

SHARING THE TECHNOLOGY: THE CASE OF NEUROSCIENCE AND MARKETING

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Abstract: *Neuromarketing is an emerging subfield in marketing that combines neuroscientific knowledge and research tools in order to address marketing related problems. Current research has provided answers to many questions that conventional marketing methods were unable to answer. This paper briefly summarizes the most important finding to date, and speculates about possible directions of further development. Key characteristics of technological tools are presented as well as ethical concerns expressed by some researchers.*

Key words: *Neuroscience, Neuromarketing, Brain activity, fMRI*

1. INTRODUCTION

The field of marketing has many distinctive subfields of scientific inquiry and among the most prominent ones is a subfield of consumer research. The fields' main question that consumer scientists are seeking to address in their research endeavours can be stated as "What do consumers want?" Variety of methods and research tools scientist's use in search for the answer to stated question is both exhaustive and still growing.

Technological advances in areas seemingly not tightly related to consumer research have provided researchers with a variety of novel research tools previously not used in marketing. The field of neuroscience has lately been referred to as the source of these new tools. The trend has even given rise to a new subfield in the marketing landscape under the name of "Neuromarketing."

Neuromarketing, in essence, seeks to answer marketing related questions through the use of neuroscientific knowledge and tools such as fMRI, EEG, etc (Hubert & Kenning, 2008). Conventional marketing research tools (like questionnaires, focus groups etc.) share a common problem and that is questionable accuracy of consumers answers. Inaccuracy can arise because of unwillingness of consumers to share a true answer with a researcher or their lack of understanding and interpretation of their true reactions (to a certain product for example).

Neuroscientific tools applied in the field of marketing measure brain activity of consumers during exposure of a consumer to marketing stimuli (product, picture, advertisement etc.). Brain activity is measured by intensity and location in the brain. Neuroscientists have located different centres in the brain that show increased activity when subjects are exposed to enjoyable experience, unpleasant experience, complex consumer problem solving etc. Observing a specific brain reaction (measured with fMRI for example) after exposing the subjects to marketing stimuli and deriving conclusions combining neuroscience and marketing knowledge is what Neuromarketing is all about.

The remainder of the article is organized as follows. The second chapter explains the functioning of various neuroscientific tools used in the field of marketing and elaborates on key areas of brain activity measured by these instruments. Third chapter sums the key contemporary issues in Neuromarketing with special reference to recent findings,

greatest problems and future research directions. The paper finishes with a Conclusion.

2. NEUROSCIENCE TOOLS IN MARKETING SERVICE

Transformation of human brain through evolution has been dramatic. Center for more primitive needs that enable the survival is concentrated in the evolutionary older brain areas (nucleus accumbens, orbitofrontal cortex, anterior cingulate). It modulates all the functions that are necessary for survival - feeding behaviours, emotions, sexual behaviour, seeking reward etc. However, the part of the brain that is evolutionary the youngest - prefrontal cortex (PFC), is the biggest in humans among all other species. It constitutes almost one third of the anterior part of the brain and is involved in higher cortical functions - decision making, differentiation among the conflict thoughts and all other functions that we call „conscience“. All of the aforementioned areas of the brain are interconnected and involved in the reward processing.

With the development of neuromarketing and neuroimaging tools, interest increased in localizing the centres in our brain for reward and liking of a certain product. Although the circuitry in the brain is so complex, with the advanced knowledge of neuroscience, 3 Tesla MRI scanners and a team of people, it is feasible to see the reaction of brain centres on different stimuli. The most useful tool for this kind of research is functional magnetic resonance imaging (fMRI). Its use is quite new and only some centres in Europe can afford it. If we count that the price of MRI scanner is 1 million euros per Tesla, it is easy to calculate that 3 Tesla scanner that is needed for this kind of research costs 3 million of euros. In Croatia, there is only one, situated at the Polyclinic Neuron.

The main principle of fMRI is as follows: the local area of the brain that becomes activated from the steady state to the activated state has an increased blood supply because it needs more oxygen. That means that the ratio between oxyhemoglobin (molecule that transfers oxygen) and deoxyhemoglobin (molecule that transfers carbon dioxide) in that particular area changes. Simplified, we get the change in BOLD (blood- oxygen level dependence) signal (Camerer et al. 2005). This is a convenient method for detecting the parts of the brain that respond to certain stimuli and is more accurate than just mere marketing questionnaires used before. No one can trick their own brain! However, the results from testing have to be accurate in order to get what we want and one has to have a fairly deep knowledge of neuroanatomy in order to interpret them. Furthermore, fMRI has its own disadvantages and that is low temporal resolution (1-10 seconds) and spatial resolution is 1-10 mm (the higher the spatial resolution, the lower the temporal resolution).

