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“Business-to-Business-to-Brain?” Reviewing Neuroscience Research in B2B-Marketing Using TCCM Analysis

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ABSTRACT

Purpose: Neuroscientific findings seem to call into question several psychological fundamentals of research in B2B-Marketing. Neuroscience was also recently proposed as an important area for interdisciplinary research, potentially leading to the development of original, courageous ideas in B2B research. Neuroscience applications, guidelines, and future research directions have been discussed in various fields. In B2B marketing, there are calls for further research adopting neuroscience and an introduction to what B2B marketing could learn from it.

Methodology: We conducted a structured literature review on Scopus with 2,336 search results, identified 67 relevant publications, and analyzed them using the theory-context-characteristics-methodology (TCCM) framework.

Originality: An overview of the status quo of research that bridges both disciplines (neuroscience and B2B marketing) and directions for future research applying neuroscience in B2B is missing. With this article, we close this gap

Findings: Neuroscience in B2B is nascent, and most publications are conceptual. Some findings rooted in B2C could be transferred to B2B. Reflecting on B2B marketing research priorities, we outline five major future research directions for applying neuroscience in B2B: 1. decision-making, 2. marketing stimuli and responses, 3. digitalization, 4. research methods and measurements, 5. advancing existing knowledge. With this, we hope to help further improve the principal psychological underpinnings of B2B-Marketing.

KEYWORDS

Neuroscience; neuromarketing; B2B marketing; industrial marketing; systematic literature review; TCCM

Introduction

There is a need to develop original, courageous ideas in business marketing research (Lindgreen, Di Benedetto, and Kock 2021). Stating a related shortage in the field of B2B marketing, as applied social science termed an inherently cross-disciplinary field, Lindgreen, Di Benedetto, and Kock (2021) apply the OBC framework (observe the world, bridge disciplines, and challenge assumptions and theories) in the mentioned context. Bridging disciplines, i.e. joining two or more disciplines and merging their respective viewpoints, concepts, and insights, can reveal original and courageous ideas and produce new theory constructions if theories are redesigned for the new combined discipline (Lindgreen, Di Benedetto, and Kock 2021). Furthermore, this interdisciplinarity paves the way for novel research that can facilitate the evolution of B2B marketing

research and therefore is highly important in the efforts to ensure the relevance and timeliness of B2B research against the background of fast-evolving markets (Markovic et al. 2021).

One of the suggested “bridging disciplines,” and thus interdisciplinary research, is neuroscience (Lindgreen, Di Benedetto, and Kock 2021). Neuroscience in general focuses on the study of the nervous system, and the human brain in particular (Shepherd 2009; Society for Neuroscience 2019; Verhulst et al. 2019). Neuroeconomics as a subfield of neuroscience uses methods originally employed in brain research to study economic problems and especially neural correlates of behavior and decision-making (Hubert and Kenning 2008; Sanfey 2007). Consumer neuroscience and neuromarketing, which are often used synonymously, can in turn be seen as subfields of neuroeconomics, and investigate issues related to marketing with

methods from brain and nervous system research (Fugate 2007; Hubert and Kenning 2008; Lee and Chamberlain 2007). To differentiate the terms consumer neuroscience and neuromarketing, distinct definitions have been proposed: consumer neuroscience as the scientific endeavor and research, and neuromarketing as the application of the findings of consumer neuroscience research in practice or the commercial field (Hubert and Kenning 2008; Javor et al. 2013). While neuroscience has been developed in medical research and was early applied in psychology research (Posner and DiGirolamo 2000), applications in the field of marketing so far mainly focus on consumer behavior (Harris, Ciorciari, and Gountas 2018; Hubert and Kenning 2008; Plassmann et al. 2015). The main objective of those activities is to obtain a more direct view into the “black box” of the consumer brain (Hubert and Kenning 2008). Examples for typical questions are if the perception of an ad, the preference for a brand, or the valuation of a price-setting can be associated with specific neural activations (Smidts et al. 2014). As topics like pricing decisions or brand awareness are of high importance in the B2B sector as well (Hodgkinson, Wright, and Anderson 2015; Zhang, Netzer, and Ansari 2014), the suggestion of neuroscience as a “bridging discipline” and interdisciplinary research to B2B marketing seems comprehensible.

In several fields of neuroeconomics, detailed discussions about the potential application including guidelines, the value, and future research directions of neuroscience in those specific fields have recently been put forward, such as in service research (Verhulst et al. 2019), information systems (vom Brocke et al. 2020), organizational and management-related research (Karmarkar and Plassmann 2019; Murray and Antonakis 2019; Butler et al. 2016), business ethics and the ethical implications related to neuromarketing (Cucino et al. 2022; Robertson, Voegtlin, and Maak 2017; Stanton, Sinnott-Armstrong, and Huettel 2017; Thomas et al. 2017). Neuroscience has been widely used to explore marketing research in general (Lee, Chamberlain, and Brandes 2018; Lee et al. 2017; Shaw and Bagozzi 2018; Harris, Ciorciari, and Gountas 2018, He et al. 2021; Lim 2018; Sung

et al. 2020; Ariely and Berns 2010). Also, neuromarketing as the commercial application of consumer neuroscience (Culqui-Salazar, Alvarez-Altamirano, and Cordova-Buiza 2023; Spence 2019), including special issues on neuroscience and marketing in top tier journals (Daugherty et al. 2018; Camerer and Yoon 2015; Singh, Singh, and Nagaraj 2023), and even articles on the potential contribution of neuromarketing and consumer neuroscience back to neurology (e.g. Javor et al. 2013).

Specifically for B2B settings, there are calls for further research using neuroscience to shed new light on, for example, B2B decisions and interactions (Tuncdogan et al. 2019), or pricing (Iyer et al. 2015). The application of neuroscience has been discussed recently as well. Öberg (2023) conducts a co-citation analysis on B2B in neuroscience. Lim (2018) gives a detailed and highly valuable overview of what B2B marketing could learn from neuroscience, how it differs from B2C neuroscience, what it is and is not, what it can do and cannot do, and what it should do and should not do. Yet, in order to advance the B2B marketing field with the application of neuroscientific methods, a clear overview of the current state of research would be highly useful. This would serve to identify the current location on the map of charting the potential for this interdisciplinary approach, so to speak. Furthermore, to stay in the picture of “charting” and staying on track, it is equally important to identify potential directions and goals in which future research applying neuroscientific methods should go in B2B settings, in order to arrive at answers for the current most pressing issues in B2B marketing. Current research is unfortunately lacking in both: an overview and transparency on existing, as well as potential applications of neuroscientific insights and instruments to the various B2B marketing dimensions.

This study, therefore, aims to answer the following research questions: (RQ1) What is the current state of the art of neuroscience research in B2B marketing? (RQ2) How could neuroscience help to answer current research priorities in the B2B field?

Hence, a main objective and contribution of this work is to offer an overview of neuroscience in marketing research with a particular focus on

B2B studies, as a starting point for further inquiries. The second major contribution of this article is that we link existing B2B neuroscience research to recent B2B research priorities identified by the Institute for the Study of Business Markets (ISBM, Wuyts 2021; ISBM – Institute for the Study of Business Markets n. d.) and the Marketing Science Institute (Marketing Science Institute 2020). In doing so, we indicate the advances that neuroscience already now brings to the B2B marketing area. Charting the potential of further interdisciplinary research using neuroscience in B2B marketing, we most importantly suggest areas where neuroscientific concepts, theories, and measures could help advance the B2B area. This complements and extends recent inquiries into what neuromarketing is and is not, can and cannot do, should and should not do with respect to B2B (Lim 2018; Öberg 2023), with specific research priority themes where neuroscience could be highly beneficial to the field. With this, we hope to be able to contribute to further advances in the field of B2B marketing, specifically in times where there are calls to develop original, courageous ideas in business marketing research (Lindgreen, Di Benedetto, and Kock 2021), and where advances in social cognitive neuroscience and neuroeconomics call into question fundamentally the principal psychological foundations that form the fundamental of large bodies of work in B2B (Hodgkinson 2015).

In order to achieve these goals, we conducted a systematic literature review (Tranfield, Denyer, and Smart 2003) searching for potentially relevant publications on Scopus, which led to a total of 1,129 results. The inclusion criterion, in short, aimed to encompass neuroscience publications with reference to B2B or industrial marketing. In order to broaden our perspective and strengthen the contribution of this article, we also analyzed those articles from the B2C area that resulted from our search, and whose results could potentially be transferred to the B2B area. After checking for duplicates and excluding irrelevant references to the field, the resulting review list consists of 67 articles. This process was double-checked by four researchers. The remaining 67 articles were classified using the framework-based review approach “theory-context-characteristics-

methodology” (TCCM) (Paul and Criado 2020; Paul and Rosado-Serrano 2019) to paint a comprehensive and precise picture of the field and to outline a future research agenda. The main advantage of TCCM is that it is a holistic approach which sheds light on both theoretical and empirical aspects of a specific research domain (Chen, Mandler, and Meyer-Waarden 2021).

