and the conditions needed to achieve positive outcomes. The third component deals with a determination of utilities and perceived value form all possible outcomes of the amalgamation of the aforementioned components. Decision makers show a propensity to make educated and informed choices and judgments that lead to desirable results that meet the decision-makers goals.

Antecedents	<ul style="list-style-type: none"> • Desires • Beliefs • Experiences
Behavioral Choices	<ul style="list-style-type: none"> • Choice options and alternatives • Outcomes from past actions • Utility and perceived value
Mediating Variable	<ul style="list-style-type: none"> • Decision Context • Decision Importance • Decision Sequence
Outcome	<ul style="list-style-type: none"> • Behavior

Figure 2

In most instances decision-makers synthesize multiple, imperfect, often conflicting experiences to draw inferences about the events and outcomes in question. The standards used to infer the quality of decisions, usually compare the outcomes of decisions with the ideal expected outcome. The research stream that draws upon the model described above usually are categorized as being founded on subjective expected utility theory. The subjective expected utility is also referred to as rational expectations principle, which proposes that each alternative course of action or choice option should be based on expected satisfaction (or dissatisfaction) with the consequences of the experience (Lieberman, 2007).

There are several limitations to this framework. First, it provides a very incomplete analysis of behavior since it pays very little attention to the perceptual construction of decision context being constructed by the decision-maker. By nature, humans weigh their options unequally depending on the context of the decision in question. This leads to a second limitation, all possible decision and action alternatives are thus beyond the scope of this theory. Thirdly, this theory assumes a static decision moment, which again is in conflict with the real life complexity of a dynamic environment.

Neuromarketing techniques may be seen as useful tools to overcome some of these limitations by studying the brain activities during decision-making. However, even an ardent supporter of neuromarketing would have to concede that most of the limitations listed above remain unaddressed by mere use of a sophisticated scientific technique.

In a Neuromarketing study, one might be able to determine uncertainty experienced by the decision-maker but the cause of that uncertainty would still remain unclear. The researcher using neuroimaging tools would still have to rely on empathy – a subjective approximation of the subject's emotions and experience (Plassmann, 2007, Briggs, 2006, Lieberman, 2007). All a market researcher would be able to state at this point (based on brain activity) is if the subject in question is even aware of the product or service being offered, and perhaps if the outcome of product consumption is perceived in positive or negative light – given the past experience of the customer.

Studies that have examined the decision and judgment model using neuroimaging have been able to measure neural responses as subjects indicate their emotional response to a stimulus such as a picture, package, branding insignia, the reaction of decision-makers in such studies are strongly associated with activity in a medial frontoparietal network. Neuroimaging work on attitudes and prejudice has primarily focused on identifying the neural correlates of attitudes toward concepts, famous names, geometric shapes, or paintings. In such studies activation tends to increase in both medial and lateral frontoparietal networks (Hamilton, 2004; Lieberman, 2007).

An important aspect for Neuromarketers to make note of, is that there have been many neuroscientific findings that imply a distinction between the intuitive and analytic processes. Neuromarketers must be conscious of the fact that some decision processes are deeply ingrained in the nervous system at a level at which they are unlikely to be consciously penetrable. The most popular methods used in empirical studies in marketing fail to acknowledge this important

limitation.

Besides using technology to conduct brain scans to measure neuroactivity, consumers are also being hooked up to electrodes to measure skin changes and heart rates. Even the movement of a person's facial muscles, undetectable to the human eye, is being analyzed to interpret nonverbal communication. It is based on the assumption that every purchase decision creates a neurological reaction and neuroactivity is influenced by emotion. The EEG based neuroimaging techniques measure the intensity of emotion being felt and whether it is positive or negative. This test is similar to facial recognition technology that prosecutors use to prove if a potential assailant recognizes a weapon from a crime (Melillo, 2006).