The other less used but promising techniques in neuromarketing are electroencephalography (EEG), positron emission tomography (PET), magnetoencephalography (MEG) and transcranial magnetic stimulation (TMS). EEG measures changes in the electrical field by the electrodes applied to the

scalp and therefore has excellent temporal resolution (milliseconds), but has poor spatial resolution (approximately 1 cm) and has poor sensitivity for deep brain structures. PET uses a radioactive tracer and is based on the detection of radiation from the emission of positrons. The most commonly used radioactive tracer in this kind of research is FDG (fluorodeoxyglucose), which is a glucose analogue and is taken into the cells that need metabolic supply. MEG and TMS have not found the overall use, especially not in Croatia, but their use will be quite interesting in the near future.

3. REFINING MARKETING FINDINGS THROUGH NEUROSCIENCE

As it can be deduced from the previous chapters, Neuromarketing findings are arguably more of an exploratory nature. However the subfields' potential to contribute in solving methodological and substantive marketing questions and problems has been well documented in the literature.

On the methodological level, neuroscience tools can pinpoint on potential problems with respondents inaccurate (consciousness or unconscious) replies to survey testing. Self-reporting often suffers from respondents' inability to correctly interpret his/her emotional reactions to marketing stimuli. fMRI can help in analyzing intensity and location of the respondent's brain activity to indicate if the answer given to the survey question was a result of automatic or cognitive process.

Increased brain activity in neofrontal cortex points to increased cognitive activity, which is often interpret as uncertainty about an answer to a survey question. This can arise because of the subjects' reluctance to give an exact answer or because of an ambiguous form of the question. Both issues are ignored (at best indirectly addressed through test samples and expert analysis) in survey testing.

3.1 New insight from new research methods

McClure et al. (2004) researched preference of consumers for two popular soda drinks. While, on average, subjects showed no significant difference in brain activity during blind taste tests, fMRI showed significant change in patterns of brain activity during brand-cued test. When consumers were exposed to brand cue information (tin can packaging of a drink) they have showed not only strong stated preferences that influenced expressed behavioural preferences but also a change in pattern of brain activity. Exposure to stronger brand has shown increased activity in hippocampus and midbrain which was not observed for the weaker brand. These two sections of the brain have been strongly related to altering behaviour due to emotional and affective reactions. This research has shown strong evidence that there indeed exist a bias between emotional response of a consumer (as indicated by brain activity) and self-reported preference, and that the emotional response is the one driving behaviour of the consumer.

Further evidence was provided by Knutson et al. (2007). They have conducted a study observing consumer reactions to prices. They used fMRI to analyse brain activity when subjects were exposed to perceived high and low prices for a certain product. Different regions of the brain have shown activity depending on the price level and based on that activity researchers were able to predict purchase outcomes to (statistically significant) greater accuracy than using self-reported variables.

Plassmann et al. (2008) have come upon an interesting finding that challenges one of the basic assumptions in conceptualization of economic utility. They have proved, using brain scanning, that intrinsic properties of the product and consumer (such as thirst) are not the only ones that influence experienced pleasantness of the consumer. In their research they monitored the change in blood-oxygen-level dependent signal of the consumer during the tasting of the same wine at

two different prices (high vs. low). Interestingly, the BOLD signal has shown substantial activity in the medial orbitofrontal cortex which is an area of the brain related to encoding actual experienced pleasantness. In other words, neural activity has shown that higher price (often used as a marketing cue for better quality) does not only influence the perceived quality of the consumer, but also an experienced quality as indicated by the brain activity.

3.2 Impediments for future development

Major impediments are related to high cost of brain scanning equipment and its size which severely limits field application. Further technological advances such as mobile fMRI would constitute a huge step forward. Future researchers should have cross-field neuroscientific and marketing knowledge in order to better relate existing concepts in both fields. Once the knowledge base of Neuromarketing increases this will probably constitute a necessity for significant new contributions.

Other concerns relate to ethics of the brain scanning research. Some argue that the results could be used in influencing decision making process of consumer on an unconscious level hence unknowingly to consumer alter his choice. Such concerns remain only speculative so far, without empirical evidence.

4. CONCLUSION

The preceding discussion has shown a great potential that neuroscience and its research methods have for the field of marketing. Due to the fact that current research attempts have been mostly of exploratory nature their contributions have been mainly to the methodological domain of marketing. Tentative propositions and hypothesis have been derived from initial results that will need further field testing before significant contributions can be made to the substantive domain. Although current state of the subfield of Neuromarketing is far from generating new insights to substantiate emergence of novel theories of consumer behaviour it nevertheless shows great potential.

Further research should be conducted in field setting in order to prove external validity of results the like presented here. Further technological advancement in neuroscience that will decrease the size of cumbersome equipment and refine reading of the brain activity will be of immense aid in this direction.

5. REFERENCES

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