# The added value of neuromarketing tools in the area of marketing research

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## ABSTRACT

The knowledge about the brain and therefore the interest in the topic of neuromarketing has increased in recent years. Therefore the purpose of this paper is to examine the added value of neuromarketing tools in the area of marketing research. There is no literature which includes all the aspects of marketing research and the added value of neuromarketing tools to these aspects. In regard to the topic of neuromarketing this study will be done on the basis of a critical literature review.
The inability of people to describe their feelings as a method of self-assessment is one of the most important reasons why neuromarketing could be useful. Another reason mentioned is that the brains of people also contain hidden information about their true preferences. Such information can be used to influence their buying behaviour.
After a brief explanation of the neuromarketing techniques like the outside reflexes, input-/output models and the inside reflexes, this paper examines the added value of these neuromarketing tools in the area of marketing research. The results indicate a positive contribution of neuromarketing tools to the aspects of identifying the customers' needs and wants and to all four aspects of the integrated marketing program: product, price, distribution and promotion. Therefore it may be concluded that neuromarketing adds a lot of value to the marketing research area.

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## Keywords
Neuromarketing, marketing research, neuroscience, fMRI, eyetracking, brainstructure, neuroimaging


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# 1. INTRODUCTION

## 1.1 Relevance of the topic

In recent times, 'neuromarketing' has come to mean the application of neuroimaging techniques to market products and allow us to more fully understand human behaviour in an extremely important context. (Lee, Broderick, & Chamberlain, 2006) Understanding human behavior also requires knowledge of the brain functions. The brain can be divided in three parts: the new brain, the middle brain and the old brain. The body of research that demonstrates the prevalence of the old brain in the decision making process is overwhelming. But the problem is how to address the old brain? (Renvoise & Morin, 2007) The knowledge about the brain and therefore the interest in the topic neuromarketing has increased in recent years. There are two main reasons for this increase. First, the possibility that neuroimaging will become cheaper and faster than other marketing research methods; and second, the hope that neuroimaging will provide marketers with information that is not obtainable through conventional marketing research. (Ariely & Berns, 2010) There is a lot of evidence why the second reason is very important. Ninetyfive per cent of the decisions people make are made by the subconscious and only five per cent of the decisions are concious ones. (Arendonk, Polderman, & Smit, 2013) Traditional marketing tools are trying to understand the five per cent, but neuromarketing tools are trying to identify the other ninetyfive per cent. Because of this high percentage neuromarketing has attracted increasing attention, but critical aspects of it remain underexplored, including what exactly it is or includes, and how it is used in practice. (Fisher, Chin, & Klitzman, 2010). Furthermore several neuromarketing findings have been published, yet there is a lack of clarity concerning the use of neuromarketing tools in the area of marketing research.
Therefore this paper will be an overview of what neuromarketing exactly is, what the differences are between traditional marketing tools and neuromarketing tools and what the added value of neuromarketing tools are in the area of marketing research.

**Research problem:**
The main problem is many people, and thereby also companies, do not know consumers make the most decisions unaware. Furthermore, not everyone is familiar with the term neuromarketing and its advantages. Could neuromarketing tools be useful for companies in the marketing research area? Therefore the following research question evolved:

*What is the added value of neuromarketing tools in the area of marketing research?*

To support the main research question, there are sub-questions.

- *What is neuromarketing?*
- *What is the difference between neuromarketing tools and the traditional marketing tools?*
- *How can you use neuromarketing tools as a marketing tool?*

**Research goal of study:**
The first goal of the study is to familiarize the reader with the topic of neuromarketing. However, the most important goal of the study is to develop a table which gives insight in the added value of neuromarketing tools in the area of marketing research. The goal is to figure out if neuromarketing has the potential to become part of the marketing strategy and in particular part of the market research domain.

This paper is ordered in the following way. First of all, there is an introduction of the topic of neuromarketing. Afterwards the most important literature is summarized and explained, followed by a part about the brain to better understand the neuromarketing process. Thereafter follows an overview of the neuromarketing tools followed by an explanation of the marketing research area, and finally the added value of neuromarketing tools in this area is discussed.

**Relevance paper:**
This critical literature review has practical and academic relevance.

*Practical relevance:*
Acquaintance with the subject of neuromarketing and an overview of the neuromarketing tools is useful for companies. Furthermore, it is useful to know in which aspects of marketing research neuromarketing could help.

*Academic relevance:*
In this paper the main focus is to show the added value of neuromarketing tools in the area of marketing research. There is no literature which includes all the aspects of marketing research and the added value of neuromarketing tools to these aspects. Existing literature is combined to get an expanded overview of the topic. Therefore this paper will be a good representation of the most important literature in the field.