The remainder of the paper is structured as follows: First, the research method is described, detailing the inclusion and exclusion criteria which resulted in our final body of articles to analyze. Second, the analysis of the articles is presented based on the TCCM approach. Third, themes for future research using neuroscience in B2B are outlined based on the B2B research priorities. Lastly, we close with a discussion and conclusion.

Research method

This study uses a systematic literature review method to identify and review the extant literature on neuroscience in B2B marketing (Tranfield, Denyer, and Smart 2003). This review follows the PRISMA guidelines (Moher et al. 2009). These guidelines are divided into four stages:

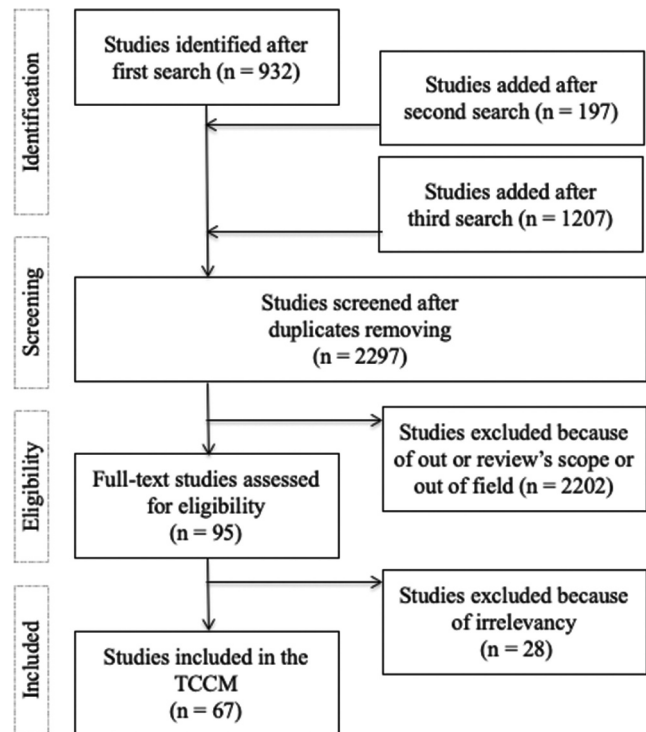


Figure 1. PRISMA flow diagram.

identification, screening, eligibility, and inclusion (see a visual representation of this process in the context of our study in [Figure 1](#)). In the identification stage, the search string strategy is defined in terms of search keywords and database source; in the screening stage the inclusion criteria is described (Snyder 2019). After, the full publications are assessed for eligibility in a two-step blind process (Moher et al. 2009). The final dataset contains the publications which are going to be included in the TCCM analysis.

Identification: search strategy

This study searched for potentially relevant publications using the combination of two sets of keywords: one related to neuroscience studies (“neuromarketing” OR “neuroscience” OR “neuroimaging”) and another one related to B2B marketing (“B2B” OR “BtoB” OR “B-to-B” OR “Business-to-Business” OR “Industrial Marketing”). The setting criterion was restricting the search string to English written studies, including journal articles, conference papers, books, and book chapters. To control the quality assessment, only publications from Scopus were considered (i.e. Singh, Dhir, and Mishra 2024; Yeasmin 2024). There was no restriction regarding the year of publication. The first search was conducted in July 2021 and covered all documents published until then. This first search identified 932 publications. In the meanwhile, this search string was validated by five external researchers on the line of B2B/industrial marketing and neuroscience in order to assess methodological quality and avoid risk of bias (Ma et al. 2018). Similarly, the B2B specialist researchers suggested also extending the B2B set of keywords to cover the field. Based on this feedback, a second research string added the following keywords: in the set related to neuroscience: “EEG,” “fMRI,” “SCR,” “heart,” “eye track” (see

a description of the tools in [Table 1](#)); and in the set related to B2B marketing: “professional sell*,” “account management,” “B2B sales,” “organizational buying behavior.” This second search identified 197 studies. The third search, applying the extended search string for the years 2021–2024, identified 1207 additional studies. Therefore, the initial identification resulted in 2,336 records.

Screening: inclusion and exclusion criteria

After removing duplicates, the dataset comprised 2297 publications to screen. The inclusion criterion established stated that the publications had to belong to both sets of keywords: neuroscience and B2B marketing. To broaden the perspective of our analysis, we also considered those B2C studies which were mentioning the B2B area and were having potentially transferable results to B2B. Several articles from the B2C context were included in the initial results of our search, because our search terms were not limited to search within the “title, abstract, keywords” fields, but we expanded our search to all potential search fields of the articles. This led to the inclusion of articles in these initial search results, which were, for example, citing a paper with the term “B2B” in its title in their own reference list (e.g. Al-Kwafi 2016; Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández 2018). We purposefully made this decision to gain a broad understanding and perspective of the neuroscience field, while at the same time maintaining the connection to the B2B area. Due to these extensive initial inclusion criteria, we conducted a more thorough screening and exclusion of articles in this stage.

The exclusion criteria were focused on two main filters; one was to exclude publications out of the scope of review and the other one out of related fields of research. This process was double-checked

Table 1. Description of neuroscience tools.

Description of the neuroscience tools used in the keywords of the search string
fMRI (functional magnetic resonance imaging) is a neuroimaging tool that detects blood flow measuring activity in specific areas of the brain.
EEG (electroencephalography) is a neuroimaging tool able to monitor (de)activation of different waves and brain lobes measuring electrical brain activity.
Eye-tracking is an external device considered a neurophysiological tool able to track eye position, movement and pupil dilatation. These glasses offer the possibility to record the gaze, highlight areas of interest and heat maps.
SCR (skin conductance response) refers to the autonomic nervous system response transmitted by the skin sweat glands.
Heart rate offers the possibility to measure variations in the parasympathetic and sympathetic activity of the autonomic nervous system.

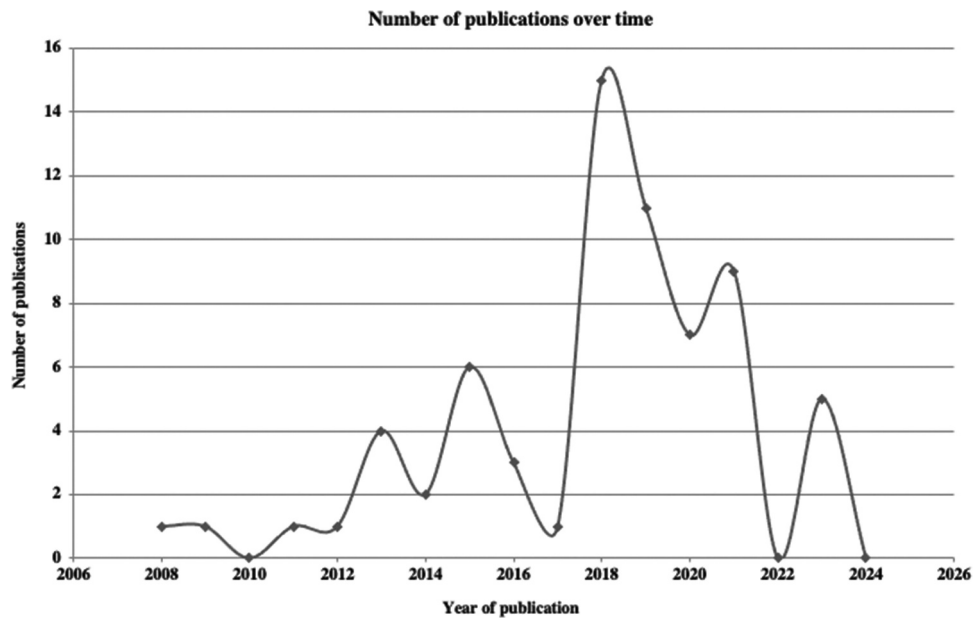


Figure 2. Number of studies over time.

by all four authors of this article in a two-step blind process, meeting the quality assessment of the peer-reviewed process (Cooper et al. 2018). First, each author individually was assessing the eligibility of the publication (based on the title, abstract and keywords); second, inconsistent decisions were thoroughly discussed. Due to the extensive inclusion of articles in the identification stage, we now also excluded articles due to “irrelevancy” for our investigation, which did either not use but only mention neuroscientific tools (e.g. Lam, DeCarlo, and Sharma 2019, mentioning neuroscience but using a survey/experiment instrument without neuroscience application the B2B selling context), or use neuroscience but have no direct connection or transfer potential to the B2B marketing field (e.g. Shahtalebi and Mohammadi 2018, which used the term “B2B” in their abstract as part of an abbreviation of “Bayesian double band spectrospatial filter optimization (B2B-SSFO)” in the context of brain computer interfaces). At this stage, we did not exclude studies from the B2C field, where at least two of the researchers saw a potential application or knowledge transfer to the B2B field (e.g. Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández 2018, investigating consumer reactions to risky/secure e-payments with fMRI; or Dietvorst

et al. 2009, developing a “Sales Force-specific Theory-of-Mind” (SToM)-Scale, testing its validity with classical methods and fMRI with respondents participating in an executive education program, with no specification of whether these participants were B2B or B2C salespersons). In total, 2202 publications were excluded because of their irrelevancy, resulting in 95 valid publications.

