
Anticipating the Effects of Marketing Communication: A Neuroeconomic Framework for Marketing Purposes

Steffen Schmidt, Klaus-Peter Wiedmann, Philipp Reiter
und Christina Kurlbaum

Abstract

High expectations in neuroeconomics raised the hope of marketers that their (daily business) problems could be solved easily. In fact, neuroeconomics has provided considerable insights for marketing science and business practice concerning consumer decision making over the last two decades. However, tapping into customer's black box of unconscious and automatic processes, so-called implicit processes, does not require the mandatory usage of advanced neuroimaging techniques, such as fMRI. In order to obtain a specific brand positioning in customer's head, brand communication is an effective means for the marketing of ideas to gain a promoted cortical representation probability and, consequently, an enhanced perceptual and behavioral impact. The marketing of ideas itself is closely related to the concept of brand associations. Those types of associations can be assessed by implicit association measures from psychology (e.g., Implicit Association Test) comparatively accurately but are less properly measured with neuroimaging due to physiological and scientific fallibility. Against this background, the current work introduces a practical neuroscience-related

S. Schmidt (✉)

Institut für Marketing & Management, Leibniz Universität Hannover, Hannover, Germany

E-Mail: schmidt@m2.uni-hannover.de

K.-P. Wiedmann

Fakultät Wirtschaftswissenschaften, Leibniz Universität Hannover, Institut für Marketing und Management, Hannover, Germany

E-Mail: wiedmann@m2.uni-hannover.de

P. Reiter

eye square GmbH, Berlin, Germany

E-Mail: reiter@eye-square.com

C. Kurlbaum

Continental Reifen Deutschland GmbH, Korbach, Germany

E-Mail: christina.kurlbaum@conti.de

brand communication framework incorporating explicit and implicit brand-related associations to provide guidance for serious marketing-related communication purposes. Moreover, the performance of the introduced conceptual model is tested. In detail, the presented case study demonstrated sufficient performance to detect associative branding change via a (short) communication contact. Specifically, the combined application of implicit, concretely an advanced latency-based tool, and explicit measures, concretely a conventional self-report, provides an integrated assessment of brand-related marketing efforts in general and brand communication activities in particular.

Keywords

Implicit Measures • Reaction Time Measurement • Attention Tracking • Neuroeconomics • Brand Management

1 **Implicit Daydreams: Hope in Neuroeconomics as a Savior of Marketing Science and Business Practice**

Since the expansion of neuroscience and related advances – especially with the introduction and continuous improvement of neuroimaging technology initiated during the late 1980s – the picture of the human mind and personality has changed dramatically (Choudhury and Slaby 2012). The potential benefit of neuroscience for society as a whole received broad support through public efforts, such as the 1990–1999 *Decade of the Brain* proclaimed and promoted by the US government or the 2000–2009 *Decade of the Human Brain* announced by German researchers and supported by the German government. More recently, a 10-year scientific research collaboration, the *Human Brain Project* (HBP), was launched in October 2013 and is largely funded by the European Union. The project’s ambitious main goal is to create a better understanding of the human brain and its functions by building a full computer model of a functioning brain (Markram et al. 2011). Note that despite all the enthusiasm about this project, certain scientists, especially in the field of cognitive science, complain about an excessively narrow neuroscience perspective and that the current focus on massive data-based brain simulation – on “*databasing the brain*” (Chicurel 2000, p. 822) – without specified correction loops in the HBP may not lead to (new) fundamental insights (Frégnaç and Laurent 2014). Those (neuro-) scientists argue that big data applications without well-grounded theories (from neurobiology and cognitive psychology) or experimental adjustments will lead to a “*brain wreck*” of understanding and will not create substantial findings. However, the fascination behind brain research driving such efforts is the character of the human brain as *key player* in behavioral decision making – while weighing only approximately 1.5 kg – and as most complex “*machine*” in our galaxy surrounded by great mysteries (e.g., European Research Council 2013; National Institutes of Health 2014). In particular, how the brain acts unconsciously and creates conscious thoughts have been of high interest since Aristotle’s times (Damasio 1994).

In marketing in general and communication in particular, progress in neuroeconomics provided advanced tools to measure the impact of marketing activities (e.g., software-based facial coding to capture a person's affective state, Bartlett et al. 2005) and generated new findings and evidence for intuitive '*gut knowledge*' with reference to the performance of marketing activities (e.g., regular price setting increases the activation of the *pain system*, specifically, the insula area, as shown by Knutson et al. 2007, while premium price setting may enhance activity in parts of the *reward system*, namely, the medial orbitofrontal cortex). Consequently, high expectations in neuroeconomics generally and in neuroimaging technology particularly raised the hopes of marketers that their (daily business) problems could be solved, e.g., by improving marketing activities (pricing strategies, product packaging design, etc.) or uncovering insights about customer's true preferences (Ariely and Berns 2010). Given the highly stressed nature of current competition challenges, e.g., critical innovation decision making during product development and consistently high failure rates of newly developed products (Schmidt and Calantone 2009), the discovery of the "*buy button*" in customer's brain seems to be the holy grail of marketing science and business practice (Hubert and Kenning 2008). Neuroeconomics findings such as the *winner-take-all/first choice brand effect* (Deppe et al. 2005a), meaning that only the favored brand of a customer positively emotionalizes the decision-making process, and therefore increases the buying probability, challenge the suitability of established marketing and marketing research concepts such as the evoked set (Kenning and Linzmajer 2011).

However, in the contemporary science and business world, the label "*neuro*" is overused, e.g., innumerable books have been published on all sorts of *neuro topics* (neuromarketing, neuromanagement, neurosales, neuroleadership, neurowebdesign, etc.) and an increasing number of companies sell *neuro as a business activity* (e.g., consulting, market research). Anyhow, or, for that reason: "*All that neuro that glitters is not gold*" and is sometimes merely "*new neurowine in old marketing wineskins*". With this tendency in mind, this paper aims to extract and discuss justifiable hopes from blind hype. Specifically, a practical neuroscience-related brand communication framework will be introduced in the next sections to provide guidance for serious marketing purposes.

2 Implicit Hunting: Dead Fish Walking and First Fishing Catches in Brain's Ocean

In the "*slipstream*" of pioneering study findings, such as the *winner-take-all/first choice brand effect*, the hype surrounding neuroeconomics figuratively speaking overtakes all marketing hopes without acknowledging the crash barriers and imprecision of the "*neuro hunt*" since the mid-2000s. Oversimplifying, pseudo-scientific publications proclaiming the existence of a "*buy button*" in the customer brain, such as "*Buyology*" (Lindstrom 2008) or "*The Buying Brain*" (Pradeep 2010), stoke the hype and systematically disregard the limited significance of neuro-economic study results. Those limitations do not only concern theoretical aspects

(for example, the interpretation and conception of the nature of habits, e.g., Bernacer and Murillo 2014, or the discussion of conscious experience and the need for an observing self, e.g., Baars et al. 2003) but also empirical questions, such as the reliability and validity of neuroeconomic measures. In an extreme case, Bennett et al. (2010) demonstrated in a neuroimaging study the risk of false-positive results when data are improperly analyzed in their famous post-mortem Atlantic salmon functional magnetic resonance imaging (fMRI) study. In an open-ended mentalizing task setting, the participating subject, a mature Atlantic salmon, was shown a series of pictures of humans engaged in social activities while its brain was scanned by fMRI. Specifically, the authors “asked” the salmon to specify the emotion depicted in each picture as in a human subject study. After analyzing the data, Bennett et al. (2010) found that the salmon’s brain showed some evidence of responding to the pictures. The problem with this finding was that the fish was not alive during the test. The observed responses were methodological and statistical artefacts inherent in noisy fMRI data, and such noise is easily neglected if not adjusted using multiple comparison corrections (Bennett et al. 2010).

Neuroeconomics is relatively young discipline that must address several limitations such as the temporal resolution restrictions of fMRI (for a discussion, e.g., see Kable 2011; Reimann et al. 2011; Sharp et al. 2012) and inherent complexity, which is sometimes ignored as shown above. Despite flawed methods and analytic applications as well as misleading results interpretation, neuroeconomics has provided considerable insights for marketing science and business practice concerning consumer decision making over the last two decades (for a first overview, see Hubert and Kenning 2008). In this respect, evidence from recent studies indicates that buying decisions are multifactorial by incorporating a set of neurobiological processes (Ariely and Berns 2010). For example, studies addressing brand information processing showed that brain regions responsible for memory and cultural information influence brand preference (e.g., McClure et al. 2004) and that (the probability of) buying is modulated by the degree of activation in brain structures indicating reward and pain processing (e.g., Knutson et al. 2007). In short, these studies reveal that perceived and processed simple brand information, such as name, logo, and product design have a high impact on preference decisions (Reimann et al. 2011).