## 1.2 Background

The term neuromarketing cannot be attributed to a particular individual as it started appearing somewhat organically around 2002. (Morin, 2011) The last few years the number of publications concerning this topic has grown exponentially and the same holds for the number of neuromarketing companies founded. (Plassmann, Ramsøy, & Milosavljevic, 2012) On Google Scholar for example, there were 14 results on the term 'neuromarketing' in 2002. In 2014 if you search for 'neuromarketing' on Google Scholar it increased to 622 results. In 2004 the interest in neuromarketing increased fast after McClure, et al., (2004) did an experiment with a group of people who drank Pepsi and Coca Cola while their brains were scanned by a fMRI machine. Both Pepsi and Coca Cola are nearly identical in chemical composition, yet humans routinely display strong subjective preferences for one or the other. McClure et al. studied two tests, one test was blind and in the other test people did know what they were drinking. The results were different for both tests. Most of the participants liked Pepsi when they did the blind test, but when they knew what they were drinking most of them liked Coca Cola. The brand preference for Coca Cola was stronger. (Sharma, Koc, & Kishor, 2014) The interesting aspect that emerged was that brands can influence shopping behaviour. (Sebastian, 2013)

## 1.3 What is neuromarketing?

The combination of neuroscience and marketing implies the merging of two fields of study. (Morin, 2011) Neuromarketing techniques like eye tracking have existed for a long time, but the earliest reported use of the word neuromarketing with the use of fMRI techniques appears to be in a June 2002 press release by an Atlanta advertising firm, BrightHouse, announcing the creation of a business division using fMRI (functional magnetic resonance imaging) for marketing research. (Fisher et al., 2010) Afterwards more definitions of neuromarketing appeared. One definition of neuromarketing is to perpetrate marketing on the basis of neuroscience. (Arendonk

et al., 2013) It is a qualitative and quantitative market research method focused on being able to predict consumer behavior. The results give insight in the subconscious emotions and motivations of the consumer. “The goals of neuromarketing studies are to obtain objective information about the inner workings of the brains of consumers without resorting to the subjective reports that have long been the mainstay of marketing studies.” “Thus, neuromarketing purports to provide qualitatively different information, ostensibly superior to that obtained by traditional means, about the economically valuable topic of consumer preferences.” (Murphy, Illes, & Reiner, 2008)

## 1.4 Why neuromarketing?

For too long, both marketers and advertisers have relied on old ways to create and assess effective advertising campaigns and they have used outdated methods to do marketing research. Countless campaigns fail to attract consumer attention and successfully impact our memory banks. (Morin, 2011) Also, conventional methods for testing and predicting the effectiveness of those investments have generally failed because they depend on consumers’ willingness and competency to describe how they feel when they are exposed to an advertisement. (Marichamy & Sathiyavathi, 2014) Neuromarketing offers methods for directly probing minds without requiring demanding cognitive or conscious participation (Rantalainen, 2014) and it could be a solution for the waste of millions of dollars.

The majority of reviewed articles mentioned the advantages neuromarketing has in comparison with traditional marketing techniques. In many articles, the inability of people to describe their feelings as a method of self-assessment is one of the most important reasons why neuromarketing has an advantage in favour of traditional marketing tools. (Lee, Broderick, & Chamberlain, 2006) (Ariely & Berns, 2010) (Kenning & Linzmajer, 2010) (Pradeep, 2008) Another advantage mentioned was their brains also contain hidden information about their true preferences. Such information can be used to influence their buying behaviour. This would outweigh the costs for the use of the neuromarketing tools. (Ariely & Berns, 2010) (Hubert & Kenning, 2008) In section 4.4 the differences will be explained in detail.

# 2. METHODOLOGY

In regard to the topic of neuromarketing this study will be done on the basis of a critical literature review. In the last few years a lot of researchers In regard to the topic of neuromarketing this study will be done on the basis of a critical literature review have done research to neuroscience and neuromarketing. A critical literature review was chosen, because there is a lot of literature available but there is a gap in the literature when looking at neuromarketing whether it has the potential to become part of the market research domain. The effects of neuromarketing tools in the area of marketing research are not very clear and a model is missing in this field. Therefore this paper examines whether there is any added value of neuromarketing tools in the area of marketing research.
The data for the critical literature review is collected from books and search engines like ‘Jstor’ and ‘Google Scholar’. First of all non-academic books were read to better understand the topic of neuromarketing. Afterwards the most important literature was derived from scientific articles on Google Scholar. The most important search terms were ‘neuromarketing’, ‘neuroscience’, ‘marketing mix’, ‘fMRI’, ‘eye tracking’ (or other methods), ‘brain’. Other terms were ‘buying behavior’, ‘analyzing the brain’ and ‘neuromarketing tools’. The term neuromarketing for example gave almost 2500 results for English or Dutch papers. After reading the title and the abstract, the paper was classified as interesting or not. If it was an interesting paper, the introduction and conclusion were studied too. If it still was a relevant paper, the whole paper was read and summarized. Subsequently the literature was added to the table of contents and to the literature list. (see References)
The main information used was derived from scientific articles. The article ‘Consumer neuroscience: an overview of an emerging discipline with implications for consumer policy’ by Kenning was very interesting. The primary goal of this paper was to provide an overview of methods, findings, and implications of selected studies in consumer neuroscience. Furthermore the article by Fisher et al., (2010) and Morin, (2011) were useful because they reviewed the history of neuromarketing among other things.
Together with the articles of Morin, Ariely & Berns and Lee, Broderick and Chamberlain this is the most important literature which will be reviewed critically. Finally, the books by Dick Swaab and Pradeep about the brain were useful to better understand the techniques of neuroscience.

