

THE IMPORTANCE OF EMOTIONS IN CONSUMER PURCHASE DECISIONS — A NEUROMARKETING APPROACH

ZNACZENIE EMOCJI W DECYZJACH ZAKUPOWYCH KONSUMENTÓW —
PODEJŚCIE NEUROMARKETINGU

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DOI: 10.2478/minib-2022-0010

ABSTRACT

Traditional methods used in marketing research focus on the rationality of individuals and the conscious processes they are able to analyse and verbally expose. Developments in the field of neuroscience have proven that emotions are the fundamental basis from which the thoughts, behaviours and actions of individuals emerge. Thus, this paper explains the importance of the emotional dimension both in consumer decision-making and in measuring the impact of marketing activities. The purpose of the article is to indicate the current position of the use of neuromarketing and its tools in the analysis of consumer behaviour and show how an important role is played by emotions and the unconscious part of consumers' minds during purchasing decisions. It is a review article, based on interdisciplinary knowledge, which brings to the fore new possibilities of studying not only the observed behaviour of consumers but also their minds — including decision-making processes, as well as the role of emotions and perceptions triggered by brands, products, messages and advertisements. New knowledge from the area of neuromarketing is not a categorical alternative to traditional marketing, but effectively complements it. Companies can adopt new research methods and invest in strategies that allow them to engage consumers emotionally in order to better connect with them and uncover hidden needs and desires.

Key words: marketing, neuromarketing, purchasing behaviour, consumer emotions, marketing research

ABSTRAKT

Tradycyjne metody stosowane w badaniach marketingowych, skupiają się na racjonalności jednostek i na świadomych procesach, które są w stanie analizować i werbalnie eksponować. Rozwój w dziedzinie wiedzy określanej jako neuronauka dowiódł, że emocje stanowią fundamentalną podstawę, z której wyłaniają się myśli, zachowania i działania jednostek. W artykule dokonano analizy znaczenia wymiaru emocjonalnego zarówno w procesie podejmowania decyzji przez konsumentów, jak i przy pomiarze wpływu działań marketingowych. Celem artykułu jest wskazanie obecnej pozycji stosowania neuromarketingu i jego narzędzi w badaniu zachowań konsumenckich i ukazanie, jak ważną rolę odgrywają emocje oraz nieświadoma część umysłu konsumentów podczas decyzji zakupowych. Artykuł ma charakter przeglądowy, bazuje na interdyscyplinarnym dorobku literatury, który ukazuje możliwości badania nie tylko obserwowanych zachowań konsumentów, lecz także ich umysłu — procesów decyzyjnych, roli emocji i percepcji wywołanych poprzez marki, produkty, komunikaty oraz reklamy. Wiedza z obszaru neuromarketingu nie stanowi kategoriycznej alternatywy dla tradycyjnego marketingu, lecz skutecznie go uzupełnia. Firmy mogą adoptować nowe metody badawcze neuromarketingu i inwestować w strategię, które pozwalają na zaangażowanie emocjonalne konsumenta, tak aby móc lepiej nawiązać z nimi kontakt oraz odkryć ukryte potrzeby i pragnienia.

Słowa kluczowe: marketing, neuromarketing, zachowania konsumentów, emocje konsumentów, badania marketingowe

JEL: M31; M37; L81

Introduction

At the beginning of the 20th century, numerous studies were carried out showing that emotions are an inseparable element of contemporary marketing, and validation of the results of these studies led to the emergence of a new stream of knowledge — neuromarketing, which is the result of an interdisciplinary approach to marketing. It uses knowledge of medicine, physics, biology and chemistry to understand consumer purchase behaviour. However, the decisive influence on the development of neuromarketing came from the discoveries of neuroscience — a scientific discipline that emerged at the end of the 20th century, which deals with the study of the nervous system, revealing new discoveries about the structure of the brain and the functions performed by its various centres (Mruk, 2008; Gregor & Wdowiak, 2016).