3 Implicit Calling: The Next Generation of Customer Insights

Moreover, a vast number of studies from all interdisciplinary fields of neuroeconomics suggest that during the decision-making process, customers are not fully aware of their beliefs, thoughts and feelings, or the reasons for their decisions (e.g., Nisbett and Wilson 1977; Weber et al. 2009). Despite conflicting views and unanswered questions, first and foremost, neuroeconomic studies primarily indicate that most information processing regarding brand-related knowledge, perception and behavior is of implicit nature, meaning that these processes are

hidden in the unconscious mind (e.g., Deppe et al. 2005b; Plassmann et al. 2008; Reimann et al. 2010).

The existence of dual-processes – that is, implicit and explicit processes – in the human mind has been theorized by several scientists, especially in the field of psychology, since the late 1970s, although a unified definition is lacking (e.g., Schiffrin and Schneider 1977: controlled and automatic processes; Chaiken 1980: systematic and heuristic processes; Cacioppo and Petty 1984: central and peripheral processes; Evans 1984: analytic and heuristic processes; Fazio 1990: deliberate and spontaneous processes). However, in economics in general and marketing in particular, the acknowledgement of such *theories of two minds* is still surprisingly rare despite Kahneman's (2003) popular distinction between System 1 and System 2 during his prize lecture for the *Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel* in 2002. Kahneman's idea of two cognitive systems achieved further dissemination with his bestselling book, "*Thinking, Fast and Slow*" (Kahneman, 2011). According to Kahneman (2003, 2011), *System 1* is labeled intuition, which reflects the implicit system (fast, automatic and effortless information processing) and operates on an unconscious level, while *System 2* is categorized as reasoning or explicit system and performs on a conscious level (slow, controlled and laborious information processing).

4 Implicit Rehabilitation: Policy Up the Old-Fashioned Marketing Perspective and Move on to the Research Frontiers of Implicit Marketing

Within the field of marketing, there is still a consequent disregard for an implicit perspective in a considerable extent despite the hype and the hopes, both in science as well as in business practice. For example, in a scientific review article examining brand research, brand expert Keller and his colleague only considered work that influenced brand and branding research (Keller and Lehmann, 2006), but ignored work that might improve brand understanding. Another illustration from business practice is obtained from the most popular brand equity valuation ranking conducted by Interbrand. Mike Rocha, in his role as Global Director of Brand Valuation at Interbrand, says that their assessment provides "*a rich and insightful brand analysis, delivering value to the business beyond the number alone.*" (Rocha 2014). In fact, their methodology completely excludes an implicit view and assessment of customer's perception and behavior toward brands (for a brief overview about the valuation, see Interbrand 2014). Therefore, Interbrand is capturing only a glimpse of brand-related associations without knowing relevant but hidden facts from customer's implicit cognition. In other words, their clients will not become smarter simply by reading the blurb of a customer book.

Indeed, that type of defiance is extremely irritating against a background of various studies that have demonstrated the considerable importance of implicit processes on customer's decision making described above (see also, e.g., Shiv and Fedorikhin 1999; Maison et al. 2004; Florack et al. 2010; Ohme et al. 2010).

Furthermore, innovative articles about reaction time measurement as a beneficial tool to capture implicit processes in brand performance assessment were published in high-quality journals over one-quarter century ago (see Tyebjee 1979, and Aaker et al. 1980). Yet, established conceptualizations of marketing (e.g., the classical marketing mix) do not consider implicit processes despite their proven significance (Plassmann et al. 2008); therefore, the need to reconsider and adjust these concepts exists (Kenning and Linzmajer 2011). In addition, widely used conventional self-assessment measures are not capable of capturing implicit processes (Reimann et al. 2011). However, tapping into customer's black box of implicit processes does not require the mandatory usage of neuroimaging techniques, such as fMRI, positron emission tomography (PET) or electroencephalography (EEG), which are comparatively expensive to operate and difficult to use (e.g., Ariely and Berns 2010). While those measures are extremely valuable for fundamental research questions, they are currently less applicable to daily questions for which provable answers are needed quickly, sometimes within 24 h (for example, copy testing, e.g., which print advertising best fits the targeted brand positioning).

In fact, implicit measures developed in cognitive psychology are also able to capture automatic and unconscious processes (De Houwer 2006). Moreover, measures such as the well-known Implicit Association Test (IAT; e.g., Greenwald et al. 1998; Nosek et al. 2007) or Go/No-go Association Task (GNAT; Nosek and Banaji 2001) are relatively easy to use. Typically, only a standard personal computer (or similar devices, such as a smartphone or tablet) is needed to capture implicit data. Additionally, these measures can be run online in the subject's home. Besides allowing quick, global data collection at lower costs, online measurement increases sample sizes and therefore improves the validity and reliability of the results. Another advantage of implicit measures from cognitive psychology, especially latency-based measures, is their application against the backdrop of well-grounded theories and concepts about which factors affect behavior, such as attitude (e.g., Greenwald et al. 1998), prejudice and stereotype (e.g., Greenwald et al. 2002), or self-esteem (e.g., Bosson et al. 2000). In contrast, currently available functional brain imaging techniques to measure neural activity struggle with inferential questions (for an extended discussion, see Aguirre 2014). For example, setting aside the challenges of accuracy in neuroimaging, does the bioelectrical information retrieved from a brain during a neuroimaging study indicate a specific mental state (e.g., reward activation) caused by the content of a presented marketing stimuli (e.g., a prominent testimonial in an advertisement), or is the mental state evoked by other confounding variables (e.g., stored memories that are positively related to the brand presented in the advertisement)?

Although multivoxel pattern analysis (MVPA) and resting-state approaches will improve the diagnostic rigor of neuroimaging studies (Aguirre 2014), and it is fair to state that implicit measures from cognitive psychology face a number of difficulties and unresolved issues as well (e.g., Seymour and Rosemary 1999; Evans 2008), at least the applicability of neuroimaging to practical marketing communication is questionable. In fact, the number of neuroimaging studies that reveal the perceptual and behavioral effectiveness of advertising is relatively low (Ariely and Berns 2010).

From a neuroeconomic perspective, a customer’s decision is largely based on sociocultural and personality factors (Gutnik et al. 2006). With that said, brand communication is an effective means for the *marketing of ideas* to affect decision-making processes. The marketing of ideas itself is closely related to the concept of brand associations, which “*are the informational nodes linked to the brand node in memory and contain the meaning of the brand for consumers*” (Keller 1996, p. 106). Those types of associations can be assessed by implicit association measures from psychology (e.g., IAT) comparatively accurately but are less properly measured with neuroimaging due to physiological and scientific fallibility as noted above.

Hence, implicit association measures from cognitive psychology are a suitable, inexpensive, precise and powerful “*research weapon*” to scout the communication performance of implicit marketing. However, without a well-grounded framework, each research weapon remains *blunt and blind*.

5 Implicit Battlefield: Proposing a Neuroeconomic Communication Framework for Branding the Brain in the Fight for the Customer’s Head

To avoid “*dead fish insights*” based on a “*brain-wreck of understanding*”, a well-grounded framework is needed. Figure 1 illustrates the scientific and practical framework introduced and discussed in the following sections. Specifically, the fundamental mechanism of the introduced communication concept will be explained but other relevant variables, such as context or brand familiarity, that (may) moderate the overall impact of marketing communication are not discussed additionally. Basically, the concept is derived from previous research in the field of cognitive (neuro-) psychology with strong focus on behavioral decision-making processes.