# 3. THE BRAIN

The knowledge about the brain is increasing and due to some leading scientists the secrets of the brain will become more and more revealed. (Arendonk, Polderman, & Smit, 2013)
In this section the aspects of the brain useful in neuromarketing will be explained. Without a small explanation it is hard to understand the process behind neuromarketing. The two most common approaches to divide the brain are mentioned here.
The first approach of the brain as can be seen in figure 1 (see Appendix) is divided into three parts: the new brain, the middle brain and the old brain As already mentioned before, the old brain is the most important part in taking decisions.
The new brain thinks. It processes rational data. The middle brain feels. It processes emotions and feelings. And finally the old brain decides. It takes into account the input from the other two brains, but the old brain is the actual trigger of the decision. (Renvoise & Morin, 2007)

In the second approach, the brain is also divided in three parts as can be seen in figure 2 (see Appendix).
The first part is the limbic system. The limbic system is a group of structures in the brain which are involved with motivations, emotions, enjoyment and the emotional memory. The limbic system is one of the oldest parts of our brain. (Arendonk, Polderman, & Smit, 2013) The limbic system is often referred to as the emotional brain. This system contains the thalamus, hypothalamus, amygdala, and hippocampus. (Serendip)
The second part of the brain is the neocortex. The neocortex is a six-layered structure found only in mammals. It is thought that the neocortex is a recently evolved structure, and is associated with "higher" information processing in more fully evolved animals (such as humans, primates, dolphins, etc). (Serendip)
The neocortex is part of the cortex cerebri and is involved in higher functions of the brain like sensory perception, conscious movements, reasoning, plan, decide and language. (Arendonk, Polderman, & Smit, 2013) The last part is the brainstem.
Underneath the limbic system is the brain stem. This structure is responsible for basic vital life functions such as breathing, heartbeat, and blood pressure. Scientists say that this is the simplest part of the human brain because the entire brains of evolutionarily older animals (for example, reptiles) resemble the human brainstem. (Serendip)

# 4. NEUROMARKETING TOOLS

In this section the neuromarketing tools will be discussed. The tools can be divided into three groups. The first one is that of the external reflexes (4.1), the second is the input-/output models (4.2) and the last one is the group of the internal reflexes. (4.3)

## 4.1 External Reflexes:

The tool of external reflexes consists of the identification of customer reaction patterns on marketing stimuli. External reflexes are studying the customer's body language, empathic design, facial coding and eye tracking.
External reflex methods have existed for a long time. These early applications don't look into the brain, but they register the external reflexes of people. The external reflexes find their origin in the brain. (Postma, 2013)

### *4.1.1 Body language*

Non-verbal behavior plays an important role in social life. In every form of human interaction a large portion of the signals people send or receive, either consciously or unconsciously, are non-verbal. (Korte, 1997)
These externally visible reflexes can hardly be suppressed and they reflect activities in the old neural system: emotions. In fact you get access to the brain, just like you make use of a fMRI-scan. People often communicate more through their body language than by words. Body language also works on the phone. Although you don't have visual contact during a call, body language is still very important. Your voice reflects your body language. In a call center for example, people who have a smile on their face have a smile in their voice. Consumers can hear this. Body language is applicable in all marketing processes where personal contact is necessary. However, there are two limitations. In the first place you need to take into account that it may be possible that you will not like the other person you see at first glance. This body language expression is not correctable by yourself nor the other person. The first impression is not always reliable and difficult to manage. The second limitation of body language is the fact that you do not always have personal contact. Many contacts are made by mail, blogs, twitter etc. Without personal contact an important element in communication is missing. Everyone can use body language, with some limitations, if there is personal communication. (Postma, 2013)

### *4.1.2 Empathic design*

Another special method to study people without equipment is empathic design. People are being observed in their own environment to see how they use a product. This is almost the same method as body language; the only difference is people know you are studying them. There is one condition; the product or service must be available and people should work with the product in their normal circumstances. (Leonard & Rayport, 1997)

### *4.1.3 Facial coding*

A specific form of body language is facial coding, where facial expressions are systematized and linked to emotions. 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. For the purpose of facial coding, subjects need to be confronted with the appropriate stimulus, while their facial expressions are being interpreted. This is a disadvantage in comparison with body language, because with body language the person does not know he is being observed. (Postma, 2013)

### *4.1.4 Eye tracking*

The last form of external reflexes is eye tracking. It is not a new method, but it is now widely used, partly because it has become simpler to implement and cheaper than in the past. The benefits are clear: eye movements indicate the focus of visual attention with more detail and accuracy than self-reported answers. However, the method doesn't reveal why a particular area of an ad catches the eye, or how people respond to it, which is why it can be difficult to interpret in isolation. (Du Plessis, 2011) If a person's eye is fixed at a certain point for a long time, there could be two reasons for this. First of all, the point is not understandable and not clear. And second the point is attracting the person and he or she wants to look at it a bit longer. (Postma, 2013)

## 4.2 Input-/output Models:

The application of such models allows the measuring of effects of various stimuli on peoples' behaviour. This approach can be applied today due to the enormous volume of information people publish and distribute on the online public domain about their behaviour. When applying this model you do not get access to the brain by analysing internal or external reflexes, but by systematically establishing the result of a stimulus. (Postma, 2013)

## 4.3 Internal Reflexes:

The third approach mentioned by Postma is the internal reflexes. By using this approach you are looking inside the brain. The most common definition is: 'Identification of customer reaction patterns on marketing stimuli by using advanced technologies like Electroencephalography(EEG), Functional Magnetic Resonance Imaging(fMRI), (Postma, 2013) Magnetoencephalography (MEG) and Transactional Magnetic Simulation(TMS). (Ariely & Berns, 2010) (Du Plessis, 2011) In this section there will be an overview of the internal reflexes.