Eligibility: full publication evaluation

After the screening stage, the next step was to evaluate the full publications. Each paper was evaluated with respect to its relevance to the topic of neuroscience in B2B marketing. The publications had to meet the requirements of being a conceptual, qualitative, or quantitative study on the field of research of B2B or B2C marketing (whose topics and results could be transferred to B2B), and of using or discussing the usage of neuroscience tools such as EEG (electroencephalography), fMRI (functional magnetic resonance imaging), eye-tracking, SCR (skin conductance response), heart rate, facial coding, etc. After double-checking the 95 publications by four researchers, 28 articles were excluded from the dataset.

Inclusion: data coding and analysis

The final dataset contained 67 relevant records. The descriptive analysis shows that the publications can be found mainly in journals such as *Industrial Marketing Management* (10 articles), *Journal of Personal Selling and Sales Management* (3 articles), or *Frontiers in Neuroscience* (3 articles). Most of the studies were published in 2018 (see Figure 2).

These 67 articles of the dataset were coded and classified using the framework-based review approach theory-context-characteristics-methodology (TCCM) (Paul and Criado 2020; Paul and Rosado-Serrano 2019). An introduction to this methodology and the results of our analysis are presented in the next section.

TCCM analysis

In this section, we systematically review the literature on neuroscience in B2B based on the four stages of the TCCM framework (Chen, Mandler, and Meyer-Waarden 2021; Paul and Criado 2020; Paul and Rosado-Serrano 2019). This entails a discussion of the theoretical underpinnings of neuroscience research, analyzing the theoretical frameworks and lenses that are used in the “theory” stage of the TCCM framework. Subsequently, we turn to the empirical realm of neuroscience research in B2B. In the “context” stage of TCCM, we assess the different settings/contexts of the research in our sample, i.e. geographic context, industrial context, and time context. Moving from this macro-level of countries and industries to the micro-level, we examine the different marketing dimensions, concepts, variables, and instruments that are being used and investigated in the “characteristics” stage of the TCCM framework. This includes a detailed analysis of independent, mediating, moderating, or independent variables in neuroscience research in the B2B field. Lastly, we evaluate the field’s major methodological facets, such as the research strategy, data types, and instruments that have been employed to gain knowledge within the context of neuroscience in B2B in the last stage of the TCCM, the “methodology” stage.

TCCM analysis: theory

We identified several theoretical perspectives in the domain of neuroscience in B2B marketing. This section provides an overview of the ones most frequently used, roughly categorized into three main groups: neurocognitive theories, behavioral theories, and psychological theories. Studies included in the category of neurocognitive theories aim to monitor neurophysiological activation or reactions to certain stimuli. Studies in the category of behavioral theories focus on changes in behavior or attitude as a main purpose, while studies in the psychological theories category aim to reveal internal neurological and psychological processes.

Neurocognitive theories

Neurocognitive theories in marketing research draw on a variety of theoretical foundations and paradigms that help understand internal processes that can be answered with neuroscience tools. Among the 67 articles of this review, 12 are theoretically framed on neurocognitive approaches. A total of four articles rely on neuroeconomics or broadly named neuroscience (Ascher et al. 2018; Dietvorst et al. 2009; Riedl and Javor 2012; Weber 2018); four in organization neuroscience based on cognitive processes (Bagozzi and Verbeke 2020; Cucino et al. 2022; Healey and Hodgkinson 2015; Verbeke et al. 2011), two in human cognition (Hodgkinson, Wright, and Anderson 2015; Huang et al. 2021), and two in the cognitive load theory (Buettner 2016; Lim et al. 2019), one of them in a combination with the brain-based learning theory (Lim et al. 2019). All of these theories aim to study neural and behavioral cognitive processes. Neurocognitive theories focus on understanding how a certain stimulus is processed by human cognition. In this vein, these theories offer support to explore attention, memory, overload, or arousal with neuroscience tools.

Behavioral theories

Behavioral theories are the most commonly used framework to ground the neuroscience studies in our sample, employing 12 different theories in 25 articles. One of the reasons for this is the frequent use of behavioral surveys together with

neuroscience experiments to offer robustness to these studies. Out of the 67 articles of this review, 5 are grounded in information processing-related theories, such as the Elaboration Likelihood Model to study attitudinal changes, and decision-making paradigms (Alonso Dos Santos and Calabuig Moreno 2018; Ferguson and Mohan 2020; Guerrero Medina et al. 2021; Mora Cortez, Gilliland, and Johnston 2020; Young 2017). The information processing approach focuses on explaining people's attitudes after being exposed to persuasion stimuli. Moreover, four articles are framed on relationship theories (de Bondt, Mayoral, and Vallelado 2013; Mesly 2015; Pandey and Mookerjee 2018; Papen et al. 2019) and four on the technology acceptance model (Al-Kwafi 2016; Dumont et al. 2018; Pandey and Mookerjee 2018; Riedl and Javor 2012), to understand the effect of relations or technology, respectively, on behavior. Also, two articles are based on game theory (Krueger and Meyer-Lindenberg 2019; Xu, Becker, and Kendrick 2019) and price theory (Hinterhuber 2015; Koschate-Fischer and Wüllner 2017) as part of economic behavioral research. There are some articles which combine theories such as behavioral inhibition/activation system theory and the Stimulus-Organism-Response model (van Zeeland and Henseler 2018) to explain the effect of, for example, the professional buyer's social cues on the behavioral response. As a single use, the following paradigms have been also used: Service and Brand theories (Yang and Kim 2019), Service-Dominant-Logic (Randall et al. 2014), Behavioral economics (de Bondt, Mayoral, and Vallelado 2013), Uses and gratification theory (Russo et al. 2023), Prospect theory (Pirraglia et al. 2023), and Customer equity framework (Du et al. 2021).

Psychological theories

In this review, 15 articles used 12 psychological theories, such as Regulatory Focus theory (Chugh et al. 2023), Social learning theory (Ceravolo et al. 2021), Theory of mind (Gabler et al. 2019; McFarland and Dixon 2021), Coping theories (McFarland and Dixon 2021), Situational awareness theory (Marcus et al. 2020), Task-rule-congruency paradigm (Dezwaef et al. 2019),

Pleasure-Arousal-Dominance model (Al-Kwafi 2016), Social exchange theories (Mesly 2015; Pandey and Mookerjee 2018; Riedl and Javor 2012; Verbeke et al. 2011), Theory of personal constructs (Hodgkinson, Wright, and Anderson 2015), Social identity theory (Hodgkinson and Healey 2014), Emotional intelligence theory (Borg and Johnston 2013), and Self-perception theories (Verbeke et al. 2011). All these theories, applied to neuroscience, shared the intention to reveal internal neurological and psychological processes.

Other theories that contribute to ground the studies of this systematic literature review are Self-efficacy (Gabler et al. 2019), Constructal theory (Ascher et al. 2018; Hodgkinson 2015; Lee and Yun 2019), Strategic management theories (Mogaji, Czarnecka, and Danbury 2018), Communication model (Hodgkinson and Healey 2014), Institutional theories (Hodgkinson 2015; Hodgkinson and Healey 2014), and Economic theory (Randall et al. 2014).

Table 2 gives an overview of the theoretical perspectives in the analyzed articles on neuroscience in B2B marketing.

TCCM analysis: context

The context section of this TCCM review aims to analyze the geographic context, industrial context, and time context of the publications in our sample. Regarding geography, most studies of Neuroscience in B2B marketing are set in Europe (16 articles), followed by North America (7 articles), Asia (6 articles), and South America (2 articles). Focusing on quantitative articles running experiments with neuroscience tools (that is, not considering conceptual articles), eleven studies have been conducted in Europe (Bagozzi and Verbeke 2020; Buettner 2016; Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández 2018; Ceravolo et al. 2021; Dietvorst et al. 2009; Dumont et al. 2018; Guerrero Medina et al. 2021; Mobbs et al. 2015; Papen et al. 2019; Russo et al. 2023; Verbeke et al. 2011), four in North America (Dumont et al. 2018; Ferguson and Mohan 2020; Huang et al. 2021; Mesly 2015), and five in Asia (Aprilianty, Purwanegara, and Ismail 2018; Lee and

Table 2. Theoretical perspectives in neuroscience in B2B marketing.