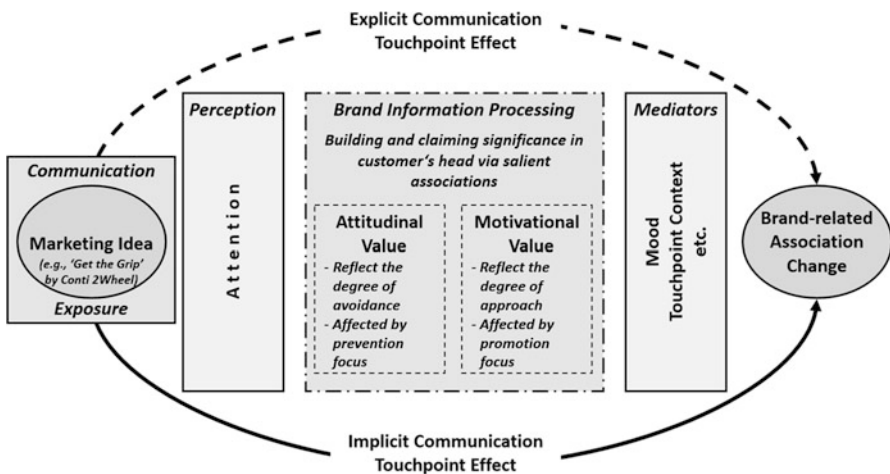


Fig. 1 Neuroeconomic communication framework

That body of research has a long tradition and can provide reasonable findings as well as practical measures for daily business questions. Despite advances in brain research that increasingly illuminate the neural processes of brand-related information processing (for an overview, see Plassmann et al. 2012), from a marketing view, these methods and theories are less applicable, or are applied with less confidence, for communication purposes, whereas neuroimaging at this stage of research can contribute to improved marketing performance with respect to product development (Ariely and Berns 2010). However, the underlying principle of the introduced framework resembles Kahneman's distinction (and other dual-system views) between system 1, the implicit level, and system 2, the explicit level, which is largely applied in all research branches of neuroscience and psychology.

5.1 Attentional Value

Every second, an estimated 11 million bits of information *hit* our sensory system, that is, all the information sent to the human brain, and most of this information (approximately 10 million bits) is received through the eyes (Dijksterhuis 2004). The attentional impact of each marketing communication exposure, specifically, the conveyance of a marketing idea or goal-oriented association, is embedded somewhere within this continuous information stream. Indeed, only a small amount of that information, approximately 50 bits, is processed explicitly and consciously (Wilson 2002). That capacity is equivalent to the number of items, on average, that a human can consciously hold in short-term memory (at the present day often called working memory), which is the *magical number* 7 ± 2 rule (i.e., to repeat and remember five words and two pictures, respectively, shortly after presentation plus or minus two), commonly known as *Miller's Law* (e.g., Miller 1956; Bourginge 2004; Barrouillet et al. 2011).

However, as recent research has shown, short (but repeated) exposure to only 13 ms (in comparison, the average time of a human blink is approximately 300–400 ms) of a goal-relevant brand may provoke goal-directed behavior (Fitzsimons et al. 2008). Such findings are motivating for brand communication managers because not every brand-related message must be perceived consciously to obtain a positive brand-related perceptual and behavioral effect. Ultimately, the goal-directed quality of a marketing idea (e.g., strengthen loyalty, provoke a price premium) depends on the overall perceived valence characteristic (e.g., positive or negative, rewarding or hurting) of a brand at the end of the business day. That said, the perceived valence is a "*mental function*" of the predicted future value that rest upon on past and present experiences (for a detailed introduction from a predominantly brain research view, see Plassmann et al. 2012). The greater the valence, the higher the likelihood that "*the brand is activated and the brand name enters our awareness during the choice process*" (Walvis 2008, pp. 182–183). From a brand-related communication perspective, the marketing idea must be salient (relevant), first, to be (re-) stored in long-term memory and, second, to be retrieved from it (Walvis 2008), e.g., at the point of sale. According to Keller's (1993) brand equity

conceptualization, the perceptual and behavioral significance of a brand consideration (e.g., recommendation or trial purchase) from a customer's perspective is mainly determined by favorable and unique associations held in the customer's memory. Favorability of brand associations forms the overall brand attitude, i.e., some type of liking, whereas the uniqueness of brand associations relates to the additional motivational benefit (unique selling proposition) that gives customers an appealing motive for a positive behavioral reaction towards the brand (e.g., repurchase), i.e., some type of wanting. With that said, attitudinal values create the necessary conditions and motivational values create the reasonable conditions for strong brand positioning in a customer's head.

5.2 Attitudinal Value

One striking characteristic of humans is their constant evaluation of all features of their environment (e.g., people, objects, things) (Wilson et al. 2000). Everybody holds at almost every time at least one judgment towards almost everything. Those overall evaluations are categorized as attitudes (Bohner and Dickel 2011), or within a brand management context, brand attitudes (Wilkie 1986). Therefore, from a marketing communication perspective in general and a brand communication perspective in particular, attitudes are “*summary judgments and overall evaluations to any brand-related information*” (Keller 2003, p. 596). With regard to the association networks in the human brain, attitudes represent the object-evaluation links (for a discussion, see Fazio 2007). Those evaluation links can range from extremely positive to extremely negative. However, research demonstrates the basic independence of positively related and negatively related evaluations towards an object (for a discussion, see Cacioppo et al. 1997), meaning that the fundamental positive and negative beliefs underlying individual attitudes toward an object are discriminable (for example, high positive and low negative beliefs indicate a positive attitude, while high positive and high negative beliefs suggest an ambivalent attitude). With regard to approach vs. avoidance reactions (for an introduction, see Higgins 1997), attitudes reflect the degree of avoidance tendency, primarily affected by a prevention focus, such as safety, while the approach tendency is primarily regulated by a promotion focus, such as aspiration, and reflected by motivational goals. Therefore, it is unlikely that a brand will provide pleasure and elicit an approach intention by satisfying motivational needs without establishing at least a neutral attitude because negative attitudes are related to pain, which automatically triggers an avoidance reaction.

5.3 Motivational Value

People are embedded in large social networks in which they have different ties of every type (e.g., strong relations to relatives, moderate relations to familiar objects such as their current car, or weak relations to unfamiliar colleagues), which are

consequences of several psycho-emotional development phases (Bischof 1990). The quality of an individual's tie to a specific entity (e.g., relative or brand) within his social network is indicated by the degree of attachment and is regulated by social motivation processes (Gubler and Bischof 1991). To explain and predict the processes of social distance regulations (e.g., approaching familiar people or avoiding strangers, see Bischof 1975), the Zurich Model of Social Motivation, as devised by Bischof (1985, 1990), provides an established quantitative model. Specifically, three basic and interacting motivational systems are proposed by the model: security, arousal and autonomy (Gubler and Bischof 1991; Schneider 2001).

In a brand management and brand communication context, brands are cues that are selected to achieve a balanced state of equilibrium. According to drive reduction theory (e.g., Graham and Weiner 1996), a customer's behavior is pushed to restore equilibrium by satisfying needs. Specifically, disequilibrium is a psychological state that provides a motivation to satisfy needs. Therefore, a brand can be perceived as appetitive or aversive cue depending on its motivational characteristic to satisfy a specific motivation need. That said, brands that provide joy and excitement are associated with lust for life and hedonism. Such brands regulate motivational arousal needs and can be termed joyrider brands. In contrast, brands that convey conservative values evoke associations of protection, assurance and stability. The satisfaction of such motivational security needs is provided by caregiver brands. Meanwhile, brands that convey status and power are linked to best in class, outstanding products and services. Brands that are capable of addressing motivational autonomy needs can be labeled ruler brands.

With regard to that triad, a detailed motivation profile of a brand can be attained from a customer's perspective. With that profile, which reflects the strategic brand orientation with the most (positive) impact on perceptual and behavioral reactions towards the brand, communication performance can be rated objectively. For example, if a brand is primarily driven by implicit arousal needs, does a touch point contact with a respective campaign maintain or strengthen the associations related to this motivational dimension?

6 Implicit Case Study: Analyzing the Effectiveness and Efficiency of Print Advertising Applying Neuromarketing Techniques

In the following sections, the performance of the introduced conceptual model is tested. Specifically, real print advertisements were selected and analyzed for their effectiveness and efficiency in strengthening and enhancing certain brand-related associations, that is, brand-related attitudinal and motivational aspects, for positive future brand-related perceptions and behaviors from a customer point of view.