### *4.3.1 Electroencephalography (EEG)*

The electroencephalography is a non-invasive instrument, which uses sensors which are capable of capturing the electrical signals produced by the brainwaves' activity. The electroencephalography's sensors are capable of recording very low frequency signals of brain activity. The more sensors there are, the better the monitorization of the whole brain activity. (Sebastian, 2013)This technique is not really new in the world, however 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) Hans Berger made the first practical application of the EEG in the 1920s. He understood from the start that his invention could and should be used to measure the brain's full range of activity, not just an extremely small portion of it. "Many areas of the brain are responsible for several functions, and because of this, the EEG technique has full-brain coverage to know exactly which regions are operating simultaneously and in concert in response to a specific stimulus." (Pradeep, 2008) EEG has advantages and disadvantages. The strength is that EEG is very precise in regard to timing since its temporal resolution is in milliseconds. (Ariely & Berns, 2010) Every small or short activity will be noticed. The weakness of this technique concerns the measurement of deeper brain structures. It can only record more superficial electric signals. (Fortunato, Giraldi, & Olivieira, 2014) In practice this technique is quite simple. A researcher puts on the electrodes attached to a helmet on a person's head,

and then present the products from which the attractiveness in form of brain activity can ultimately be measured. (Morin, 2011) (Postma, 2013) To be more effective Postma came up with the solution to combine the EEG method with the eye tracking method. You can see exactly where the person is looking and see which stimulus is responsible for the reaction in the brain.

### *4.3.2 Functional Magnetic Resonance Imaging (fMRI)*

The MRI-scanner is been productive in the medical sector for years now and in the fMRI format it is a useful form of neurological research. With a fMRI technique a subject is scanned by lying down in a long, narrow, tube, surrounded by extremely powerful magnets. Activation of these magnets produces electrical fields, which computer imaging converts to reveal inner body structures, or in fMRI applications, brain functionality. To keep it short fMRI measures the increase in oxygen levels in the flow of blood within the brain. When neurological activity increases, the brain calls for added oxygen-bearing blood to fuel that activity—and fMRI scans record these increases. (Pradeep, 2008) According to No Lie MRI, current accuracy of fMRI tests is over 90%, but it is estimated to be 99% once product development is complete. (Blakemore, 2010) "Of the approximately ninety firms worldwide claiming to work with methods from neuroscience, most only apply neuroscientific insights from publications. Only about ten per cent apply fMRI, which is the cornerstone of primary research in consumer neuroscience." (Kenning & Linzmajer, 2010)

### *4.3.3 Magnetoencephalography (MEG)*

Magnetoencephalography(MEG) is the recording of magnetic fields generated by the brain. (Sato et al., 1985) Whilst EEG measures the electric fields that are produced in the brain, MEG measures the magnetic fields that result from these electric fields. MEG yields about the same temporal resolution as EEG(time in milliseconds) and a much better spatial resolution (a couple of millimetres) at parts of the cortical surface. MEG does not, in itself, produce an image of the brain. However, MRI produces such an image, and the activity can then be superimposed on this picture. (Du Plessis, 2011) In contrast to the EEG, MEG is able to predict activity in deeper brain structures. (Kenning & Linzmajer, 2010)

### *4.3.4 Transcranial Magnetic Simulation (TMS)*

According to Kenning: 'Transcranial magnetic stimulation is a method that stimulates the brain by sending electromagnetic impulses through the skull. This requires placing an electromagnetic coil directly over a specified location of the head and introducing a transient high intensity current.'
By applying brief magnetic impulses over the scalp we can now excite or inhibit activity of small areas of the brain briefly. (Du Plessis, 2011) Researchers think this will lead to some very important experiments by brain scientist but it is unlikely to be used by marketers. (Du Plessis, 2011) (Kenning & Linzmajer, 2010)

## 4.4 Differences between traditional marketing research tools and neuromarketing tools

In today's business environment it is hard to acquire a competitive advantage with the use of traditional marketing research tools. Some examples of traditional marketing research tools are observations, surveys and experiments.

Traditional marketing tools have proven to be limited when testing human subjects and have frequently been criticized for their inability to assess consumers' motivations. (Hammou, Galib, & Melloul, 2013) Neuromarketing gives immediate and accurate feedback on consumer's preferences and behavior compared to traditional marketing strategies. It is no longer viable for large organizations to keep on glued to traditional marketing tools. (Sharma et al., 2014)
According to Hunt one of the reasons BMW's Mini Cooper had been selling so well was that, at least subconsciously, it had an "adorable face." Furthermore, when drivers were shown pictures of high-performance cars, particularly the Ferrari 360 Modena and the BMW Z8, the areas of the brain associated with concepts of wealth and social dominance were excited. No focus group or survey could ever pick up such a pure and unguarded emotional response. (Hunt, 2008) On the other hand, it is a misconception that marketers will be able to just measure people's responses to brands via electrodes, and work out what they really want. There is still no substitute for talking to people, as this is the only way we can understand the whole meaning of their relationships with brands and products. The point of market research is to generate insights that lead to more desirable brands, rather than to use the latest methods for the sake of it. For this reason it does not seem possible neuroscience methods can ever replace the need for conversation with consumers. However it could be a powerful complement to it. (Du Plessis, 2011)