Theoretical perspective	Theories employed	No. of articles	Studies
Neurocognitive theories (12 articles, 5 theories)	Human cognition/cognition model	2	Huang et al. (2021), Hodgkinson (2015)
	Organization neuroscience/Neurocognitive	4	Cucino et al. (2022), Bagozzi and Verbeke (2020), Healey and Hodgkinson (2015), Verbeke et al. (2011)
	Brain-based learning theory	1	Lim et al. (2019)
	Cognitive load theory	2	Lim et al. (2019), Buettner (2016)
	Neuroeconomics/Neuroscience	4	Ascher et al. (2018), Riedl and Javor (2012), Weber (2018), Dietvorst et al. (2009)
Behavioral theories (25 articles, 12 theories)	Use and Gratification theory	1	Russo et al. (2023)
	Prospect theory	1	Pirraglia et al. (2023)
	Decision-making & information processing	3	Guerrero Medina et al. (2021), Alonso Dos Santos and Calabuig Moreno (2018), Young, (2017)
	Elaboration Likelihood Model	2	Mora Cortez, Gilliland, and Johnston (2020), Ferguson and Mohan (2020)
	Relationship theories	4	Papen et al. (2019), Mesly (2015), de Bondt, Mayoral, and Vallelado (2013), Pandey and Mookerjee (2018)
	Game theory	2	Krueger and Meyer-Lindenberg (2019), Xu, Becker, and Kendrick (2019)
	Service and brand theories	1	Yang and Kim (2019)
	Technology acceptance model	4	Dumont et al. (2018), Al-Kwif (2016), Riedl and Javor (2012), Pandey and Mookerjee (2018)
	Behavioral inhibition/activation system theory	1	van Zeeland and Henseler (2018)
	Stimuli-Organism-Response model	1	van Zeeland and Henseler (2018)
	Price theory	2	Koschate-Fischer and Wüllner (2017), Hinterhuber (2015)
	Service-Dominant-Logic	1	Randall et al. (2014)
	Behavioral economics	1	de Bondt, Mayoral, and Vallelado (2013)
	Customer equity framework	1	Du et al. (2021)
Psychological theories (15 articles, 12 theories)	Regulation Focus theory	1	Chugh et al. (2023)
	Social learning theory	1	Ceravolo et al. (2021)
	Theory of mind	2	McFarland and Dixon (2021), Gabler et al. (2019)
	Coping theories	1	McFarland and Dixon (2021)
	Situational Awareness theory	1	Marcus et al. (2020)
	Task-rule congruency paradigm	1	Dezwaef et al. (2019)
	Pleasure-Arousal-Dominance model	1	Al-Kwif (2016)
	Social exchange theories	3	Mesly (2015), Riedl and Javor (2012), Pandey and Mookerjee (2018), Verbeke et al. (2011)
	Theory of personal constructs	1	Hodgkinson, Wright, and Anderson (2015)
	Social identity theory	1	Hodgkinson and Healey (2014)
	Emotional intelligence theory	1	Borg and Johnston (2013)
Self-perception theories	1	Verbeke et al. (2011)	
Other theories (6 articles, 5 theories)	Self-efficacy	1	Gabler et al. (2019)
	Constructual theory	3	Lee and Yun (2019)
	Strategic management theories	1	Ascher et al. (2018), Hodgkinson (2015)
	Communication model	1	Mogaji, Czarnecka, and Danbury (2018), Hodgkinson and Healey (2014)
	Institutional theories	2	Hodgkinson (2015)
	Economic theory	1	Randall et al. (2014)

The reported frequencies are based on 67 analyzed articles.

Yun 2019; Ma, Zhang, and Wang 2018; Wang, Huarng, and Chuang 2018; Yang and Kim 2019).

Regarding industrial context, seven articles are set in a narrower industrial goods B2B context, further eleven studies in a broader, more general B2B context (i.e. also encompassing B2B transactions in wholesale of consumer goods), and 22 in B2C with B2B transfer potential. The 18 B2B articles can be categorized as OEM business (two articles), system business (three articles), project

business (two articles), and product business (eight articles) and cross-business-domain-articles (three articles) (Backhaus et al. 2011).

Attending to the years on publication, there are five articles in 2023, nine articles in 2021, seven in 2020, eleven in 2019, fifteen in 2018, one in 2017, three in 2016, six in 2015, two in 2014, four in 2013, one in 2012, one in 2009, and one in 2008. Specifically, when observing only the B2B marketing neuroscience experiments (excluding

conceptual or revisions and those articles focused on B2C with possibility to transfer results to B2B), there are only five articles published in the last decade (Aprilianty, Purwanegara, and Ismail 2018; Bagozzi and Verbeke 2020; Buettner 2016; Ferguson and Mohan 2020; Verbeke et al. 2011).

Digging deeper in these most recent articles, Ferguson and Mohan (2020) run an eye-tracking experiment to study the effects of B2B advertising on hedonic and utilitarian products on attention, recall, and attitude. Bagozzi and Verbeke (2020) analyze genetics via human saliva to understand physiological reactions of industrial salespersons to underpin motivation and job satisfaction. Aprilianty, Purwanegara, and Ismail (2018) use electroencephalography to study the buyer's role in collaborative business. Buettner (2016) utilizes eye-tracking to study the cognitive load in negotiation support. Verbeke et al. (2011) design an fMRI experiment to investigate how personality traits affect salespersons.

TCCM analysis: characteristics

We also analyzed the articles with connections to B2B regarding specific marketing dimensions and instruments, which we see as the characteristics of the papers. Fourteen articles (23%) focus on communication and branding aspects, eleven articles (18%) on relationship management, ten articles (17%) on sales and negotiation issues, and seven articles (12%) on pricing. Most contributions (33%) have other marketing references. Moreover, nine articles are without clear marketing references but adaptable to the discipline. By focusing on communication and branding topics, it is noticeable that nearly a quarter of articles are addressing typical neuromarketing subjects which are

discussed and applied in B2C environments in similar ways. Mora Cortez, Gilliland, and Johnston (2020) are, for example, investigating the evolution of B2B advertising tools and suggest the application of fMRI or EEG to detect their effects across buying center members. Other articles focus on particularly B2B-specific issues such as relationship management or negotiations. These articles reach out to incorporate neuroanalytic tools contributing to the underlying B2B research questions. Dietvorst et al. (2009), for example, develop a scale for measuring how well salespeople can recognize customer intentions and interpersonal cues and adjust to them accordingly within the negotiation process. They used fMRI to pinpoint areas in the brain that distinguish high versus low interpersonal mentalizers and match them with the scales (Dietvorst et al. 2009). Table 3 gives an overview of the identified B2B marketing topics that were addressed in the analyzed publications.

Overall, 39 articles (58%) contain constructs and variables, either in a suggested conceptual or actual empirical tested way. Almost half of contributions are written on a purely conceptual level or are reviewing existing literature. While 39 papers contain independent (IVs) as well as dependent (DVs) variables in general, we could recognize a wide variety within those variables. Our review suggests that the vast majority of studies include IVs on the level of marketing-related stimuli (61%). These stimuli could be either communication-, product/service- or interaction and relationship related. Seng and Ang (2018), for example, use service stimuli as IVs and investigate their impact on customer emotions. They propose an audio – visual emotion recognition system to detect six basic emotions like happiness, sadness, or fear from video data. The detected customer emotions are mapped and translated into customer satisfaction scores (Seng and Ang 2018). Examples for the relationship factors as IVs are “the interaction with management support systems” (Buettner 2016), “buying situations” (Aprilianty, Purwanegara, and Ismail 2018) or “managerial advices” (Mobbs et al. 2015). Buettner (2016) executed a facial coding-based evaluation of cognitive load while sales managers have been using a negotiation support system during negotiation. It was measured if and how the interaction with the negotiation support systems as IV

Table 3. B2B marketing topics addressed in neuroscience research (single articles contained more than one marketing topic).

Marketing/sales topic	No. of articles	%
Pricing	7	10
Sales & Negotiations	11	16
Relationship Marketing	12	18
Communication & Branding	16	24
Other Marketing topics	21	31
No specific Marketing topic	9	13

The reported frequencies are based on 67 analyzed articles.

impacted on cognitive load during the negotiations (Buettner 2016). The second group of identified IVs category comprises personal factors like initial trust (Mesly 2015), personality traits (Verbeke et al. 2011), or personal skills (Gabler et al. 2019). Personal factors account for 26% of the independent variables. Gabler et al. (2019) for instance evaluated the impact of interpersonal mentalizing skills as IV on sales performance. The third category, representing 10% of analyzed IVs, contains situational factors like stress (Papen et al. 2019), time constraints (Lee and Yun 2019), or emotions (Ma, Zhang, and Wang 2018). Lee and Yun (2019) investigate the effect of time constraints on moral decision-making using fNIRS. They found that drastic time constraints can overwhelm the activities of the moral brain and by increasing decision stress could possibly lead to moral incompetency.

We found that 12 of the assessed 67 articles (20%) contain mediators while we could not identify related clusters. Single mediators used in the related investigations are, e.g., factors of relationship quality (Papen et al. 2019), perceived decision difficulty (Lee and Yun 2019), or commitment to industrial sellers (Aprilianty, Purwanegara, and Ismail 2018). Only

some single articles take moderating effects or controls into account. Dependent variables (DVs) have been found in 39 (58%) of the analyzed articles. Content-wise analyzed DVs can be divided into four categories: The majority of DVs (11 articles, 28%) can be described as situative activation factors. They comprise variables like attention (Alonso Dos Santos and Calabuig Moreno 2018), emotions (Balasubramanian, Jagannath, and Adalarasu 2013) or different ways of perception, e.g. price perception (Ma, Zhang, and Wang 2018). A second DV category (11 articles, 28%) includes personal factors such as DVs like trust (Krueger and Meyer-Lindenberg 2019), attitude (Ferguson and Mohan 2020) or the willingness to act, e.g. willingness to pay (Dezwaef et al. 2019). Seven articles (18%) containing performance and action factors like sales performance (Borg and Johnston 2013; Gabler et al. 2019) form the third category of DVs. Lastly, decision-making variables, e.g., in challenging managerial situations (Randall et al. 2014) or professional financial contexts (Mesly 2015) can be summarized as fourth category of DVs (five articles, 13%).