6.1 General Study Information

An exploratory online study was conducted to determine the brand-related communication performance of four print advertisements for the 2wheel motorcycle tire brand *Continental*. To ensure as realistic an advertising exposition as possible, the ads were shown in the real German motorcycle magazine *2Räder* (“2wheels”). Specifically, the 2014 issue of that magazine was manipulated by exchanging the original print ad on page 39 with the *Continental* print ads. Figure 2 shows all four tested Continental ads. Based on the selected ads, four ad conditions and one control condition were developed. In the ad conditions, subjects were shown the title page of the magazine *2Räder* followed by 14 double-sided pages. The title page and each double-sided page were automatically presented on the screen for 10 s. This procedure was chosen to simulate skimming through the magazine. The double-sided page with the selected Continental ad (on the left page: regular information content; on the right page: Continental ad) was shown on page position seven. In addition, print ads from other well-known motorcycle brands were shown on 7 of the 13 remaining double-sided pages to ensure a realistic and competitive ad environment. In the control condition, no ad was presented. Participants were randomly assigned to one of the five conditions.

6.2 Measures

With regard to the salient association assessment, the attitudinal value was measured using a generic attitude scale (e.g., Aaker 2000; Karpinski and Hilton 2001), while the motivational value was captured against the background of the Zurich Model of Social Motivation, which proposes three motivational subsystems (security, arousal and autonomy). Each attitudinal and motivational dimension was captured by both explicit and implicit measures. In fact, a self-report including a five-point Likert scale ($1 = \textit{strongly disagree}$ to $5 = \textit{strongly agree}$) was employed to evaluate a controlled and reflected association assessment of explicit information processing. In contrast, the i^2 BrandREACT reaction time measurement software (eye square 2014) was used to assess the automatic and spontaneous association regarding implicit information processing. The i^2 BrandREACT procedure forces respondents to react as quickly as possible to associate certain stimuli attributes (via “yes” and “no” keys) with a brand (brand category association measurement). During the test, both compliance rate and reaction time are measured. This type of implicit measurement is similar to the Single Category Implicit Association Test (SC-IAT) introduced by Karpinski and Steinman (2006) but requires less time (approximately 30 s per brand assessment compared to 3 min or more). This time advantage clearly enhances the practical usage of this latency-based tool. Both implicit measures are illustrated in Fig. 3. For the sake of clarity and comparability, all explicit and implicit association scores were rescaled from 0 to 100, where greater higher (lower) scores indicate a stronger positive (negative) association assessment. In addition, we evaluated brand performance, specifically, brand perception and brand behavior (perception: image,

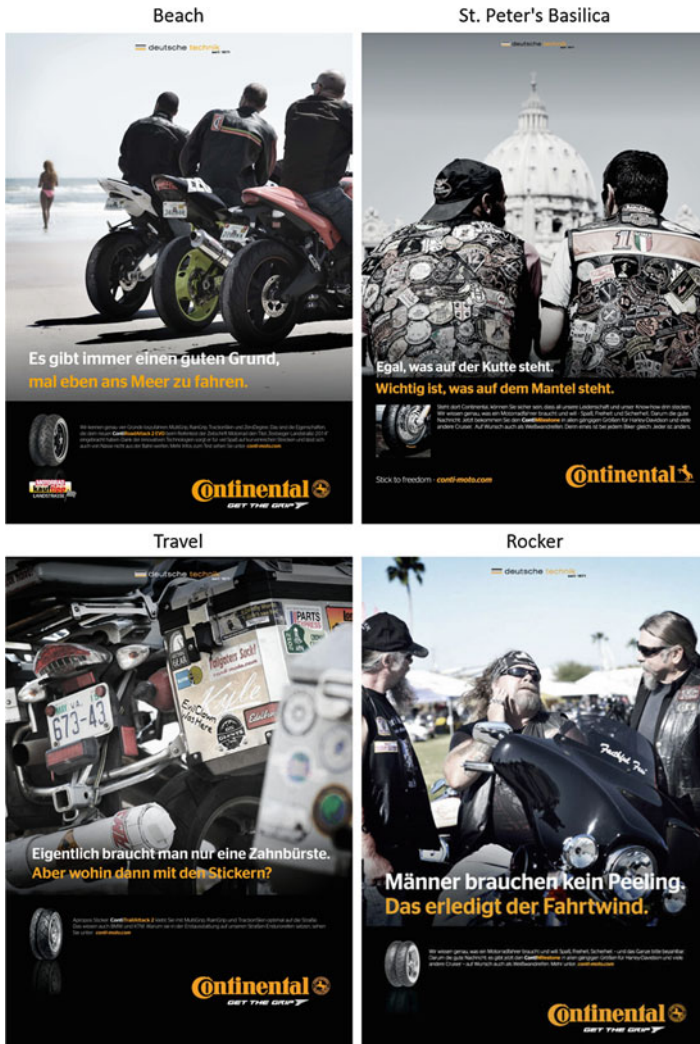


Fig. 2 Analyzed continental 2wheel tire ads

satisfaction, and trust; behavior: loyalty, price premium, buying intention, and five-point Likert rating). All items were specified with reference to the motorcycle tire brand *Continental*. Moreover, a Restricted Focus Viewer (RFV) as preferred attention tracking tool was used (e.g., Jansen et al. 2003; Bednarik and Tukiainen 2007).

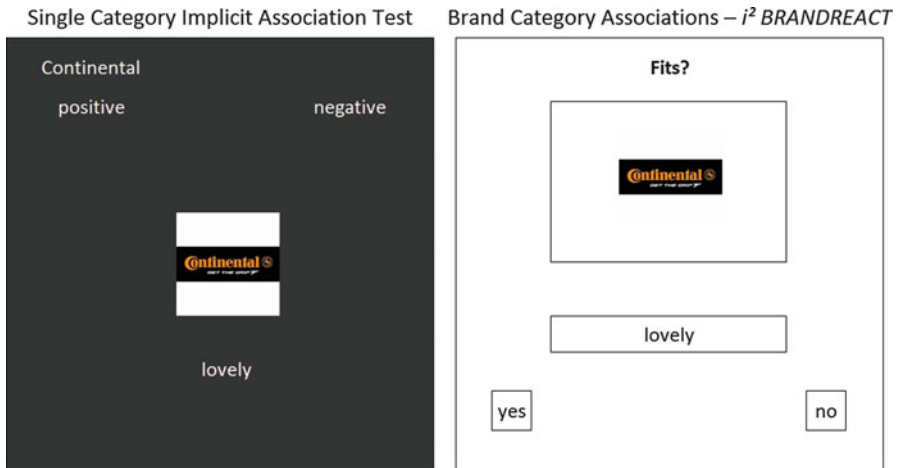


Fig. 3 Reaction time measurements

6.3 Sample and Procedure

For data collection, a web-based survey utilizing a snowball sampling method was conducted in Germany. The subjects were recruited via email messages and links on selected web pages (e.g., Facebook group/interest pages) with invitations to participate in the survey. In particular, only interviewees who possessed a motorcycle driver's license were allowed to participate in the study. These provision ensured high product knowledge and interest. Therefore, a filter question at the beginning of the survey excluded subjects without motorcycle driver's license.

During June 2014, 115 subjects were recruited (female: 11.3 %; male: 88.7 %; mainly aged 18–29 years: 42.6 %; average age, 36.38 years). All respondents owned at least one motorbike and had used their motorbike(s) at least one time within the last 12 months. On average, subjects had an active motorcycle experience of 11.83 years.

First, some introductory questions (e.g., general motorcycle usage) were asked before the participants were randomly allocated to one of the four ad treatments or the control group, respectively. Next, the reaction time measurement for assessing the attitudinal and motivational value was applied followed by a self-report addressing the same values and brand performance (here, perception and brand behavior).