# 5. MARKETING RESEARCH

Marketing research is the process that links the consumers, customers, and end users to the marketer through information. In figure 3 (see Appendix) there is an overview of an expanded model of the marketing process. First of all the expanded model of the marketing process will be explained shortly and in the next chapter the added value of neuromarketing tools in this marketing process will be discussed.
The first four steps of the marketing process focus on creating value for customers. The first step is to gain a full understanding of the marketplace by researching the customer's needs and wants. The second step is to design a customer-driven marketing strategy to select which customers to serve. Afterwards the next step is to construct an integrated marketing program that delivers superior value. This part has four subparts. The company develops product offers and creates strong brand identities for them. It prices these offers to create real customer value and distributes the offers to make them available to target consumers. Finally they communicate the value proposition, named promotion. The last step is to build profitable relationships and create customer delight. (Kotler, 2012)

# NEUROMARKETING TOOLS IN MARKETING RESEARCH

## Customer's needs and wants

The first step is to gain a full understanding of the marketplace and researching the consumer's needs and wants.
Neuromarketing tools are able to get a lot of data about the marketplace and the consumers' needs and wants. One of the reasons why marketers are excited about neuromarketing techniques is that it will provide a marketing research method that can be implanted even before a product exists. (Ariely & Berns, 2010) One of the assumptions is that neuroimaging data would give a more accurate indication of the preferences of consumers. If this is the case, they could test new products if

they are interesting for people. Those who are attractive are going to be produced and could be profitable. Those who are unattractive will not be sold. (Ariely & Berns, 2010)

## Customer-driven marketing strategy

After understanding your consumers' needs and wants the marketing management can design a customer-driven marketing strategy. "The marketing manager's aim is to find, attract, keep, and grow target customers by creating, delivering and communicating superior customer value." Target groups, value propositions and the serving of customers are important aspects of the customer-driven marketing strategy. (Kotler, 2012) The added value of neuromarketing tools is in the value proposition part. There is a lot of literature about branding, but not explicitly on the value proposition part. Therefore due to a lack of literature the argumentation is based on logical reasoning. The study to the best value proposition is possible with subject lying in a fMRI scanner. Show them value proposition and observe which gives the most positive activation in the brain. Different options are possible like small sentences, long sentences, make use of names or numbers for example. However due to a lack of research results, the added value of neuromarketing tools in this part is not yet realized.

## Integrated marketing program

### *Product*

"Product means the goods-and-services combination the company offers to the target market." (Kotler, 2012) Problems for researchers in the field of the product are the inability of people to describe their feelings as a method of self-assessment, and do not obtain the requested information why they prefer a product. (Lee, Broderick, & Chamberlain, 2006) (Ariely & Berns, 2010) (Kenning & Linzmajer, 2010) (Pradeep, 2008) Another problem is their brains also contain hidden information about their true preferences. Such information can be used to influence their buying behaviour. (Ariely & Berns, 2010) (Hubert & Kenning, 2008) This seems as justifiable reasons why neuromarketing tools could be useful in the product aspect. Aspects of the product are quality, design and brand name for example. (Kotler, 2012) Product design is one of the most important aspects of a product. It is an unquestioned aspect of its marketplace success. Several studies indicate the influence of good product design on commercial success. (Black & Baker, 1987) (Gemser & Leenders, 2001) "A good design attracts consumers to a product, communicates to them, and adds value to the product by increasing the quality of the usage experiences associated with it." (Bloch, 1995) One of the first studies by Erk et al. (2002) provided insights into how the brain responds to differently designed goods (in this study different kind of cars). The fMRI results of their investigations showed that reward related brain areas are activated by objects that have gained a reputation as status symbols through cultural conditioning; this is the unconscious process by which we are socialized to adopt the ways of thinking or behaving. In relation to the perceived attractiveness of the products, pictures of the cars in their study led to activation of different regions which are associated with motivation, the encoding of rewarding stimuli, the prediction of rewards, and decision-making. (Erk et al., 2002) Another study found out with the use of a fMRI scanner that "aesthetic packages are chosen over products with well-known brands in standardized packages, despite higher prices; and that they result in increased activation in the nucleus accumbens and the prefrontal cortex (activated by the processing of gains and losses)"(Reimann et al., 2010) The prefrontal cortex and the nucleus accumbens can be seen in figure 4 (see Appendix). These studies are feasible only with the use of neuromarketing tools like a fMRI scanner, therefore this is evidence which shows the positive value of neuromarketing tools on the design part of a product. Another aspect of the product part is the brand. "Brands represent consumers' perceptions and feelings about a product and its performance; everything that the product or the service means to consumers. In the final analysis, brands exist in the heads of consumers." (Kotler, 2012) One of the first experiments about branding was the experiment of McClure et al. (2004). While subjects were lying in a fMRI scanner, they were drinking 'Coca Cola' and 'Pepsi'. In the first test they knew what they were drinking, but afterwards they did the same test blind. If there wasn't any brand preference, both tests had to be equal. However the test results were different. Most of the subjects liked 'Pepsi' when they did not know what they were drinking, but when they knew what they were drinking most of them liked 'Coca Cola' (McClure, et al., 2004) The brand preference for 'Coca Cola' was stronger for the subjects. Another experiment by Deppe et al. (2005) determined which neural processes in the brain were involved during the processing of brand information. They analysed subject with a fMRI scanner when they had to make fictitious buying decisions. They had to choose between two similar products with only a different brand. The results showed a significant difference in brain activity when a brand was designated as the subjects preferred brand. (Deppe, Schwindt, Kugel, Plaßmann, & Kenning, 2005)This is a lot of evidence to conclude that brands are very important in the buying decisions of consumers. Because of the lack of consumers to describe their feelings, neuromarketing tools could add positive value to the branding part. In creating a new brand, neuromarketing tools could also be useful. Show pictures of your brand with different size, color, text and images to subjects while they lie in a fMRI scanner. Results show the greatest brand preference.