All such tests are drawing upon the literature on mirror neurons that evoke nonverbal communications, including gestures, facial expressions, and postures. There are scholars that have difficulty making this link due to the fact that there is a great deal of nonverbal communication that occurs without conscious effort which renders observation difficult at best and misleading at worst (Lieberman, 2007).

Mirror Neuron based tests have led retail advertisers to adopt cutting-edge technology such as hypersonic sound to beam commercials at individual store customers. Hypersonic sound works on the basis of regular audio principles, where air is vibrated to create an audible wave. This type of technology uses a thin film that sends out an ultrasonic tone that mixes with the air and is beamed with laser-like precision in a two-degree arc of dispersion. The ads will be aimed at consumers in a check-out line that only they can hear. The result is like a headphone-like experience for recipients. (Melillo, 2006).



GENERALIZABILITY OF NEUROIMAGING RESULTS

The concept of Neuromarketing is claimed to be the technique for closing the gap between business and science. Neuromarketing gives the marketers an unprecedented insight into the consumers' minds, and is said to be able to help in strengthening the consumers' emotional bonds with products. Advertising veteran, Allan Middleton, says that neuromarketing is in its early stages and is skeptical of what it can realistically achieve. He feels that there can't be one special neuroscientific strategy that will compel the consumers to buy something, because there are so many products and messages competing for their attention (Haynes, 2002).

The current challenge of neuromarketing is to establish the generalizability of the findings from an insulated lab setting to a real world marketing setting (Briggs 2006). The marketers will have to establish relationship between the experiments and experience, which will enable them to predict and comprehend the decisions and behaviors of their consumers. The research agenda in this field will only proceed further by a clear understanding of the relationship between the controlled experimental conditions and largely uncontrollable decision making environments. The questions of generalizability and validity of results and the scope application are critical to the successful implementation of any experimental science. In the behavioral sciences, the usual examination of generalizability and validity of a concept begins with an

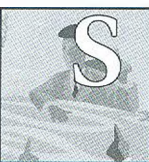
understanding of any causal relationships proposed by the scientific advance. Only then can we examine the result in systematic fashion to establish the conceptual dimensions along which variation occurs from one setting (the laboratory) to the other settings of interest (real world). Thus, progress on the problem of generalizability and validity are largely dependent on empirical research studies that curb our enthusiasm to overgeneralize and overemphasize the application of this cutting edge technology.

Christine Born, a German radiologist, posits that the use of MRI to determine consumer response eliminates the risk of dishonest or incomplete answers in market surveys. In an informal experiment she conducted, she says that she had asked a student to name his favorite brand of sneakers, and he said Adidas. But under MRI, the Puma brand suggested a more positive response, and the student admitted that his favorite shoe was a Puma model that was out of his price range (Helliker, 2006). There are several critics of neuromarketing applications that make compelling arguments as well.

Matt Andrews says, "fMRI is conducted in an unreal laboratory situation, yet consumers are subject to all sorts of influences around them all of the time...ninety per cent of what you believe is driven by your subconscious, as well as the choices you make in life, the brands you buy, and the media you consume" (Wilkinson, 2005, p. 22).

Ogilvy & Mather executive planning director Mark Earls, is another fMRI skeptic and questions its application in assessing advertising and types of media, "If you use the neuroscan to see if the 'happy', or positive part of the brain lights up you are missing the point. No communication works on an individual alone, the key influences are from other people" (Wilkinson, 2005, p. 22).

Bambos Neophytou, an account planner with Bartle Bogle Hegarty who specializes in cognitive science, believes that there are so many variables in the ways that advertising is delivered and consumed, that any form of effectiveness model using fMRI technology should be used with caution. He warns that clients with large budgets could latch on to the objectivity of fMRI as a "crutch" to justify decisions, which in turn could result in muffled creativity (Wilkinson, 2005).