6.4 Results

As presented in Table 1, all explicit and implicit measures exhibit satisfactory values for item reliability (factor loadings and average variance extracted), internal consistency (Cronbach's alpha and split-half reliability) as well as external validity

Table 1 Assessing the explicit and implicit measurement models

	Factor loadings	Average variance explained (AVE)	Cronbach's alpha	Split-half reliability	Spearman's rank correlation coefficient
Explicit attitude	0.454>	67 %	0.890	<i>n/a</i>	0.399***
Implicit attitude	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	0.557	0.424***
Explicit arousal	0.914>	84 %	0.804	<i>n/a</i>	0.436***
Explicit autonomy	0.892>	79 %	0.741	<i>n/a</i>	0.620***
Explicit security	0.838>	70 %	0.574	<i>n/a</i>	0.513***
Implicit arousal	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	0.747	0.269***
Implicit autonomy	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	0.605	0.417***
Implicit security	<i>n/a</i>	<i>n/a</i>	<i>n/a</i>	0.766	0.494***
Brand perception	0.862>	80 %	0.878	<i>n/a</i>	0.664***
Brand behavior	0.736>	65 %	0.731	<i>n/a</i>	0.807***

Note: *n/a* = not applicable

Significance: *** = 0.01, ** = 0.05, * = 0.1

External Factors for Correlation Analyses: Attitude = Feeling Thermometer (0 = very cold to 10 = very warm); Motivation Dimensions = Overall Facets (0 = not at all arousal- /autonomy- / security-oriented to 7 = extremely arousal- /autonomy- / security-oriented); Brand Perception and Brand Behavior = Net Promoter Score (0 = extremely unlikely to 10 = extremely likely)

(Spearman's rank correlation with a global factor that summarizes the essence of the corresponding construct). Considering the low acceptance of implicit measures, such as latency-based tools, and the dominance of explicit construct approaches and therefore of explicit measures within conservative research streams, such as marketing research, it is a permanent challenge and critical to achieve substantial internal consistency for implicit measures (Nosek et al. 2007). However, in this study, all four implicit reaction time measures show a satisfactory reliability with internal consistency estimates above .5 (split-half reliability).

Furthermore, the regular content of the double-sided page (here, the left page) received the most attention. Thus, all tested Continental ads received little and mostly superficial attention as expected and intended. The respective heat maps are shown in Fig. 4. Specifically, contact rates for key visual, brand logo, headline and product text ranged from 55 % to 68 %, 16 % to 42 %, 39 % to 65 % and 29 % to 36 %, respectively. Although less than 50 % of the subjects spotted the Continental logo, a recognition question (aided ad awareness) confirmed that at least 50 % could consciously remember (recognize) the respective Continental ad. That said, on an

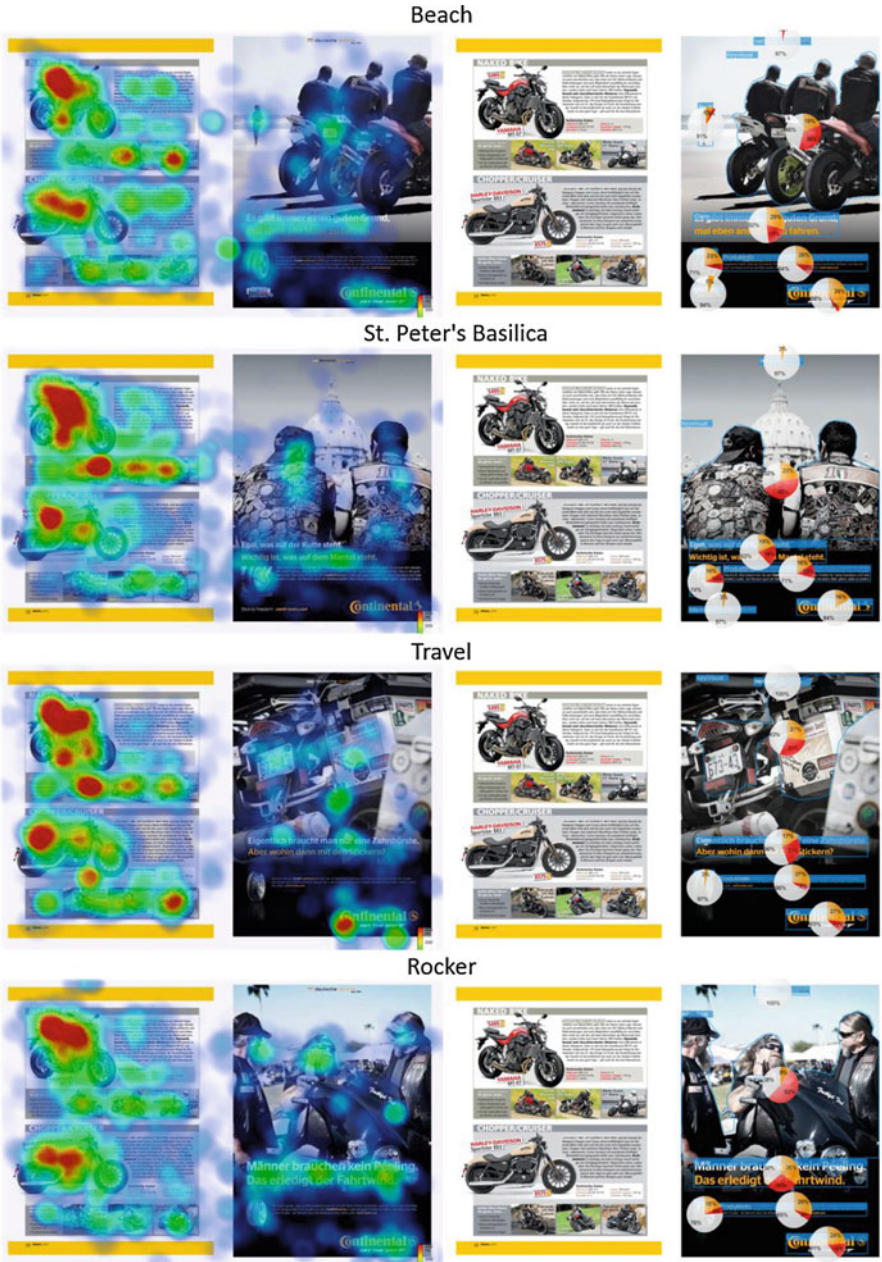


Fig. 4 Heat maps and contact rate of the analyzed continental 2wheel tire ads

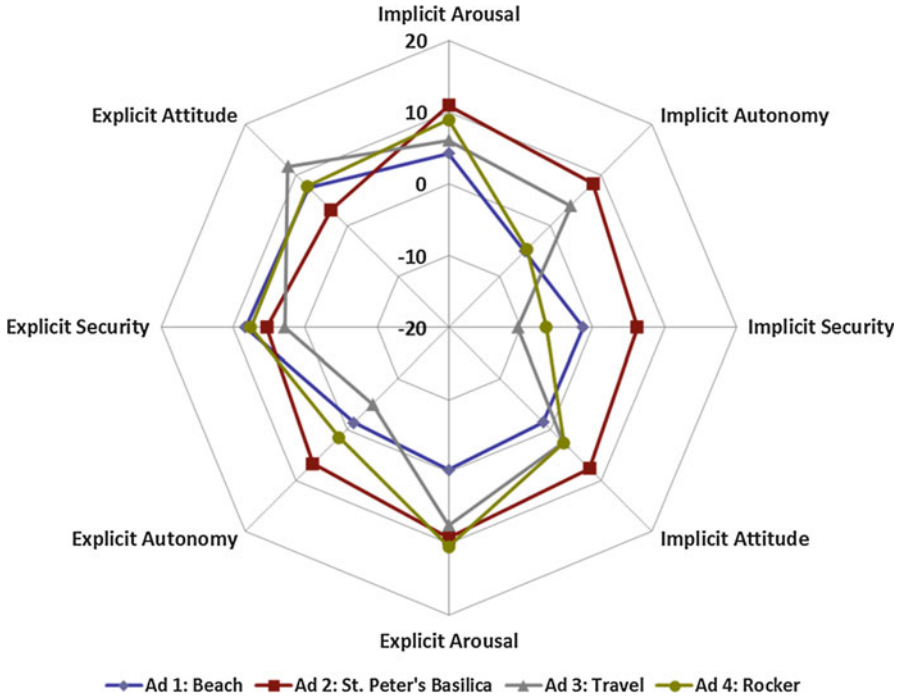


Fig. 5 Mean differences among advertising condition and control condition with regard to brand-related associations

unconscious level, that number should be even higher based on the multiple brand-related codes applied in all ads (here, especially the yellow type against a black background).