### *Price*

"Price is the amount of money customers must pay to obtain the product." In former times price was one of the most important factors in buying behaviour. Nowadays nonprice factors are more important. However price is still an important aspect in buying behaviour. (Kotler, 2012) A lot of research to pricing strategies is done. A nine year old study has explored that consumers pay less attention to later numbers than to the first digits. The study showed that a difference of 0.2 percent in price, $4.99 and $5 for example, leads to a 4.5 percent increase in quantity. (Bizer & Schindler, 2005) For researchers, however, problems arise with asking consumers about pricing issues. (Kenning & Linzmajer, 2010) Therefore it seems that "pricing lend itself almost perfectly to neuroimaging research. For example, simultaneously exploring the temporal and spatial nature of brain activity may help us understand exactly why prices such as '$4.99' are perceived as significantly cheaper than those such as '$5.00'." (Lee et al., 2006) The purchase decision of a product involves a trade-off between the potential pleasure of the purchase and the pain of paying. (Knutson et al., 2005) Furthermore Knutson et al., (2005) did a study to the neural correlates of the negative price effect. Subjects were lying in an fMRI scanner and were first shown the image of a product, and subsequently the same image with the price information. Afterwards they had to decide whether or not to buy the product. The study showed three results. "The activation of the nucleus accumbens (activated by the anticipation of gains) correlates with product preferences. The activation of the insula (activated by the anticipation of losses) corresponds to excessive prices. Finally the activation of the medial prefrontal cortex (activated by the processing of gains and losses) correlates with reduced prices." (Kenning &

Linzmajer, 2010) Another aspect of pricing is the increase or decrease of a price. On the one hand an increased price can evoke a negative influence to buy the product because it creates a perception of loss. On the other hand, a higher price can be seen as an increase in quality which leads to a higher product value. This higher product value leads to a positive influence to buy the product. (Völckner & Hofmann, 2007) (Kenning & Linzmajer, 2010) Another study tested subjects while lying in an fMRI scanner while they tasted wine. They believed they were drinking two types of wine, sold at different prices. The results show that increasing the price of wine increases the blood-oxygen level in the brain. (Plassmann, O'Doherty, Shiv, & Rangel, 2008) Furthermore it is proven that consumers are relatively often not in the position to retrieve prices of certain products (Kenning & Linzmajer, 2010) and not knowing how much they would be willing to pay for a product. (Evanschitzky, Kenning, Vogel, & Ahlert, 2007) Neuromarketing tools, like fMRI, can solve this problem by testing a subject while lying in a fMRI scanner, just like the studies mentioned above, and confront the subjects with products with different prices. From which price will subjects not be willing to buy the product anymore? By analysing the brain activity there is an activation of the accumbens(activation of gains) or from the insula(activation of pain).

### *Distribution*

"Distribution includes company activities that make the product available to target consumers." (Kotler, 2012) A company's distribution decisions directly affect every other marketing decision. Whether a company develops new products depends on the possibility of the channel members to sell these products. Pricing depends on it if the company works with high-quality stores or if they sell directly to consumers via the Web. "The firm's sales force and communications decisions depend on how much persuasion, training, motivation, and support its channel partners need." (Kotler, 2012) Therefore the distribution part is also very important. The optimal distribution of products can have influence on the buying decisions of consumers. (Ailawadi & Keller, 2004) Neuromarketing tools could help with two aspects of the distribution process. First of all the loyalty towards retail brands will be examined. A study by Plassmann, Kenning, & Ahlert (2007) viewed subjects lying in a fMRI scanner while they were choosing between retail brands for the purchase of an identical garment with the brand they preferred. The results showed the favourite retail brand of the subjects. Next the subjects were split into two groups, loyal and disloyal customers. The results showed that "loyal customers integrate emotions into the decision making process in a more intense way and that the favourite retail brand can act as relevant rewarding stimulus." With disloyal subjects the same activation in these regions was not measurable. (Plassmann et al., 2007) The conclusion derived from this result is that "the use of emotional reinforces in the distribution part can constitute the base for sustainable, long-term customer retention." (Kenning & Linzmajer, 2010) The customer's positive experiences are combined with the retail brand, afterwards stored in the memory and then recalled for future buying decisions. (Hubert & Kenning, 2008) Another aspect of distribution is the place where to sell the products. Products can be placed in locations that attract more attention and thus will be more likely to be chosen by a buyer. (Pieters & Warlop, 1999) To know which place attracts the most attention, the eye tracking technique could be useful. Subjects need to do some shopping with an eye tracking glass on their heads. The data will show the place where they paid the most attention to. Earlier research showed that customers pay more attention to products on the top shelves in stores. (Chandon, Hutchinson, Bradlow, & Young, 2009)