Currently, support for creative marketing activities of enterprises emerges from the analysis of consumer behaviour using neuromarketing techniques, because as Fabris puts it, 'the consumer changes his views, seeking experiences more than products and sensations and emotions rather than utilitarian values' (Fabris, 2003). These words indicate the nature of the changes in consumer buying decisions that present marketing is following. It is necessary to study not only consumer behaviour but also consumer minds — including their decision-making processes, as well as the role of emotions and perceptions triggered by brands, products, messages and advertising. Companies can therefore find new impulses, taking into account the fact that, in addition to systematic thinking, the consumer makes purchase decisions based on the emotions felt at the time of the decision. Therefore, an in-depth analysis of the surrounding reality is necessary, focussing on the hidden desires and emotions of consumers in order to predict their behaviour, and thus empower the business enterprise to adopt actions that are no longer only about the consumer as a business object that generates revenue for the company, but also about him as a human being, and his satisfaction and contentment (Gaczek, 2016).

The COVID-19 pandemic rapidly changed consumer behaviour and marketing agencies were forced to be more creative and engaging. Individual customers have increased their online shopping and, consequently, the emotions that accompany such purchases have also changed, as well as the moment and the level of perceived gratification and satisfaction with the purchase. This has inspired marketing researchers to use emotional memory, which is a combination of event memory and emotion, to build brand awareness and maintain a good and lasting relationship with customers (Pispers, Rode, & Fischer, 2021; Ziober, 2021).

Owing to the development of technology and the incorporation of techniques from medical science and psychology into the repertoire of marketing research, it is now possible to, so to speak, reach into the brains of consumers and thereby incorporate the complexity of the human mind into research. This gives a more realistic representation of the process that actually occurs within the consumer's mind when making purchase decisions. This is what neuromarketing deals with, and its development is

fostered by increased competition in the market for consumer goods and services, as well as the increasing reluctance of consumers to participate in classic research such as surveys and interviews (Disterheft, 2018).

Factors for the Development of Neuromarketing

Professor Ale Smidts — winner of the Nobel Prize in Economics — is considered to be the father of neuromarketing. In 2002, Smidts coined the term neuromarketing, defining it as 'a set of techniques for identifying brain mechanisms to better understand consumer behaviour for developing more effective marketing strategies' (Diotto, 2020). Neuromarketing gained popularity in 2003 owing to the efforts of Read Montague, who conducted a series of experiments comparing consumer responses to two large well-known brands, such as Coca-Cola and Pepsi, using neuroscience technologies to study brain activity in order to compare consumer preferences and the responses they had previously given regarding these brands (McClure, Li, Tomilin, Montague, & Cypert, 2004). Since then, there has been an increase in the use of biometric and neuroscience techniques for marketing purposes, fuelled by companies' and brands' interest in the potential of these methodologies. Over time, the variety of methods used by companies and brands also started to develop. Due to the growing interest in this new field of research, books and articles have been published on marketing, biometrics and neuroscience (Lankjaer-Bain, 2011; Dooley, 2022).

As a result, four key factors can be identified that have contributed to the rapid growth in the use of biometric and neurological methodologies by companies:

- advances in neuroscience development and technological advances in the construction of neuroscience methodologies and tools;
- marketing's growing interest in unconscious consumers and in measuring their emotional responses to marketing messages;
- increasing market competitiveness, which requires companies to develop effective communication (including advertising) to attract as many customers as possible and generate profits;

- increasing numbers of customers as a result of using neuroscientific methods in marketing.

It should be noted here that with the rise in popularity of neuromarketing, there are potential dangers associated with unauthorised and non-ethical use of neuromarketing techniques, which will also be discussed in the paper.