SOCIAL AND ETHICAL RESPONSIBILITY

Neuromarketing is in its beginning stages, and is a controversial issue of discussion for many. Neuroimaging applications in marketing are relatively new, and the process is not described in enough details for an objective analysis to be conducted. There is a lingering suspicion that the researchers may not be using all neuroimaging procedures, frameworks, and models needed to be able to represent it positively, in the eyes of those outside of the research laboratories. Some feel that neuromarketing may be used in a manipulating sense. Neuromarketing raises the question of whether or not brain-scanning technology can provide an ethical and reliable means to assess the influence of marketing variables upon consumers. There have been no large-scale studies to draw upon, scans of a handful of subjects may not be a reliable guide to consumer behavior in general ("Inside the Mind of the Consumer", 2004).

Since Neuromarketing is not a widely used and examined area

in market research, it is important that the marketer remain cautious about how and where the results are used. G. Ruskin of Commercial Alert, a lobby group, thinks traditional marketing techniques are powerful enough. He states "Already, marketing is deeply implicated in very serious pathologies" ("Inside the Mind of the Consumer", 2004). This is especially true of recent attention to childhood obesity and early onset of type-2 diabetes. Will neuromarketing serve as a tool to exacerbate such negative trends?

Another concern is that neuroimaging represents an invasion of privacy. The neuromarketing studies currently rely on small numbers of volunteer subjects, therefore, some believe that privacy issue is an unlikely concern. However, as the popularity and application of these technologies gain momentum, one will have to grapple with this question soon.

Critics also object to the use of medical equipment for marketing purposes, rather than medical purposes. Tim Ambler, who is a neuromarketing researcher at the London School says that, "A tool is a tool, and if the owner of the tool gets decent rent for hiring it out, then that subsidizes the cost of the equipment, and everybody wins" ("Inside the Mind of the Consumer", 2004).

Liberman (2007) reports a study of neuroimaging on patients taking antidepressants like Effexor. The findings show that patients who expected good results, experienced it – even if subjected to placebo. It is the predictive power of these results that surprise neuroscientists, typically antidepressants take weeks to show an effect, and about 30% of patients never benefit. Physicians in the future will be able to predict which patients will in fact benefit from the antidepressants by looking at the patients brain scans even before prescribing medication. This will reduce the common criticism of doctors over-prescribing medications. A marketer can only imagine the parallels of being able to predict the success of a marketing mix element in a specified target market, before a full scale launch of the marketing strategy. Would it be ethical to conduct such pretests and then potentially discriminate among market segments? Some would argue that we already customize our marketing mix to reflect segment needs and wants.

Most ethical concerns revolve around application of results to market harmful product offerings. The use of neuromarketing by companies that market vices such as tobacco, alcohol, junk food, or gaming could be detrimental to society.



CONCLUSION

The most important step in successful research is the selection and definition of the research problem itself. We have attempted to alert marketers to the myriad possibilities and problems associated with the evolving field of neuromarketing. As the preceding narrative has underscored, one must not use a technique just because it is available. attendant questions of propriety, scientific suitability, ethical acceptability, and social responsibility can not be overlooked merely to satisfy an urge to be "cutting-edge."

It might be critical for market researchers to cross-pollinate their research with collaborations in the area of neuroscience. Neuroimaging makes it possible to examine the impact of marketing stimuli at the deepest level of mental activity, wh

may lead to revolutionary ways to enhance brand equity and customer satisfaction. But in order to achieve this lofty goal, empirical studies that focus on current state of the techniques, the ethical and socially responsible applications of the techniques, and the potential benefits (and costs) of employing such techniques have to be the focus of our attention in the immediate future. We could also benefit from the furtherance of knowledge in other fields of work that use

neuroscientific techniques and theories. For instance law enforcement agencies are embracing some of these techniques to increase the accuracy of a lie detector (Hamilton, 2004). We believe that a whole stream of research is needed before marketers rush to employ neuroscientific techniques without establishing the foundational and theoretical literature that would render the findings useful, valid, and reliable.

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