### *Promotion*

"Promotion means activities that communicate the merits of the product and persuade, for example by advertising or public relations" "Advertising involves communicating the company's or brand's value proposition by using paid media to inform, persuade, and remind consumers." (Kotler, 2012) "Advertising works in two ways: it may trigger some immediate response and/or change the respondent's brand memories in some way that influences later behaviour." (Plassmann, Ambler, Braeutigam, & Kenning, 2007) It is assumed that neuroscience can help with questions when an advertisement triggers people or when an advertisement is attractive for example. The attractiveness is dependent on the activation of the rewarding system in the brain. (Hubert & Kenning, 2008) A study by Kenning et al. (2009) examined the neural correlates of advertisements. Subject were lying in a fMRI scanner while they were asked to give grades to different advertisement about their attractiveness. Results showed that advertisements who were very attractive or unattractive were better memorised than neutral advertisements. Other results showed that advertisements who were graded as attractive led to higher activation in brain areas. (Kenning et al., 2009) "These activation in brain areas are associated with the integration of emotions in the decision-making process and the perception of rewards." (Kenning & Linzmajer, 2010) This is evidence which shows that with the use of neuromarketing techniques it is possible to uncover if an advertisement is attractive or unattractive. Another study showed that the presence of famous people in advertisements activates a brain area which is involed in the process of recognition and trust. This indicates that famous people influence consumers' buying decisions. (Hubert & Kenning, 2008) Furthermore according to Fugate (2007), "neuromarketing helps companies identify elements that are neurologically engaging in a television advertisement. Companies assess images, sound effects and music to develop advertising campaign that are more appealing to consumers." (Fugate, 2007) With this knowledge and the use of neuromarketing techniques it is possible to receive information if your advertisement is attractive or not. Although it does not say if the consumer actually buys the product. The best way of dealing with it is to make your advertisement as attractive as possible.

## Profitable relationships

### *Relationship with customers and marketing partners*

Due to a lack of literature in this part argumentation is based on logical reasoning. To create a good relationship with your marketing partners for example you want to know what they want and how they feel. External reflexes like body language could help in this part. Expressions of your marketing partners can be analysed by this neuromarketing technique. However body language is not as accurate as the internal reflexes like fMRI or EEG. Therefore the usefulness of neuromarketing techniques on this part is limited to the minimum.

# 6. CONCLUSION/DISCUSSION

First of all, the present paper provides an introduction of what neuromarketing exactly is. Afterwards the parts of the brain are explained and the different neuromarketing techniques are shown. Thereafter the added value of neuromarketing in the area of marketing research is examined. The most important

conclusions will be discussed here. The first aspect of the marketing research process was to gain a full understanding of the marketplace and researching the consumer's needs and wants. The conclusion was that neuroimaging data would give a more accurate indication of the preferences of consumers. (Ariely & Berns, 2010) This shows the positive contribution of neuromarketing to the process of gaining a full understanding of the consumer's needs and wants. The second point was to create a customer-driven marketing strategy. Due to the lack of literature it is not possible to conclude that neuromarketing adds value to the customer-driven marketing strategy part. The next part was the integrated marketing program with the aspects product, price, distribution and promotion. Neuromarketing contributes positively to all these aspects. In the product part the inability of people to describe their feelings as a method of self-assessment is a reason why neuromarketing adds value to this part. (Lee, Broderick, & Chamberlain, 2006) The neuromarketing tools to use in this part are internal reflexes like fMRI or EEG. In the price part neuromarketing tools, like fMRI, can solve the problem of which price to ask for which product. You need to confront the subjects with products with different prices. From which price will subjects not be willing to buy the product anymore? By analysing the brain activity there is an activation of the accumbens (activation of gains) or from the insula (activation of pain). In the distribution part neuromarketing techniques like eye tracking add value to know the best place to sell your products. Subjects need to do some shopping with an eye tracking glass on their heads. The data will show the place where they paid the most attention to. Earlier research showed that customers pay more attention to products on the top shelves in stores. (Chandon, Hutchinson, Bradlow, & Young, 2009) In the promotion part it is assumed that neuroscience can help with questions as to when an advertisement triggers people or when an advertisement is attractive for example. The attractiveness is dependent on the activation of the rewarding system in the brain. (Hubert & Kenning, 2008) Finally, the relationship with customers and marketing partners. Due to a lack of literature it is not possible to conclude that neuromarketing adds value to this part. The thesis started with the following research question: *What is the added value of neuromarketing tools in the area of marketing research?* In table 1 (see Appendix) a summary can be found of the added value of neuromarketing tools in the area of marketing research. The conclusion is that neuromarketing has a great contribution in the area of marketing research and that it adds value to many aspects. However neuromarketing tools like fMRI scanners are very expensive and for small companies the advantages do not outweigh the costs.

# 7. LIMITATIONS/FUTURE RESEARCH

Dick Swaab (2010) in his book 'Wij zijn ons brein. Van baarmoeder tot Alzheimer' claims it is possible for people to train their brain to function differently. With use of a fMRI-scanner they teach patients to get control of their front part of the brain. Patients with chronic pain in a hospital for example could decrease their pain perception. If it is possible for people in a hospital to train their brains, it could also be possible for participants whose brain activity is being monitored. This is a limitation for the use of neuromarketing tools and it will require further research to show if this is really possible. Another limitation is that companies cannot decide only on the results of neuroimaging data. They have to keep in mind aspects like culture and climate for example. If it is attractive to sell winter clothes in the Scandinavian Islands, it may not be profitable in a country like Kenia, for example. Culture is another aspect. In the United States for example the sale of pigs could be very lucrative, but in Muslim countries people do not eat pigs and there it is not a lucrative business.