The Potential of Neuromarketing Knowledge

The concept of neuromarketing, in its strict sense, refers to the use of brain imaging techniques to identify areas of the brain associated with psychological phenomena such as cognitive activities, thoughts, emotions, sensations and perceptions, considered in their biological dimension, i.e. purely chemical and neuronal (Neff, 2011). However, a definition describing neuromarketing as a discipline that uses only brain activity detection techniques is reductive. Neuromarketing practices involve measuring biometric variables that detect changes in physiological parameters such as respiratory rhythm, skin conductance, pupil dilation, heartbeat, sweating, eye fixation point displacement and facial expression. Owing to technological progress, it is possible to monitor and study these parameters in real time. The measurement of biometric parameters takes place when a subject performs a task (cognitive or emotional) or is receiving stimuli such as watching an advertisement. These findings are indirect (passive) because they do not involve a verbal response from the subject. Consequently, they are objective measurements that produce new and higher quality information because they are not subject to the filtering of the individual's reason.

In neuromarketing methodology, three basic parameters are studied: (1) concentration, i.e. the extent to which the subject's brain is engaged in performing a task or viewing a stimulus; (2) in measuring the impact of advertising, since it is important to understand whether the part of the brain that is associated with the ability to remember has been activated while viewing the content; and (3) detecting the emotional engagement that an advertisement or experimental task arouses in the individual.

Neuroscience applied to marketing can, among other things, help identify key aspects of a product's appeal and its compatibility with customer needs. Neuromarketing research on a product can be carried out as early as in the project planning phase and then in the subsequent phase of product launch, e.g. together with research on the effectiveness of the campaign being introduced. Using these techniques prior to a product launch, an advertisement (or any other message from the business enterprise directed at the consumer) allows to verify in advance whether the marketers' efforts will produce the desired results, or at least enables a preliminary understanding of the level of attention and emotional engagement the efforts will elicit from the consumer. Neuromarketing techniques can therefore be applied in the selection of marketing communication tools and in other areas where emotional involvement and individual attention are important success factors (Lindstrom, 2009). Other areas of application of this new knowledge are prevalent in: content construction and website navigation, engaging users of computer games, advertising, product placement in games and films, and 'in store' marketing, including observation of in-store customer behaviour and visual merchandising (Pradeep, 2012; Swida & Kabaja, 2013).

Neuromarketing Tools

To better understand consumer behaviour over time, biometric instruments have been developed that record the impact of certain stimuli at the brain and emotional level. These are research techniques that are mainly based on the belief that the body cannot lie and for this reason can definitely provide more information than the traditional tools that have always been used to observe and study consumer behaviour. There are many tools belonging to the sphere of biometric research that can be used for marketing analyses. These are new instruments useful for understanding the functioning of the human brain and that are able to determine which cortical areas are activated in conjunction with specific consumer behaviours and experiences.

The research techniques currently used by neuromarketing experts fall mainly into three groups:

1. Techniques called brain imaging, which analyse and study human brain activity, such as functional magnetic resonance imaging (fMRI) or electroencephalography (EEG);
2. Behavioural indicators such as eye-tracking or facial expression analysis, tools that are limited to the analysis of consumer behaviour in different situations;
3. Physiological indicators that analyse the often involuntary physical reactions of the subjects, such as galvanic skin response (GSR) or heart rate variability (HVR). These techniques aim to record the emotions that affect a person and their level of engagement and recall after exposure to a specific marketing stimulus. The greatest strength of these instruments is their ability to register even the smallest neurological and psychophysical changes: their extraordinary sensitivity in simultaneously detecting, on several individuals, parameters that also differ greatly from each other guarantees a deeper understanding of the type of emotions and the type of stimulus that is induced in consumers and makes it possible to carry out neuromarketing studies even on very large samples of the population (Chmielewska, 2013; Antoniuk, 2020).