Finally, our review of the investigated dependent variables shows that 19 studies (28%) use

Table 4. Characteristics investigated in B2B neuroscience research.

Characteristics	No. of articles	%
Articles with constructs/characteristics	39	58
Articles w/o constructs/characteristics	28	42
Articles with independent variables (IV)	39	58
Independent variables (IV)		
Marketing stimuli/trigger	24	61
Personal factors (initial trust, personal skills, personality traits)	10	26
Situative factors (emotions, stress, time constraints)	4	10
Others	1	3
Marketing/sales stimuli/trigger as independent variables (IV)		
Communication trigger	8	33
Product/service trigger	6	25
Interaction/relationship trigger	7	30
Pricing trigger	2	8
Other marketing/sales trigger	1	4
Articles with mediating variables	13	19
Articles with control variables	8	12
Articles with moderating variables	8	12
Articles with dependent variables (DV)	39	58
Dependent variables (DV)		
Situative activation factors (attention, perception, emotions)	11	28
Personal factors (trust, attitude, willingness to act)	11	28
Performance and action factors (sales performance, negotiation strategy)	7	18
Decision making (purchase decision, financial decision)	5	13
Other factors	5	13
Articles using neuromeasures for DV measurement (some are using more than one neuromeasure)		
fMRI	5	26
fNIRS	1	5
EEG	11	58
ET	4	21
FC	1	5

The reported frequencies are based on 67 analyzed articles.

neuromeasures in order to investigate the addressed DVs. Approx. 50% of the identified DVs are measured exclusively or supplementarily by neuroscientific tools. That DV measurement is strongly dominated by electroencephalogram (EEG) data (eleven articles, 58%) followed by functional magnetic resonance imaging (fMRI) (five articles, 26%) and eye-tracking data (ET) (four articles, 21%).

Table 4 provides a summary of the characteristics described here.

TCCM analysis: methodology

This section covers the methods used in the analyzed publications, whether own data were collected or secondary data were used, and which tools were used (e.g. EEG, fMRI, ET, ...).

The publications were divided into conceptual or literature review papers, qualitative papers, which were based on interviews and did not use special neuroscience tools, and papers, which actually collected data and used different neuroscience tools.

Of the 67 publications examined, 32 were conceptual papers or review papers (Öberg 2023; Cucino et al. 2022; Muñoz-Leiva et al. 2021; González-Morales, Mitrovic, & Garcia 2020; Lindgreen et al. 2020; Marcus et al. 2020; Mora Cortez, Gilliland, and Johnston 2020, Rawnaque et al. 2020; Vences et al. 2020; Ortega-Gijon and Mezura-Godoy 2019; Krueger and Meyer-Lindenberg 2019, Alcañiz, Bigné, and Guixeres 2019; Xu, Becker, and Kendrick 2019; Barraza et al. 2019; Baek and Falk 2018; Al-Kwafi 2016, Lim 2018; Revilla-Camacho et al. 2018; Ascher et al. 2018; van Zeeland and Henseler 2018; Koschate-Fischer and Wüllner 2017; Young 2017; Hodgkinson 2015; Healey and Hodgkinson 2015; Hinterhuber 2015; Hodgkinson and Healey 2014; Borg and Johnston 2013; de Bondt, Mayoral, and Vallelado 2013; Riedl and Javor 2012; Wang and Minor 2008, Du et al. 2021; Lim et al. 2019) that did not collect their own data and did not access any other data. Of these publications, the majority (19 articles) did not originate from the B2B sector and were included in this study for reasons of potential transferability. Regardless of whether they originate from the B2B or B2C sector, these papers

will not be discussed in more detail in this section. Instead, the method section of the other studies that used primary data will be analyzed in more detail.

Of the remaining 35 publications, three are qualitative studies. The focus here is on neuroscientific topics, yet the studies described are limited to conducting interviews (Mogaji, Czarnecka, and Danbury 2018; Pandey and Mookerjee 2018; Randall et al. 2014). Mogaji, Czarnecka, and Danbury (2018) also presented a content analysis of 834 print advertisements for their work. This paper is about emotional appeals in British advertising for financial services, thus set in the B2B area. Randall et al. (2014) combine a literature review with interviews of supply chain team members to develop a model of the knowledge transformation process.

Of the papers analyzed within this review, 32 are quantitative, of which three of the publications did not use neuroscience tools within their studies. Gabler et al. (2019) instead focused on examining the impact of interpersonal mentalizing skills by analyzing sales data (Gabler et al. 2019). The second study addressed a previous study in relation to a set of bipolar attributes based on the well-known affective circumplex model of human emotion (Hodgkinson, Wright, and Anderson 2015). The last of the three studies explores the question “Does It Matter How One Assesses Moral Reasoning?” (Weber 2018). The aim here is to investigate whether differences arise when using a learning recognition task, versus a knowledge formulation task, to assess individual moral judgment (Weber 2018).

Of the remaining work, eight studies used EEG, another seven used fMRI, four used eye-tracking, and two studies analyzed facial expressions (Papen et al. 2019; Seng and Ang 2018). Seng and Ang (2018) suggested an audio – visual emotion recognition system to detect the universal six emotions from video data. These emotions were afterward mapped and translated. Papen et al. (2019) used a service–employee interaction and a psychological stress induction (Social Evaluative Cold-Water Pressure Test [SECPT]) to give customer satisfaction scores.

Table 5. Overview of analyzed studies adapting quantitative methods.

Process used	n	Stimuli (Data collected)	Device	Study	
EEG	16	Four computer algorithms differing in credibility and reliability, system monitoring subtask of Air Force Multi-Attribute Task Battery (AF-MATB)	BCI 2000 (Schalk et al. 2004) and g.USBamp amplifiers (g.tec Medical Engineering), sampled at 256 Hz and notch-filtered at 60 Hz.	Huang et al. (2021)	
	37 (19)	Four service categories (E-commerce, finance, airline, and accommodation), two popular brands from each category	actiCHamp, Brain products GmbH	Yang and Kim (2019)	
	26 (23)	60 pictures obtained from the Internet, brands erased. In event-related potential (ERP) experiment, two groups of random number and each picture was paired with a high price set and a low price set – 4 groups in total.	NeuroScan SynAmps 2 Amplifier; Scan 4.5, Neurosoft Labs	Ma, Zhang, and Wang (2018)	
	42	Zik.ca, a major online music store in Canada at the time of data collection	A Magstim DC stimulator (Magstim, Whitland, UK) EEG was recorded using EGI 32 electrodes and analyzed using Brain Vision software	Dumont et al. (2018)*	
	40	Framed trading patterns of different types of buyer	EMOTIV Insight	Aprilianty, Purwanegara, and Ismail (2018)	
	60	“Three different sporting activities where the level of congruence was perceived in a different way according to the different attributes of sponsorship message”	Mindset device, developed by NeuroSky Inc.	Alonso Dos Santos and Calabuig Moreno (2018)	
	8	TV commercials		Balasubramanian, Jagannath, and Adalarasu (2013)	
	30	120 advertisements; award-winning and non-award-winning (ERPs)	Synamps2, Quik-Cap and SCAN 4.3.3; STIM2 analysis software	Wang, Huang, and Chuang (2018)	
	Eye-tracking	53 (48)	18 consecutive slides, displaying as many different Key Investor Information Documents (AOIs: entry time, end trial time, net dwell time, fixations, average fixation duration)	SMI REDn Scientific (SensoMotoric Instruments GmbH, Berlin, Germany)	Ceravolo et al. (2021)
		62	Print advertisement for a commercial shredder with and without celebrity. (Heat Map, AOIs: Fixations and durations)	TobiiX2–60 (Danderyd, Sweden)	Ferguson and Mohan (2020)
42		Zik.ca, a major online music store in Canada at the time of data collection	Tobii X60 (Danderyd, Sweden)	Dumont et al. (2018)*	
13 (5)		A standard, a chat-based, and an argumentation-based negotiation support system (pupil diameter and SD, number gaze fixations, saccades)	EyegazeEdgeTM System	Buettner (2016)	
fMRI	18	25 products twice while in the scanner (products consisted of a choice of categories of low-involvement food, office and household cleaning articles plus Corporate Social Responsibility (CSR) claims	3 Tesla Trio Siemens Scanner	Guerrero Medina et al. (2021)	
	30	Four low-involvement products accompanied by the Paypal symbol; the same products accompanied by a debit card	Device not mentioned. Stimuli were presented via E-Prime Professional 2.0	Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández (2018)	
	13	Event related fMRI experiment: image with a specific word is attached to a specific brand name (e.g.; Apple user images related to the Samsung brand were presented)	Device not mentioned.	Al-Kwif (2016)	
	23 (16)	Advisor-Advisee Game, where subjects acted as an Advisor to a confederate Advisee who selected one of the three options when trying to win money	3-T Tim Trio Magnetic Resonance Imaging scanner (Siemens, Germany)	Mobbs et al. (2015)	
	47 (20)	maze trying to capture a yellow circle that earns them money or else flee a red triangle that, if it catches them, will make them lose money	Device not mentioned.	Mesly (2015)**	
	20	fMRI used to identify salesperson as high or low mentalizer	Device not mentioned.	Dietvorst et al. (2009)	
	43	Mach-IV test, compared with an MRI scan	3-D MRI machine using a dedicated eight-channel head coil.	Verbeke et al. (2011)	
Device Combination	40	Two conditions were studied, once an infomercial was administered with a male seller and once with a female presenter. EEG and eye-tracking were used.	NVX 52 device with 2000 Hz (24 channels); Tobii EyeTracker ProSpectrum (60 Hz)	Russo et al. (2023)	

The reported frequencies are based on 67 analyzed articles.