Figure 5 presents the mean differences among advertising condition and control condition with regard to brand-related associations. A visual inspection indicates that ad 2 ‘*St. Peter’s Basilica*’ evokes the most positive associations. Particularly on an implicit information processing level, that ad reveals the strongest brand-related association enhancements compared to the control condition. Student’s *t* tests confirm this pattern statistically. In fact, the ‘*St. Peter’s Basilica*’ ad condition differs significantly and positively, including the additional consideration of 95 % confidence interval (*CI*), from the control condition with regard to implicit arousal ($\Delta M = 10.915$, $p < 0.01$, ΔM 95 % *CI* = 3.849 to 17.980), implicit autonomy ($\Delta M = 8.329$, $p < 0.05$, ΔM 95 % *CI* = 0.441 to 16.216), implicit attitude ($\Delta M = 7.677$, $p < 0.10$, ΔM 95 % *CI* = -0.028 to 15.382) and explicit arousal ($\Delta M = 9.222$, $p < 0.05$, ΔM 95 % *CI* = 0.188 to 18.256). In contrast, the results of ad 3 ‘*Travel*’ suggest a negative difference concerning implicit security ($\Delta M = -10.382$, $p < 0.10$, ΔM 95 % *CI* = -22.449 to 1.686) but a positive effect on explicit attitude ($\Delta M = 11.680$, $p < 0.05$, ΔM 95 % *CI* = 0.930 to 22.429). Furthermore, ad 4 ‘*Rocker*’ exhibits a positive impact on explicit arousal ($\Delta M =$

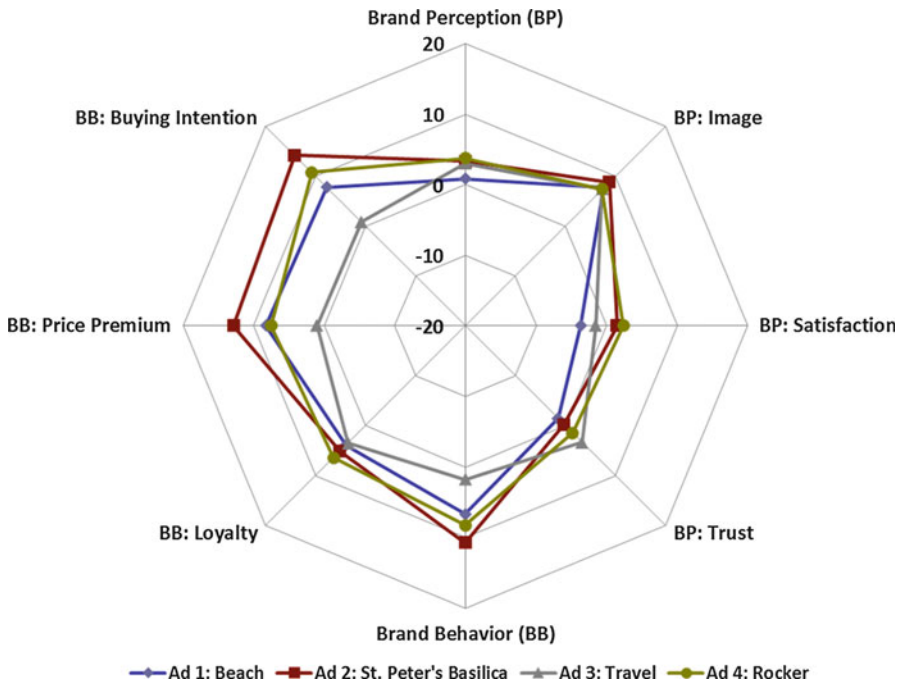


Fig. 6 Mean differences between advertising condition and control condition with regard to brand performance indicators

10.464, $p < 0.05$, ΔM 95 % CI = 2.607 to 18.321) and on explicit attitude ($\Delta M = 7.777$, $p < 0.10$, ΔM 95 % CI = -0.005 to 15.560), while ad 1 ‘Beach’ obtains a positive effect on explicit security ($\Delta M = 8.300$, $p < 0.05$, ΔM 95 % CI = 0.360 to 16.241).

With regard to brand performance, the results are presented in Fig. 6. Visually, ad 2 ‘St. Peter’s Basilica’ again performs best. For brand perception, however, positive effects on brand image can be identified for ad 1 ‘Beach’ ($\Delta M = 7.658$, $p < 0.10$, ΔM 95 % CI = -1.099 to 16.415), ad 2 ‘St. Peter’s Basilica’ ($\Delta M = 8.829$, $p < 0.10$, ΔM 95 % CI = -0.544 to 18.201), and ad 4 ‘Rocker’ ($\Delta M = 7.386$, $p < 0.05$, ΔM 95 % CI = 0.254 to 14.519). On a behavioral level, the results provide support for a significant increase of ad 2 ‘St. Peter’s Basilica’ on price premium ($\Delta M = 12.850$, $p < 0.05$, ΔM 95 % CI = 0.758 to 24.941) and on buying intention ($\Delta M = 14.161$, $p < 0.05$, ΔM 95 % CI = 2.709 to 25.613) as well as a significant effect of ad 4 ‘Rocker’ on buying intention ($\Delta M = 10.795$, $p < 0.01$, ΔM 95 % CI = 3.013 to 18.578). In contrast, no perceptual or behavioral brand impact can be determined for ad 3 ‘Travel’.

These results reflect the association enhancements. Ad 2 ‘St. Peter’s Basilica’ revealed the most positive brand-related association changes, especially on an implicit information processing level, which probably drives the remarkable brand performance increase regarding perception and behavior, notably, price premium

and buying intention. Consequently, Continental's 2wheel tire marketing managers should use the ad 2 'St. Peter's Basilica' primarily in their communication activities, at least in print advertising.

Altogether, the findings indicate the importance (and opportunity) of brand-related association changes via brand communication to manage brand performance. That said, these findings are consistent with previous studies suggesting that implicit association changes can be triggered more easily on an implicit level, first and foremost against the background of low attention processing, such as superficial or peripheral awareness (e.g., Fitzsimons et al. 2008). In other words, the absence of conscious attention during a brand communication contact, which in fact seems to be the regular exposure situation for customers, provokes an adapted associative value structure in the customer's brain in terms of an altered need satisfaction capability. As a consequence, an approach or avoidance intention towards the brand may be triggered or at least primed.

7 Implicit Discussion: Integrated Measures of Dual Associations Are Eating the Brand World in Customer's Head

In both marketing research and business practice, it is important to strive for a better understanding of the determination of explicit and implicit information processing routes regarding the influence of brand communication on customer brand-related associations. It is apparent from critical observation concerning individual's daily life, that twenty-first century customers are living in a world of screens and events occupied with brand communication contacts (e.g., via media channels, such as video on demand, web television or web radio, on a variety of modern devices, such as tablets, smartphones or wearables). In fact, customers (at least in Western cultures) encounter a broad and long stream of brand-related communication information (brand cues) in their daily lives (Fitzsimons et al. 2008), all of which create, shape and alter the brand knowledge structure in customer's head to a certain degree during each contact. From a neuroeconomic perspective, the communicated associations must be salient (relevance thesis), as indicated above, for a lasting attachment between the brand and customer resulting in a close and emotional relationship. Furthermore, ongoing communication activities must be consistent and repetitive (coherence thesis) as well as manifold (richness thesis) to gain a promoted cortical representation probability and, consequently, an enhanced perceptual and behavioral impact (Walvis 2008).

To better understand the "*brand mechanism*" in customer's head, neuroeconomic studies have revealed extremely valuable findings, as outlined in the first part of this paper. For marketers, neuroimaging tools are highly attractive to uncover all the hidden information about brands and products (Ariely and Berns 2010). Due to their implicit characteristics, that type of information is not accessible through introspective reflection; therefore, such information is not obtainable through conventional methods, such as self-reports or focus groups. However, for marketing

communication purposes, current neuroimaging is less applicable due to its physiological and scientific fallibility as well as its expense, at least for business practice (Ariely and Berns 2010). By all means, brand communication is very effective in promoting the *marketing of ideas* to affect decision-making processes. Closely connected to the concept of brand associations, on an implicit information processing level, the *marketing of ideas* can be assessed by latency-based measures from psychology (e.g., IAT) comparatively accurately to reveal the hidden information in the customer's mind. At this point, it is important to highlight that implicit measures are not considered to be better indicators of brand-related associations influencing perception and behavior (as some researchers believe, especially in marketing); they are simply another source of evidence.

Against that background, the introduced neuroeconomic communication framework incorporates the assessment of salient associations, especially attitudinal and motivational value associations, both on an explicit and implicit processing level. Reaction time measures and self-reports were used to capture brand-related associations. The presented case study demonstrated sufficient performance to detect associative branding change via a short communication contact (here: a print advertising exposure lasting less than 10 s). In detail, the combined application of implicit and explicit measures provides a holistic brand understanding. Actually, the superior perceptual and behavioral performance of ad 2 'St. Peter's Basilica' can only be explained by its better performance on an implicit processing level.