The latest, advanced neuroradiological techniques, called brain imaging, represent non-invasive research methods at the brain level, which are capable of recording areas of brain activation while subjects are making choices or performing a task. These tools allow experts to carry out mapping of the human brain, while providing information on brain function and the areas of the brain that are activated when making purchasing decisions. Brain imaging techniques differ from other tools used in neuromarketing mainly because of their optimal performance in terms of spatial resolution, millimetre accuracy and temporal millisecond precision, where the last two among these dimensions, respectively, describe the ability to understand brain activity by identifying individual elements that are even very close to each other spatially and using the shortest possible time to record the brain activity under study. The basic concept of brain imaging techniques, including, for example, fMRI or EEG, is that when one area of the brain is active, it consumes more glucose than another specific 'at rest' area, characterised by a more intense metabolism

and higher blood flow. Neuroimaging tools therefore make it possible to analyse changes in blood flow and create colour images characterised by different colours and degrees of intensity in relation to greater or lesser levels of activation of the brain area under study. By later comparing an image of a part of the brain 'at rest' with an image of an area exposed to a stimulus, it is thus possible to identify the brain areas responsible for that precise cognitive processing activated in response to that particular stimulus. The most commonly used neuroimaging techniques according to Trenti (2019) are:

- functional magnetic resonance imaging (fMRI);
- electroencephalography (EEG); and
- magnetoencephalography (MEG).

Behavioural indicators are non-invasive techniques used to analyse consumers' behaviour when they are in precise buying situations or when they are exposed to specific visual stimuli, such as advertisement or exposure to a particular brand. The following two are the most commonly used and widespread techniques in this field:

- Eye-tracking; and
- Emotion recognition.

Eye tracker is a tool designed to measure eyeball movement. More specifically, it monitors a number of factors that describe different stages of a person's attention, including stages of eye exploration, eye fixation time, visual trajectory, pupil dilation and eyelid blink (closure). As already mentioned, eye-tracking was developed to enable an understanding of the functioning of human vision mechanisms, and it is capable of identifying what the human eye is looking at any time and with what degree of attention, by recording pupil dilation and contraction. Through eye-tracking methodologies, it is possible to understand where the eye is most likely to stop, and thus understand which elements are able to attract the most attention. This technique, which is being used more and more intensively by market researchers, is based on the reflection of infrared light by the cornea: an eye tracker, mounted either on fixed positions in the

laboratory or in spaces on simple glasses, directs infrared light, which is invisible to the naked eye, onto the subject's face, and this light is reflected by the cornea itself. The reflection is then captured by cameras placed inside the instrument and analysed, allowing the position of the eye in relation to the observed object to be determined precisely at each moment of operation (Figure 1). In addition to presenting the path and direction the eye follows, the eye tracker also measures how long it takes before a person notices a product or how much time is spent observing it. Therefore, its applications are particularly relevant to the field of marketing — more and more companies are using this technology to monitor product performance and the communicative and promotional power of packaging. For example, just think of the countless applications of this technology in the area of large-scale retail products — it is not difficult to imagine how useful it would be for many companies to have objective data that indicate, for example, how much time consumers spend looking at a particular product before buying it, or what the average consumer's visual path along a supermarket shelf is before seeing the desired product and paying attention to it (Trenti, 2019).

Figure 1. Example of visual shelf mapping in a supermarket — visual focus on the middle shelves



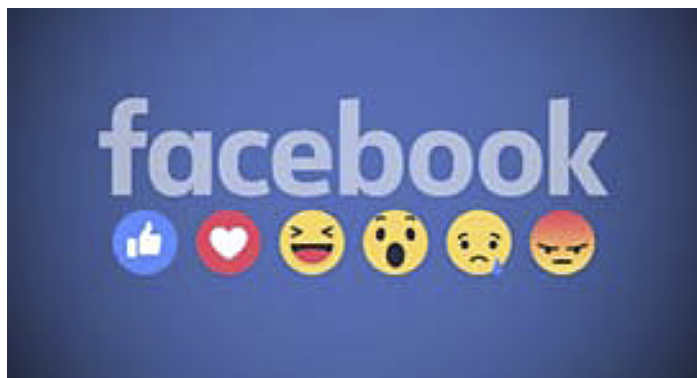
Source: Two must methods packaging testing. Downloaded on Apr. 22, 2022 from <https://medium.com/@eyesee/two-must-have-methods-for-package-testing-6fea56a62883> <http://eyesee-research.com/blog/two-must-methods-packaging-testing/>