T	Neurocognitive theories	Behavioral theories	Psychological theories
C	Geographic context: Europe North America South America Asia	Industrial context: OEM business Systems business Project business Product business	Timing context: (2009-2021)
C	Marketing instruments: Pricing/ Sales/ Negotiations Relationship management Branding/ Communications	Independent variables (IVs): Marketing stimuli Personal factors Situative factors	Dependent variables (DVs): Personal factors Situative factor Performance, action and decision making
M	Neuroimaging tools (fMRI, EEG)	Neurophysiological tools (Eye tracking)	Biochemical tools (Genetic data)

Figure 3. TCCM: distribution of theories, context, characteristics, and methods applying neuroscience in B2B marketing.

Lee and Yun presented a work with neural investigations, which were conducted with a two-part fNIRS experiment (Lee and Yun 2019). First, the DLPFC activity was measured under time constraint while the agents solve a business-related moral dilemma. Second, the time constraint factor was manipulated as and the brain activity of selective moral agents while they make moral choices in solving dilemmas was measured.

Also, two studies examined biochemical parameters, in this case, saliva for the investigation of genetic and psychological underpinnings of motivation and satisfaction (Bagozzi and Verbeke 2020; Mesly 2015).

The rest of the quantitative studies that did not use neuroscientific tools were limited to the use of surveys (McFarland and Dixon 2021), or an adaptation of the task-rule congruency (TRC) paradigm (Dezwaef et al. 2019).

Table 5 provides an overview of the quantitative studies in our analysis. Overall, Figure 3 summarizes the findings of our TCCM analysis of neuroscience in B2B marketing.

This table lists the quantitative work only. The number of test subjects and the number of those actually included in the results are given in parentheses. The stimuli refer only to the respective tool used. Almost all of the studies described here have integrated a questionnaire into their studies in addition to the use of EEG, eye-tracking, or other tools (* within this study different tools were used, which is why it appears several times in the table; **

here another study was described, which was not conducted in the context of the presented work).

Outlining a future research agenda for neuroscience in B2B marketing

After this overview of the existing literature on neuroscience in the B2B field, in this section we link existing and suggested neuromarketing research with B2B marketing research priorities formulated by the Institute for the Study of Business Markets (ISBM) (ISBM – Institute for the Study of Business Markets n. d.; Wuyts 2021) and the Marketing Science Institute (MSI) (Marketing Science Institute 2020). We clustered and merged a selection of the multitude of B2B research priorities in five overarching themes. These themes were derived from discussions of the authors of this study on the B2B research priorities. Based on the findings of our TCCM analysis, the goal was to identify where neuroscience could already now or potentially be useful for B2B marketing in the future. These themes are 1) decision-making, 2) marketing stimuli, value, and broader responses, 3) digitalization, 4) research methods and measurement, as well as 5) the general advancement of existing knowledge. For the first three relatively specific B2B research priority themes, we briefly outline the research analyzed in this review, which was using or related to neuroscience in the B2B area in the following sections. We

Table 6. Propositions for future lines of research of neuroscience in B2B.

B2B Marketing – research priority themes	Exemplary articles and opportunities investigating or mentioning these gaps	Propositions for future research, based on ISBM and MSI research priorities (Wuyts 2021; ISBM – Institute for the Study of Business Markets n.d.; Marketing Science Institute 2020)
Decision-making	Hodgkinson, Wright, and Anderson (2015); Hinterhuber (2015); Randall et al. (2014); Koschate-Fischer and Wüllner (2017); van Zeeland and Henseler (2018); Du et al. (2021)	<ul style="list-style-type: none"> ● How can neuroeconomic concepts, theories, and measures help understand and explain decision-making in inter-organizational relationships? ● How can neuroeconomic concepts, theories, and measures help improve decision-making in inter-organizational relationships? ● How can neuroeconomic concepts, theories, and measures help understand the neural basis of the decision-making process in B2B? ● How can neuroeconomic concepts, theories, and measures help understand the influence of personal factors or external, situative factors and stimuli (economic/market development, institutions, socio-economic class, inequality, racial and gender aspects, cultural factors, social networks, . . .) on decision-making in B2B? ● How can neuroeconomic concepts, theories, and measures help predict likely buying center choice? ● How can neuroeconomic concepts, theories, and measures provide new insights into implicit attitudes and psychological processes in B2B?
Marketing stimuli and responses	Mora Cortez, Gilliland, and Johnston (2020); Ferguson and Mohan (2020); van Zeeland and Henseler (2018); Du et al. (2021); (Lim 2018);	<ul style="list-style-type: none"> ● How can neuroeconomic concepts, theories, and measures help understand and explain the influence of marketing stimuli in business markets (e.g. pricing, product or service, branding, advertising, communication, channel, . . .)? ● How can neuroeconomic concepts, theories, and measures help conceptualize and understand value in business markets (customer value, but also of marketing in general)? ● How can neuroeconomic concepts, theories, and measures help explain and predict responses from customers, buyers, channels, sellers, and suppliers in business markets (e.g. behavior, attitudes, values, brand awareness, brand preference, platform and channel preference?) ● How can neuroeconomic concepts, theories, and measures help explain and predict the complex interactions and relationships in business markets, between customers, buyers, channels, sellers, and suppliers? ● How can neuroeconomic concepts, theories, and measures help explain customer journey differences? ● How can neuroeconomic concepts, theories, and measures help attribute and apportion outcomes to various causal factors?
Digitalization	Alcañiz, Bigné, and Guixeres (2019); Du et al. (2021); Muñoz-Leiva et al. (2021); Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández (2018)	<ul style="list-style-type: none"> ● How can neuroeconomic concepts, theories, and measures help evaluate challenges and opportunities with new technologies (e.g. automation/robots, AI, IoT, 5G, voice activation, virtual/augmented reality, . . .) ● How can neuroeconomic concepts, theories, and measures help understand how new technologies (e.g. automation/robots, AI, IoT, 5G, voice activation, virtual/augmented reality, . . .) change interaction and decision-making processes in B2B? ● How can neuroeconomic concepts, theories, and measures help advance marketing in a digital world, with digital transformation and digital natives?
Research methods and measurements	Lim (2018); Mora Cortez, Gilliland, and Johnston (2020); van Zeeland and Henseler (2018); Hinterhuber (2015); Hodgkinson (2015); Randall et al. (2014); Du et al. (2021)	<ul style="list-style-type: none"> ● How can neuroeconomic methods and measures help advance current research methods and measurement in business marketing? ● Which implicit measurements could best help to improve self-reporting or other explicit modes of measurement? ● Which are the appropriate methods (traditional, neuroeconomic, or both) for different business marketing problems? ● How can experimental research designs using neuroeconomic methods best be conducted in business markets?
Improvement of existing knowledge	Hodgkinson (2015); Lindgreen, Di Benedetto, and Kock (2021); McFarland and Dixon (2021); Lim (2018); van Zeeland and Henseler (2018)	<ul style="list-style-type: none"> ● Interdisciplinary research & combination of methods: How can researchers combine neuroscience methods with traditional methods to offer more robust results and uncover areas of research that were not fully accessible so far? ● When should insights from neuroeconomics supplement or replace traditional approaches?

(Continued)

Table 6. (Continued).

B2B Marketing – research priority themes	Exemplary articles and opportunities investigating or mentioning these gaps	Propositions for future research, based on ISBM and MSI research priorities (Wuyts 2021; ISBM – Institute for the Study of Business Markets n.d.; Marketing Science Institute 2020)
		<ul style="list-style-type: none"> • How can neuroeconomic studies (also conducted in the lab) be conducted in and extrapolated to the real world of business marketing? • How can neuroeconomic concepts, theories, and measures help validate current models to advance in the research of strategic knowledge in B2B? • How can neuroeconomic concepts, theories, and measures help validate current models to advance in the research of persuasion and influence?

furthermore describe contributions from our review in general neuroscience which could potentially be transferred to these B2B research themes. Lastly, we outline future research directions that we identified based on our analysis, where neuroscience could be helpful for the respective B2B research priority theme. For the two remaining, general research priority themes, research methods and measurement as well as the general advancement of existing knowledge, we focus on a more general outline of the research priority theme. Table 6 gives an overview of these potential B2B neuroscience research directions per theme.