In sum, the findings presented in this paper yield the following implications for marketing communication:

- First, marketing managers must examine the *status quo of brand-related associations* from the customer's point of view, considering both explicit and implicit information processing.
- Second, to evoke a positive association *transmission* in the customer's head, communication managers should focus on salient codes (e.g., headline, key visual), which are of personal relevance to a customer's decision-making process (e.g., conveying motivational value, such as joy for need satisfaction related to arousal).
- Consequently, to assess and enhance brand-related marketing efforts in general and brand communication activities in particular, marketing researchers should apply *integrated measurement methods* including implicit as well as explicit measures.

First and last, the results of the case study presented in this paper provide another promising and fruitful basis for ongoing research that blends the insights of consumer psychology, neuroscience and marketing management into one trans-disciplinary research framework. With regard to brand communication in particular, "*creating and repeating relevant specificity (over time and across touch points) around one central brand theme, using the richest and most engaging forms and media possible*" (Walvis 2008, p. 189) should be the overall branding motto of communication manager in both the '*explicit and implicit customer-oriented marketing world[s]*'.

References

- Aaker, J. L. (2000). Accessibility or diagnosticity? Disentangling the influence of culture on persuasion processes and attitudes. *Journal of Consumer Research*, 26(4), 340–357.
- Aaker, D. A., Bagozzi, R. P., Carman, J. M., & MacLachlan, J. M. (1980). On using response latency to measure preference. *Journal of Marketing Research*, 17(2), 237–244.
- Aguirre, G. K. (2014). Functional neuroimaging: Technical, logical, and social perspectives. *Hastings Center Report*, 44(2), 8–18.
- Ariely, D., & Berns, G. S. (2010). Neuromarketing: The hope and hype of neuroimaging in business. *Nature Reviews Neuroscience*, 11(4), 284–292.
- Baars, B. J., Ramsøy, T. Z., & Laureys, S. (2003). Brain, conscious experience and the observing self. *Trends in Neurosciences*, 26(12), 671–675.
- Barrouillet, P., Portrat, S., & Camos, V. (2011). On the law relating processing to storage in working memory. *Psychological Review*, 118(2), 175–192.
- Bartlett, M. S., Movellan, J. R., Littlewort, G. C., Braathen, B., Frank, M. G., & Sejnowski, T. J. (2005). Toward automatic recognition of spontaneous facial actions. In P. Ekman & E. L. Rosenberg (eds.), *What the face reveals: Basic and applied studies of spontaneous expression using the Facial Action Coding System (FACS)* (2nd edition, pp. 393–412). New York: Oxford University Press.
- Bednarik, R., & Tukiainen, M. (2007). Validating the Restricted Focus Viewer: A study using eye-movement tracking. *Behavior Research Methods*, 39(2), 274–282.
- Bennett, C. M., Baird, A. A., Miller, M. B., & Wolford, G. L. (2010). Neural correlates of interspecies perspective taking in the post-mortem Atlantic Salmon: An argument for multiple comparisons correction. *Journal of Serendipitous and Unexpected Results*, 1(1), 1–5.
- Bernacer, J., & Murillo, J. I. (2014). The Aristotelian conception of habit and its contribution to human neuroscience. *Frontiers in Human Neuroscience*, 8, 1–10.
- Bischof, N. (1975). A systems approach toward the functional connections of attachment and fear. *Child Development*, 46(4), 801–817.
- Bischof, N. (1985). *Das Rätsel Ödipus: Die biologischen Wurzeln des Urkonfliktes von Intimität und Autonomie*. München: Piper.
- Bischof, N. (1990). Phase transitions in psychoemotional development. In H. Haken & M. Stadler (eds.), *Synergetics of cognition, proceedings of the international symposium at Schloss Elmau, Bavaria, June 4–8* (pp. 361–378). Berlin: Springer.
- Bohner, G., & Dickel, N. (2011). Attitudes and attitude change. *Annual Review of Psychology*, 62(1), 391–417.
- Bosson, J. K., Swann, W. B., & Pennebacker, J. W. (2000). Stalking the perfect measure of implicit self-esteem: The blind men and the elephant revisited? *Journal of Personality and Social Psychology*, 79(4), 631–643.
- Bourgin, P. (2004). What is cognitive economics? In O. Bourgin & J.-P. Nadal (eds.), *Cognitive economics: An interdisciplinary approach* (pp. 1–12). Berlin: Springer.
- Cacioppo, J. T., & Petty, R. E. (1984). The elaboration likelihood model of persuasion. In T. C. Kinnear (eds.), *Advances in consumer research* (Vol. 11 pp. 673–675). Provo: Association for Consumer Research.
- Cacioppo, J. T., Gardner, W. L., & Berntson, G. G. (1997). Beyond bipolar conceptualizations and measures: The case of attitudes and evaluative space. *Personality and Social Psychology Review*, 1(1), 3–25.
- Chaiken, S. (1980). Heuristic versus systematic information processing and the use of source versus message cues in persuasion. *Journal of Personality and Social Psychology*, 39(5), 752–766.
- Chicurel, M. (2000). Databasing the brain. *Nature*, 406, 822–825.
- Choudhury, S., & Slaby, J. (2012). Introduction: Critical neuroscience – between lifeworld and laboratory. In S. Choudhury & J. Slaby (eds.), *Critical neuroscience: A handbook of the social and cultural contexts of neuroscience* (pp. 1–26). Chichester: Wiley-Blackwell.

- Damasio, A. R. (1994). *Descartes' error: Emotion, reason, and the human brain*. New York: Avon Books.
- De Houwer, J. (2006). What are implicit measures and why are we using them? In R. W. Wiers & A. W. Stacy (eds.), *Handbook of implicit cognition and addiction* (pp. 11–28). Thousand Oaks: Sage.
- Deppe, M., Schwindt, W., Kugel, H., Plassmann, H., & Kenning, P. (2005a). Nonlinear responses within the medial prefrontal cortex reveal when specific implicit information influences economic decision making. *Journal of Neuroimaging*, *15*(2), 171–182.
- Deppe, M., Schwindt, W., Krämer, J., Kugel, H., Plassmann, H., Kenning, P., & Ringelstein, E. B. (2005b). Evidence for a neural correlate of a framing effect: Bias-specific activity in the ventromedial prefrontal cortex during credibility judgments. *Brain Research Bulletin*, *67*(5), 413–421.
- Dijksterhuis, A. (2004). Think different: The merits of unconscious thought in preference development and decision making. *Journal of Personality and Social Psychology*, *87*(5), 586–598.
- European Research Council. (2013). ERC projects to unlock mysteries of the human brain. http://erc.europa.eu/sites/default/files/publication/files/unlock_mysteries_of_human_brain.pdf. Accessed 21 Nov 2014.
- Evans, J. S. B. T. (1984). Heuristic and analytic processes in reasoning. *British Journal of Psychology*, *75*(4), 451–468.
- Evans, J. S. B. T. (2008). Dual-processing accounts of reasoning, judgment, and social cognition. *Annual Review of Psychology*, *59*, 255–278.
- eye square. (2014). BrandREACT. <http://www.eye-square.com>. Accessed 29 May 2014.
- Fazio, R. H. (1990). Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. In M. P. Zanna (eds.), *Experimental social psychology* (Vol. 23 pp. 75–109). San Diego: Academic Press.
- Fazio, R. H. (2007). Attitudes as object-evaluation associations of varying strength. *Social Cognition*, *25*(5), 603–637.
- Fitzsimons, G. M., Chartrand, T. L., & Fitzsimons, G. J. (2008). Automatic effects of brand exposure on motivated behavior: How apple makes you “think different”. *Journal of Consumer Research*, *35*(1), 21–35.
- Florack, A., Friese, M., & Scarabis, M. (2010). Regulatory focus and reliance on implicit preferences in consumption contexts. *Journal of Consumer Psychology*, *20*(2), 193–204.
- Frégnac, Y., & Laurent, G. (2014). Where is the brain in the Human Brain Project? *Nature*, *513*, 27–29.
- Graham, S., & Weiner, B. (1996). Theories and principles of motivation. In D. C. Berliner & R. C. Calfee (eds.), *Handbook of educational psychology* (pp. 63–84). New York: Simon & Schuster Macmillan.
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, *74*(6), 1464–1480.
- Greenwald, A. G., Rudman, L. A., Nosek, B. A., Banaji, M. R., Farnham, S. D., & Mellott, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, *109*(1), 3–25.
- Gubler, H., & Bischof, N. (1991). A systems theory perspective. In M. E. Lamb & H. Keller (eds.), *Infant development: Perspectives from German-speaking countries* (pp. 35–66). Hillsdale: Erlbaum.
- Gutnik, L. A., Hakimzada, A. F., Yoskowitz, N. A., & Patel, V. L. (2006). The role of emotion in decision-making: A cognitive neuroeconomic approach towards understanding sexual risk behaviour. *Journal of Biomedical Informatics*, *39*(6), 720–736.
- Higgins, E. T. (1997). Beyond pleasure and pain. *American Psychologist*, *52*(12), 1280–1300.
- Hubert, M., & Kenning, P. (2008). A current overview of consumer neuroscience. *Journal of Consumer Behaviour*, *7*(4–5), 272–292.