Understanding what emotions are evoked in consumers in response to specific stimuli or messages, such as promotional spots or price increases, is of growing importance to marketing. Recognising and analysing consumer emotions aroused by advertising messages can also be achieved through tracking the personalisation of promotional messages on a website or in social networks. In fact, focussing on people's reactions and engagement on an emotional level seems to be an effective way for brands to stand out from the competition. It is no coincidence that the companies that are able to build solid brand loyalty today are in fact those that have historically been able to establish a kind of emotional bond with their customers.

One of the first researchers who focussed on studying facial expressions in relation to different emotional stages is psychologist Paul Ekman, who created an extensive catalogue of over 5,000 facial muscle movements, demonstrating that even a small movement of the eyebrow or nose reveals a different emotion. Following this database, he created models based on the relationship between a specific facial expression and its accompanying emotions, in an attempt to predict the different emotional reactions of the subjects. This is a thorough study that has been used in practice by many global brands (e.g. Coca-Cola, Microsoft and Apple) developing emotion recognition technology. The measurement of change in facial expression is a technique based on the high capacity of facial expressions to uniquely express the emotional states of individuals, transcending possible linguistic and cultural differences of the individuals studied (Ekman & Friesen, 1978). Today, there are well-established examples of brands using emotion recognition technology: just think, for example, of Facebook's introduction of emotional responses to posts (Figure 2) or the use of negative facial expression recognition systems in many Japanese shops since 2014 to prevent theft (Baptista, 2016).

The techniques analysed so far in neuromarketing research can be complemented by physiological measurements, often involuntary and related to various emotional and cognitive processes, in order to conduct a more in-depth analysis of a person's response to specific marketing stimuli, thus obtaining a more complete and reliable research result. Some of these psychophysiological indicators are represented, for example, by body sweating, heartbeat variability or changes in respiratory rhythm. All

Figure 2. Emotional reactions to Facebook posts



Source: Baptista (2016). RIconoscere le emozioni dei consumatori dal volto: come cambia il marketing? Downloaded on Apr. 22, 2022 from <https://www.insidemarketing.it/riconoscere-emozioni-consumatori-marketing/>

signals occur after the subject is exposed to specific stimuli, and the techniques used by neuromarketing to analyse physiological signals are (Trenti, 2019):

- galvanic skin response (GSR);
- electrocardiogram (ECG); and
- electromyography (EMG).

GSR or skin conductance activity (SCA) represent one of the best known and most widely used physiological indicators, the basic principle of which is the measurement of continuous changes in the electrical characteristics of the skin, which are manifested as a consequence of the variation of the individual stages of skin perspiration. Skin perspiration is regulated by the autonomic nervous system, a system directly involved in regulating emotional behaviour, and changes involuntarily in the face of external factors that frighten or distress the individual due to the alternation between the sympathetic nervous system, which increases sweat production, and the parasympathetic nervous system, which decreases it. The guiding principle of GSR is based on the fact that sweat containing a conductive saline solution makes the skin moist and therefore better adapted to conduct electricity compared to dry skin: this phenomenon,

referred to as skin conductance, is better known as the 'galvanic skin response'. The GSR signal is very easy to detect: usually only two electrodes connected to a display are needed, which, applied to the index and middle finger of the subject's hand, pick up the flow of electrical current through the skin. If the value registered on the display increases, it means that there is more skin conductance due to the greater presence of sweat as a result of activation of the sweat glands managed by the sympathetic autonomic nervous system. By recording the reactions of subjects exposed to relaxing or stressful stimuli, it is thus easy to understand how useful it is to apply the GSR technique in marketing research to better understand subjects' reactions when they are subjected to different tests, such as, for example, watching an advertising spot (Trenti, 2019).