Neuroscience and decision-making in B2B

One key research priority defined for B2B marketing research is decision-making in various contexts, like the improvement of decision-making in inter-organizational relationships or the role of digital technologies and data science to improve B2B decision-making (Wuyts 2021). Referring to our analysis, we see significant potentials for neuromarketing within B2B decision processes. First, our research reveals that decision-making represents one of the derived DV categories within the set of analyzed articles. Second, existing applications of neuromarketing within B2B decision-making are sparse but already provide concrete hints for future B2B research. Third, decision processes already seem to be one central investigation object within neuroscience in general with promising transfer potential to B2B environments (Fellows 2004; Rilling and Sanfey 2011; Sanfey 2007).

Analyzed research on decision-making as dependent variable in B2B using neuroscience

More in detail, in our analysis, we could identify decision-related DVs on managerial decision-making and views on decision processes in general (Weber 2018). Weber (2018) focuses on general decision taking, triggered by different types of moral reasoning by referring on neurocognitive processes and theories but without application of neuroscientific tools. Randall et al. (2014) propose a model showing the impact of personal traits on managerial decisions. The model is based on neuroeconomic principals. It is not yet applying but suggesting fMRI measures to investigate personal traits of managers and their influence on decision-making.

Analyzed research on factors influencing decision-making in B2B using neuroscience

Summarizing existing B2B neuromarketing research on decision-making, we can state the importance of personal traits (e.g. moral reasoning) and situative factors (e.g. stress) (Lee and Yun 2019) as IVs measured based on neurocognitive theories and by help of neuroanalytic tools like fMRI or ET.

Analyzed research on decision-making in general neuroscience potentially transferable to the B2B context

Plenty of contributions in general neuroscience, without B2B context, are addressing decision-making and decision processes (Fellows 2004; Mesly 2015; Papen et al. 2019; Rilling and Sanfey 2011; Sanfey 2007). Laureiro-Martínez et al. (2015) identified and contrasted specific brain regions and cognitive processes associated with exploitation

and exploration decisions within a sample of expert decision makers. Researchers like Philiastides and Sajda (2007) are specifically investigating early brain signals preceding explicit decision-making by applying EEG and fMRI. Papen et al. (2019) investigated the impact of stress on repurchasing decisions using facial coding (FC). Mesly (2015) evaluated the impact of trust on financial decision-making using fMRI. These general neuroscientific research activities on decision-making show promising transfer potential to B2B decisions within the addressed fields of B2B research priorities.

Future research directions on decision-making in B2B using neuroscience

Considering our findings within TCCM analysis, we suggest neuromarketing as one future key research field supporting B2B decision-making and outline the following research angles: First, neuromarketing research should support the investigation of relevant IVs potentially determining B2B decision-making. The focus should be on IVs, which could be indicated by neural and brain activity, especially when explicit self-declarations of decision makers concerning these IVs lack validity. Examples are personal factors like empathy or trust (Lawrence et al. 2006) as well as situative factors like stress or emotions (Papen et al. 2019). Such “inner” IVs tend to be challenging to measure explicitly (Cunningham, Raye, and Johnson 2004), especially for decision-makers in B2B, who are often restrictive when it comes to statements about personal factors and inner mental life (Huyghebaert et al. 2018). Second, we see research potential in the application of these IV-related neuroanalytic measurements within concrete B2B-related decision- and action scenarios. Examples are pricing or negotiation interactions and their related decisions. In addition, a highly interesting field of investigations could be usage scenarios of digital technologies supporting B2B decisions like pricing information systems or negotiation support tools (Buettner 2016). When using these tools, it could be measured how they (by triggering the personal and situative neuromarkers) affect the related decisions and outcomes. Third and finally, neuroanalytic early indicators

of decision-making should be the subject of B2B-related research. General neuroscientific research indicates that decisions could be at least partly detected within the brain shortly before the decision-maker becomes aware of his decision himself (Fifel 2018; Soon et al. 2008). The decision or decision direction as DV detected in early implicit stages represents a field of interest that could be transferred to relevant B2B decisions like purchasing- or project decisions. It could be of interest to figure the “point of no return” of a B2B decision-maker at which a decision is already activated in the brain but not yet articulated or personally “aware.”

Neuroscience, marketing stimuli, and responses in B2B

Broader responses to marketing stimuli, besides the actual decision-making, emerged as a further theme in B2B research priorities. The ISBM mentioned several aspects in their recent B2B research priorities study as well as in their traditional research priorities that would be worthwhile to investigate. These include the following: with respect to governance, to address the challenge of demonstrating the value of marketing in general in B2B organizations; to address the knowledge gap about how to organize B2B marketing around the concept of value; how market research in areas such as customer value creation, market segmentation, or the measurement of customer loyalty, brand equity, or customer satisfaction can be used; how firms can measure the value of their communications program; approaches and measurement methods for customer value in business markets; the best ways to conceptualize and understand customer value in general; what role brands and branding strategies play in business markets; how brand awareness affects brand preference; what new concepts, theories, and measures can be used to explain and predict customer response to eBusiness initiatives; or how the changing nature of customer experience in B2B can be conceptualized and assessed, and how it changes with buying situations and buying roles (ISBM – Institute for the Study of Business Markets n. d.).

Furthermore, the MSI specifically proposes research to better understand customers using neuroscience and biomarkers; into how a marketer can attribute and apportion outcomes to various causal factors; what the right product mix and pricing in the right channel is; and how customer journeys differ when the customer is a buying group rather than an individual consumer, the key differences between customer journeys in B2C vs B2B; as well as into the KPIs that best capture behavior, attitude, and values (Marketing Science Institute 2020).

Analyzed research on marketing stimuli and responses in B2B using neuroscience

Also in this research priority theme, the literature that has covered it so far is scarce. Yet, there are investigations into broader responses such as hedonic and utilitarian attitudes as well as attention toward ads (Ferguson and Mohan 2020), and for the very important aspect of relationships and interactions in B2B, relationship quality constructs such as satisfaction, trust, commitment, or perceived value (Aprilianty, Purwanegara, and Ismail 2018), which incorporate neurophysiological measurements.

Analyzed research on marketing stimuli and responses in general neuroscience potentially transferable to the B2B context

Beyond the pure B2B research within the body of literature investigated here, several papers were identified that investigated broader consumer responses and marketing stimuli in the consumer area, which could potentially also be useful for the B2B context.

Applying EEG, neural processes in consumers underlying their judgment of service-to-service brand extensions (Huang et al. 2021), the influence of emotional arousal on price perceptions and willingness to purchase (Ma, Zhang, and Wang 2018), or the effectiveness of sponsorship messaging and sponsor-sponsee-congruence (Alonso Dos Santos and Calabuig Moreno 2018) were studied. Eye-tracking was applied to identify the influence of colors in financial documents on attention and behavior (Ceravolo et al. 2021). Furthermore, there are investigations into the influence of CSR strategy communication on perceived value and purchase intention using fMRI (Guerrero Medina

et al. 2021) or on time constraints, decision difficulty, stress increase, and moral incompetency (Lee and Yun 2019) using fNIRS. These contributions to a better understanding of consumers could also be worthwhile investigations in a B2B context.

Future research directions on marketing stimuli and responses in B2B using neuroscience

In relation to the research priority theme identified based on ISBM and MSI, several authors have also specifically proposed further research into broader responses and marketing stimuli in B2B using neuroscience. This includes marketing stimuli and the behavioral responses of customers, channels, and suppliers (Lim 2018), deeper investigations into B2B advertising and managers' responses (Ferguson and Mohan 2020), brand processing in the context of B2B advertising and buying center members behaviors (Mora Cortez, Gilliland, and Johnston 2020), the emotional state and implicit attitudes of buyers and their response to suppliers as well as the impact of social cues on decision-making processes, loyalty, and relationships (van Zeeland and Henseler 2018), as well as biometric responses throughout the customer journey, and using biometric responses to measure the effectiveness of acquisition efforts or to improve service encounters (Du et al. 2021).

Accordingly, we propose further research using neurophysiological methods on marketing stimuli and broader responses as fruitful avenues for future research, which can contribute to a better understanding of behaviors in the B2B context as well.

Neuroscience and digitalization in B2B

Both the ISBM and the MSI point to the increased emphasis on the digital world. This includes new ways of marketing in the digital world, with respect to digital natives and digital transformation, and how the use of digital technologies and data science could improve B2B decision-making (Wuyts 2021). Next, the explanation and prediction of responses to eBusiness initiatives, and the use of new concepts, theories, and measures is mentioned as a research priority (ISBM – Institute for the Study of Business Markets n. d.). Targeting marketing in general, the MSI proposes research into new technologies such as automation/robotics, AI, IoT, 5 G,

voice activation, virtual/augmented reality, and the challenges and opportunities these create (Marketing Science Institute 2020).