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# 9. APPENDIX

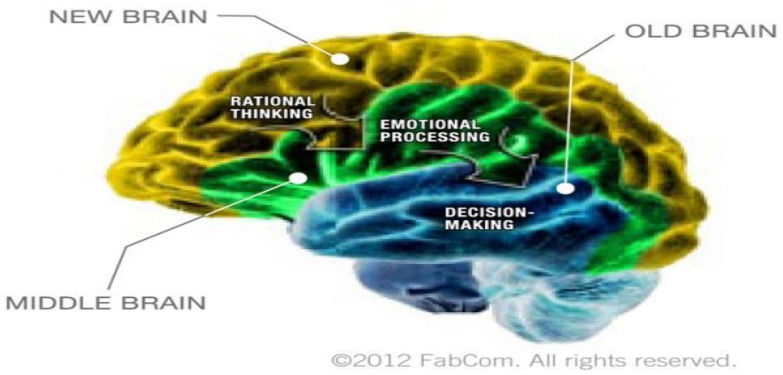


**Figure 1**

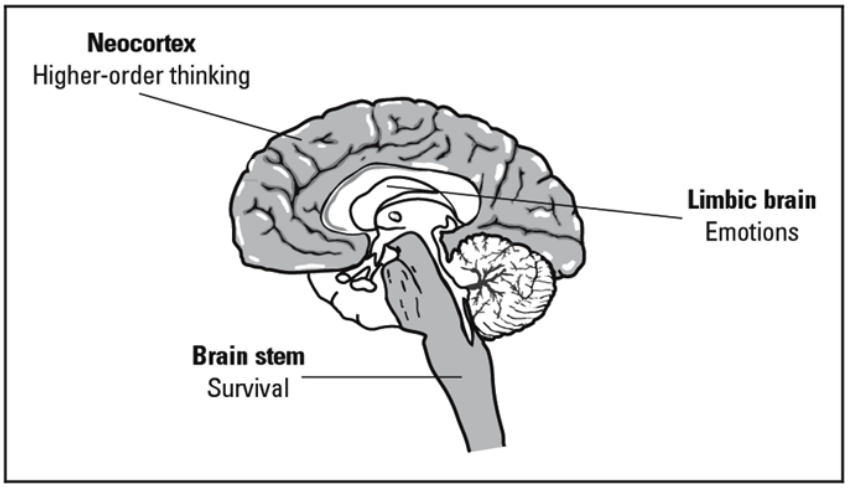


**Figure 2**

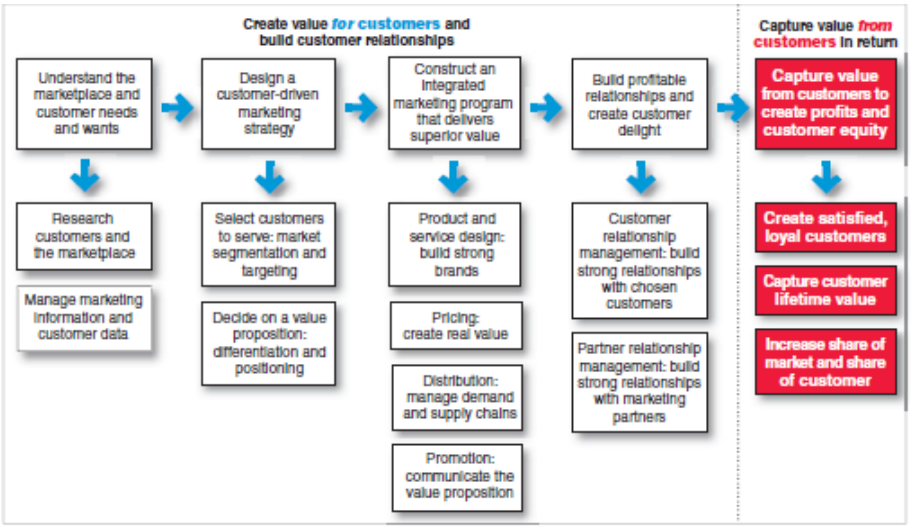


**Figure 3**

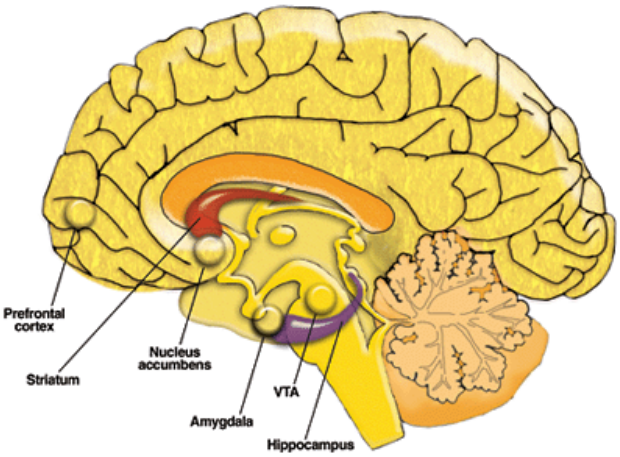


**Figure 4**

| Marketing research | Added value neuromarketing | Useful techniques |
|---|---|---|
| | | |
| Customer needs and wants | Yes | Internal reflexes |
| Customer-driven marketing strategy | No | External but no literature |
| Integrated marketing program: | | |
| Product | Yes | Internal reflexes |
| Price | Yes | Internal reflexes |
| Distribution | Yes | Internal and external reflexes |
| Promotion | Yes | Internal and external reflexes |
| Profitable relationships | No | External but no literature |

**Table 1**