The electrocardiogram is also a widely used tool in medicine, as it allows the electrical activity of the heart to be measured. There are many studies that confirm the existence of a correlation between the emotional and affective spheres and the electrical field of the heart: just think of situations of anxiety or fear, which inevitably cause changes in the rhythm of the heartbeat. Test results obtained from ECG are often used by neuromarketing experts to better understand how subjects' emotional states change during a test — the heartbeat is actually related to an individual's level of concentration: the lower it is, the more it indicates that the subject is in a mental state of attention and concentration (Chmielewska, 2013).

EMG is a technique that measures the state of contraction of muscles, such as those of the arms or face, as it has been found that the contraction of these muscles is strongly linked to certain emotional states. These are micro-contractions perceived by a sensor, useful in marketing research to identify changes in the emotional and affective levels of subjects under certain stimuli (Trojan & Gut, 2020).

Examples of practical application of selected methods and techniques of neuromarketing are presented in the synthetic Table 1.

EEG: Electroencephalography; fMRI, Functional magnetic resonance imaging.

The neuromarketing techniques discussed in the article are applicable to the implementation of corporate strategies for different product categories. In practice, they provide unique knowledge about consumer

emotions evoked by brands, products, messages and advertisements. As noted earlier, this may pose potential risks, as evidenced by the discussion in the scientific community described below.

Table 1. Examples of practical applications of neuromarketing tools

Company	Objective	Neuromarketing techniques/tools used	Results
Procter & Gamble	Renewal of Febreze air freshener product concept to improve sales performance	<ul style="list-style-type: none"> • Several hours of material were filmed of people cleaning their homes, looking for clues that could help the company connect Febreze to people's daily habits. • In addition, interviews were conducted to integrate the information obtained. 	<ul style="list-style-type: none"> • Sales doubled and a year later the profit from this product reached \$230 million. • Febreze has subsequently developed dozens of home fragrance solutions with sales of over a billion dollars a year. • The new concept has made Febreze one of the best-selling products in the world.
PepsiCo	Development of new packaging and a new advertising campaign for <i>Frito Lay's</i> crisps to make the product more attractive and relevant to the target segment under consideration	<ul style="list-style-type: none"> • Eye-tracking-EEG 	<ul style="list-style-type: none"> • Frito Lay brand turnover went up by 8%.
Campbell Soup Company	Understanding the reasons for the poor sales performance of canned soups and explaining the impact of advertising on consumer buying behaviour	<ul style="list-style-type: none"> • Eye-tracking 	<ul style="list-style-type: none"> • Campbell's new soup packaging has benefitted the company by improving the visual impact of its products on shelf. • However, the company was not protected from the sales decline it was facing.

Cont table 1

Company	Objective	Neuromarketing techniques/tools used	Results
Coca-Cola vs. Pepsi	Comparison of beverages of two well-known brands to investigate cultural vs. emotional aspects on consumers' buying one of the two beverage brands	<ul style="list-style-type: none"> • fMRI 	<ul style="list-style-type: none"> • Surveys have confirmed that people make their decisions primarily on an unconscious level, based on their own memories or impressions of a particular brand, and only later are they guided, for example, by the taste of a drink.
Intel	Achieving more effective brand positioning of processes worldwide and redefining the company's image in line with consumer perceptions and expectations	<ul style="list-style-type: none"> • Evoked Response Potential Test 	<ul style="list-style-type: none"> • There are significant differences between the thinking of men and women that transcend cultural boundaries. • Results helped advertisers create and develop new campaigns with clear brand repositioning.
PayPal	Developing a cohesive marketing strategy with a renewed image of PayPal's financial services for the eBay transaction processing division	<ul style="list-style-type: none"> • Testing brain activity (EEG) measurements in three of the seven dimensions of the brand identity model: function, benefits and feelings 	<ul style="list-style-type: none"> • After changing PayPal's visual and verbal identity in emails and on websites, the click-through rate increased 3–4 times.