- Interbrand (2014). Methodology. <http://www.bestglobalbrands.com/2014/methodology>. Accessed 07 Dec 2014.
- Jansen, A. R., Blackwell, A. F., & Marriott, K. (2003). A tool for tracking visual attention: The Restricted Focus Viewer. *Behavior Research Methods, Instruments, & Computers*, 35(1), 57–69.
- Kable, J. W. (2011). The cognitive neuroscience toolkit for the neuroeconomist: A functional overview. *Journal of Neuroscience, Psychology, and Economics*, 4(2), 63–84.
- Kahneman, D. (2003). A perspective on judgement and choice – Mapping bounded rationality. *American Psychologist*, 58(9), 697–720.
- Kahneman, D. (2011). *Thinking, fast and slow*. New York: Macmillan.
- Karpinski, A., & Hilton, J. L. (2001). Attitudes and the implicit association test. *Journal of Personality and Social Psychology*, 81(5), 774–788.
- Karpinski, A., & Steinman, R. B. (2006). The single category implicit association test as a measure of implicit social cognition. *Journal of Personality and Social Psychology*, 91(1), 16–32.
- Keller, K. L. (1993). Conceptualizing, measuring, and managing customer-based brand equity. *Journal of Marketing*, 57(1), 1–22.
- Keller, K. L. (1996). Brand Equity and Integrated Communication. In E. Thorson & J. Moore (eds.), *Integrated Communication: Synergy of Persuasive Voices* (pp. 103–132). Mahwah, NJ: Lawrence Erlbaum Associates.
- Keller, K. L. (2003). Brand synthesis: The multidimensionality of brand knowledge. *Journal of Consumer Research*, 29(4), 595–600.
- Keller, K. L., & Lehmann, D. R. (2006). Brands and branding: Research findings and future priorities. *Marketing Science*, 25(6), 740–759.
- Kenning, P., & Linzmajer, M. (2011). Consumer neuroscience – An overview of an emerging discipline with implications for consumer policy. *Journal of Consumer Protection and Food Safety*, 6(1), 111–125.
- Knutson, B., Rick, S., Wimmer, G. E., Prelec, D., & Loewenstein, G. (2007). Neural predictors of purchases. *Neuron*, 53(1), 147–156.
- Lindstrom, M. (2008). *Buyology: Truth and lies about why we buy*. New York: Random House.
- Maison, D., Greenwald, A. G., & Bruin, R. H. (2004). Predictive validity of the Implicit Association Test in studies of brands, consumer attitudes, and behavior. *Journal of Consumer Psychology*, 14(4), 405–415.
- Markram, H., Meier, K., Lippert, T., Grillner, S., Frackowiak, R., Dehaene, S., Knoll, A., Sompolinsky, H., Verstreken, K., DeFelipe, J., Grant, S., Changeux, J.-P., & Sari, A. (2011). Introducing the human brain project. *Procedia Computer Science*, 7, 39–42.
- McClure, S. M., Li, J., Tomlin, D., Cypert, K. S., Montague, L. M., & Montague, P. R. (2004). Neural correlates of behavioral preference for culturally familiar drinks. *Neuron*, 44(2), 379–387.
- Miller, G. A. (1956). The magical number seven, plus or minus two: Some limits on our capacity for processing information. *Psychological Review*, 63(2), 81–97.
- National Institutes of Health (2014). The brain initiative. <http://www.braininitiative.nih.gov/BRAIN-Brochure.pdf>. Accessed 21 Nov 2014.
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, 84(3), 231–259.
- Nosek, B. A., & Banaji, M. R. (2001). The go/no-go association task. *Social Cognition*, 19(6), 625–664.
- Nosek, B. A., Greenwald, A. G., & Banaji, M. R. (2007). The implicit association test at age 7: A methodological and conceptual review. In J. A. Bargh (eds.), *Automatic processes in social thinking and behavior* (pp. 265–292). New York: Psychology Press.
- Ohme, R., Matukin, M., & Szczurko, T. (2010). Neurophysiology uncovers secrets of TV commercials. *der markt – Journal für Marketing*, 49(3–4), 133–142.

- Plassmann, H., Kenning, P., Deppe, M., Kugel, H., & Schwindt, W. (2008). How choice ambiguity modulates activity in brain areas representing brand preference: Evidence from consumer neuroscience. *Journal of Consumer Behaviour*, 7(4–5), 360–367.
- Plassmann, H., Ramsøy, T. Z., & Milosavljevic, M. (2012). Branding the brain: A critical review and outlook. *Journal of Consumer Psychology*, 22(1), 18–36.
- Pradeep, A. K. (2010). *The buying brain: Secrets for selling to the subconscious mind*. Hoboken: Wiley.
- Reimann, M., Zaichkowsky, J., Neuhaus, C., Bender, T., & Weber, B. (2010). Aesthetic package design: A behavioral, neural, and psychological investigation. *Journal of Consumer Psychology*, 20(4), 431–441.
- Reimann, M., Schilke, O., Weber, B., Neuhaus, C., & Zaichkowsky, J. (2011). Functional magnetic resonance imaging in consumer research: A review and application. *Psychology and Marketing*, 28(6), 608–637.
- Rocha, M. (2014). Financial applications for brand valuation. <http://interbrand.com/en/views/37/financial-applications-for-brand-valuation>. Accessed 07 Dec 2014.
- Schmidt, J. B., & Calantone, R. J. (2009). Escalation of commitment during new product development. *Journal of the Academy of Marketing Science*, 30(2), 103–118.
- Schneider, M. (2001). Systems theory of motivational development. In N. J. Smelser & P. B. Baltes (eds.), *International encyclopedia of the social & behavioral sciences* (pp. 10120–10125). Oxford: Elsevier.
- Seymour, E., & Rosemary, P. (1999). Some basic issues regarding dual-process theories from the perspective of cognitive–experiential self-theory. In S. Chaiken & Y. Trope (eds.), *Dual-process theories in social psychology* (pp. 462–482). New York: Guilford Press.
- Sharp, C., Monterosso, J., & Montague, P. R. (2012). Neuroeconomics: A bridge for translational research. *Biological Psychiatry*, 72(2), 87–92.
- Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II. Perceptual learning, automatic attending and a general theory. *Psychological Review*, 84(2), 127–190.
- Shiv, B., & Fedorikhin, A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, 26(3), 278–292.
- Tyebee, T. T. (1979). Response time, conflict, and involvement in brand choice. *Journal of Consumer Research*, 6(3), 295–304.
- Walvis, T. H. (2008). Three laws of branding: Neuroscientific foundations of effective brand building. *Journal of Brand Management*, 16(3), 176–194.
- Weber, B., Rangel, A., Wibrall, M., & Falk, A. (2009). The medial prefrontal cortex exhibits money illusion. *PNAS*, 106(13), 5025–5028.
- Wilkie, W. (1986). *Consumer behaviour*. New York: Wiley.
- Wilson, T. D. (2002). *Strangers to ourselves: Discovering the adaptive unconscious*. Cambridge: Belknap Press.
- Wilson, T. D., Lindsey, S., & Schooler, T. Y. (2000). A model of dual attitudes. *Psychological Review*, 107(1), 101–126.