Source: Own study.

Discussion on the Ethics of Neuromarketing Research

Neuromarketing as an applied discipline has recently not only been the focus of industry experts debating the actual effectiveness of these methodologies, but has also raised many concerns of ethical nature. The

researchers point out that the misuse of these tools by companies may be aimed at identifying consumer weaknesses, then leading to segmentation based on these, and exploiting these weaknesses for commercial purposes. The issue concerns the privacy of consumers, who are becoming increasingly aware, and wary, of the role that modern technology could play in making their data vulnerable to unauthorised sharing and usage. Therefore, companies have to pay particular attention to ethical data collection and to providing accurate information about the process to customers. Many people believe that neuromarketing is an attempt to use our subconscious mind to force us into buying a particular product or service.

Many ethical concerns focus on the use of neuroscience techniques to stimulate and promote the purchase of goods dangerous to humanity. Neuromarketing, similar to traditional marketing, can generate undesirable effects (e.g. effective alcohol advertising can lead to serious health problems for customers). However, neuroscience techniques can also encourage a range of positive behaviours, such as helping people to better understand health-promoting campaigns (Więckowska, 2019).

Doubts and concerns about the true effectiveness of neuroscientific tools used in marketing are fuelled by the secrecy surrounding the discipline. Large companies that have carried out neuromarketing research are in practice reluctant to disseminate the data and the results obtained, contributing to the misinformation of the public concerning this field. With the discovery and increasingly widespread application of neuromarketing, industry experts should commit together with companies towards making this discipline more transparent in the eyes of consumers by establishing measures that, on the one hand, protect consumers through the ethical, responsible and correct use of these techniques and, on the other, make it possible to verify their actual effectiveness.

Summary

Operating in a competitive environment, companies seek to strengthen their market position and achieve their marketing objectives by communicating the value of their products to existing and potential consumers. Marketing managers have always tried to achieve these

objectives by gathering as much information as possible about the needs, preferences and expectations of customers through the traditional tools offered by marketing. Today, new methodologies have been developed to achieve these goals, taking advantage of technological advances and new discoveries in neuroscience. Nowadays, companies have access to much more information about how consumers' minds work, and thus also about their choice processes; and as a result, the question arises as to how marketers can ethically use this body of knowledge gathered from observing consumer behaviour. There are studies in the literature suggesting the need to be aware that capturing and predicting consumers' emotional reactions and moods-in relation to products, brands or advertisements-might possibly undermine their individuality and subjectivity (Hernandez, 2017).

In order to deal with the fact that various ethical issues are associated with the extraction and use of the neuroscientific imaging data of consumers, as well as, more generally, with the application of neuroscience in marketing, an association was founded in 2012, being the first of its kind, which brought together experts in the field of neuromarketing from around the world. The NeuroMarketing Science & Business Association (NMSBA) is an international trade association for anyone with a professional interest in neuromarketing and is present in 42 countries around the world, including Poland. In order to protect the future of neuromarketing and the discoveries that will be made over the years in the field of neuroscience, as well as to protect consumers and defend the discipline of neuromarketing itself from the many criticisms raised by sceptics, the NMSBA has also developed a code of ethics regarding the use of instruments that commonly form part of the application of neuroscience to marketing (Hernandez, 2017).

The authors share the view that neuromarketing research should be treated with great caution, given the possibility of there being aspects of neuroscientific-imaging-oriented assessments of consumer behaviour that are at quite a distance from current knowledge and existing limitations characterising the process of studying, analysing and predicting human behaviour (Kahneman, Sibony, & Sustein, 2022). However, it is worth evaluating the unprecedented potential of this knowledge for further research on consumer behaviour in the marketing arena, both from the scientific and pragmatic points of view.

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