Analyzed research on digitalization in B2B using neuroscience

Due to the comparatively young age of both fields, digitalization and neuroscience, only one contribution was identified in this study covering these topics in the B2B context. A conference paper compared different types of negotiation support systems (standard, chat-based, and argumentation-based) and their influence on cognitive workload, with neurophysiological measurements of pupillary responses, eye gaze fixation, and eye saccades as cognitive workload indicators (Buettner 2016).

Analyzed research on digitalization in general neuroscience potentially transferable to the B2B context

With regard to the digitalization topics in conjunction with neuroscience in non-B2B-contexts, our analysis was slightly more fruitful. Researchers investigated the influence of credibility and reliability in the context of trust in human-automation interaction using EEG (Huang et al. 2021) or the usability of evaluation methods of brain computer interfaces in general, with reference to, for example, EEG, fNIRS, or magnetic encephalography (Ortega-Gijon and Mezura-Godoy 2019). Furthermore, papers covered noninvasive brain stimulation to explore the neural correlates of the Perceived Ease of Use construct of the Technology Acceptance Model (Dumont et al. 2018), and an investigation into the processing of risky and secure e-payment methods by consumers using fMRI (Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández 2018).

Future research directions on digitalization in B2B using neuroscience

Combining the digital and the physical world, extended reality (XR), which encompasses virtual, augmented, and mixed reality (VR, AR, and MR), has been identified as a realm for investigation using neuroscience and implicit measurement, using various signals and techniques – even for comparing cognitive and emotional states in XR and real environments (Alcañiz, Bigné, and

Guixeres 2019). Additionally, further investigations into e-payment, especially into neural responses and their corresponding usage intention, and neural correlates to privacy, confidentiality, or transaction costs (Casado-Aranda, Liébana-Cabanillas, and Sánchez-Fernández 2018). Additionally, in the context of e-merchandising, research using neuroscience in the contexts of VR, AR, or AI was proposed as relevant (Muñoz-Leiva et al. 2021). Lastly, there is a call to identify and incorporate biometric responses throughout the customer journey, and more specifically to optimize marketing messages in real time (Du et al. 2021). Based on these mostly consumer-oriented suggested research directions in the articles we analyzed, we propose that these could also be valuable for the B2B context and conclude that neuroscience could also be of help for B2B academia and practice in the context of digitalization.

Neuroscience and research methods and measurement in B2B

The theme of applying appropriate research methods and improving measurement has been mentioned in several different ways by the ISBM and MSI as well.

This includes the general question of how firms should best match research methods with marketing problems; best practices for business marketing research especially when there is a small number of customers; measurement methods that exist and could be adapted or developed to assess customer value in business markets; measuring customer loyalty, brand equity, customer satisfaction, or the value of communication programs; as well as the general theme of metrics, or the use of business marketing research (ISBM – Institute for the Study of Business Markets n. d.). The MSI specifically highlights the advances in using neuroscience and biomarkers to understand customers, and when insights from neuro should supplement or replace traditional approaches as research priority – including the ethical implications of neuro in comparison to other research (Marketing Science Institute 2020).

The characteristics and methodology sections of our TCCM analysis describe the ways in which researchers have already adopted neurophysiological

research methods and measurements in the B2B context. Yet, based on the comparatively small number of articles, there are still ample opportunities and many of the questions raised by the ISBM and MSI remain open. A further question is, how neuroeconomic and experimental studies could best be executed in a B2B context (van Zeeland and Henseler 2018).

Neuroscience and advancing existing knowledge in B2B

Lastly, the ISBM and MSI call for research that reinvestigates, improves on, or adapts existing knowledge in changing times. For example, considering the evolution of the buying process, there is a call to investigate to what extent our knowledge on buying centers and buyer behaviors is still valid; and the already mentioned calls on new concepts, theories, and measures to explain and predict customer response in ebusiness initiatives or customer value (ISBM – Institute for the Study of Business Markets *n. d.*). Additionally, questions on the advances in neuroscience and biomarkers, and how they can help to understand customers, and when these insights should replace or supplement traditional approaches are posed (Marketing Science Institute 2020). Lastly, both the ISBM and the MSI call for research on the gap between theory and practice – the ISBM focusing on the reality of business negotiations (ISBM – Institute for the Study of Business Markets *n. d.*), the MSI on how lab findings on consumer decision-making can be extrapolated to the real world, with the potential specific context, cultural and social factors influencing the outcomes (Marketing Science Institute 2020).

In general, many articles from the B2B context which we investigated in our TCCM analysis to a certain extent follow this goal. As described in the Theory chapter of our TCCM analysis, several articles applying neuroscientific methods ground their research in neurocognitive, behavioral, or psychological theories, with the goal to improve on them based on their results. They also do so in various geographical and industrial contexts. Yet also in this context, there are ample opportunities for future research.

Table 6 gives an overview of our propositions for future lines of research, which are based on the research priorities developed by the ISBM (ISBM – Institute for the Study of Business Markets *n. d.*; Wuyts 2021) and the MSI (Marketing Science Institute 2020), including articles in our analysis that mention or investigate aspects of these themes.

Discussion and conclusion

The first goal of this research (RQ1) was to provide an overview of the current state of the research field of neuroscience in B2B marketing, an important bridging discipline and field of interdisciplinary research (Lindgreen, Di Benedetto, and Kock 2021). One apparent yet important outcome is that the field of neuroscience in B2B is still very nascent, and the literature applying neuroscience directly in the B2B context is very limited. The majority of publications are conceptual or review articles. Furthermore, a good proportion of articles investigated here are rooted in a B2C context, but could potentially be transferred and tested in the B2B context. Overall, only 26 articles in our dataset apply empirical research, of which only seven are directly set in a B2B context. This shows the potential for empirical research for the validation of these conceptualizations, or the findings in B2C, in the B2B context.

Therefore, concerning our second research question (RQ2) and the goal to pave the way into the future of this interdisciplinary research field, there are ample opportunities for future research. Based on the research priorities of the ISBM and the MSI, we identified five broader themes in which we already see some advances in B2B marketing based on neuroscience today, but especially potential for future neuroscience research endeavors.

This covers the topics of 1) decision-making in B2B contexts (e.g. Hinterhuber 2015; Randall et al. 2014) or 2) marketing stimuli and responses, more specifically advertising and communication (Ferguson and Mohan 2020; Mora Cortez, Gilliland, and Johnston 2020), pricing (Hinterhuber 2015), or the neuroscientific investigation of trust formation in personal interactions (van Zeeland and Henseler 2018). Furthermore, the theme 3) on digitalization is proposed, with

examples on Human-Computer Interactions (Huang et al. 2021), which could provide new and useful insights based on neuroscientific findings. Lastly, theme 4) covers the application of neuroscientific research methods and measures in an appropriate way – an example is the investigation of sales performance, based on genetic or other neuroscientific measures (Bagozzi and Verbeke 2020; Dietvorst et al. 2009; Verbeke et al. 2011). But of course also other implicit measurements could be useful in order to shed light on processes that are difficult to evaluate and understand using behavioral measurements (Tuncdogan et al. 2019). Additionally, theme 5), the further investigation, improvement, adaptation, extension of existing knowledge emerges as an important research priority, specifically when advances in social cognitive neuroscience and neuroeconomics call into question fundamentally the principal psychological foundations that form the fundament of large bodies of work in B2B (Hodgkinson 2015).

B2B marketers who want to enter the realm of neuroscience and inform themselves about the possibilities and pitfalls of it, or are considering the implementation of neurophysiological research and measurements, can refer to recent guiding articles – specifically targeted on the B2B context (Lim 2018), marketing research in general (Wang and Minor 2008; Lee, Chamberlain, and Brandes 2018; Lee et al. 2017; Lim 2018), but also in the adjacent fields of service research (Verhulst et al. 2019) and information science (vom Brocke et al. 2020) for deeper information.

To conclude, our study shows that neuroscientific methods in the B2B marketing area have been mentioned as a fruitful potential area for research. Furthermore, recent neuroscientific findings seem to call into question the psychological fundamentals of the interplay between cognition, action, and outcomes in industries and business markets (Hodgkinson 2015). Yet, neuroscience has its own limitations, and therefore it is important to know when and when not to apply neuroscientific tools (Plassmann et al. 2015). We therefore agree that the application of neuroscience and its findings in B2B should not be seen as a challenge or replacement to the traditional approaches and existing knowledge, but rather as complimentary approach and an

opportunity to advance the B2B field with a fresh, interdisciplinary perspective (Hubert and Kenning 2008; Markovic et al. 2021; Plassmann et al. 2015). With our TCCM analysis, we identify the status quo of the field, and hope to chart the potential for more interdisciplinary research using neuroscience in B2B marketing that is relevant for practice and rigorous in the application of neuroscientific methods, and thus might help to further improve the principal psychological underpinnings of the B2B marketing area.

Limitations

Systematic literature reviews can suffer from certain potential bias which may influence the findings. These biases or limitations are associated with the review process or to the interpretation of the results. To avoid the limitations of the review process, we have reported it with transparency, following the steps of the PRISMA guidelines (Moher et al. 2009; Snyder 2019), and paying particular attention to the quality assessment. For example, using external experts feedback and performing the inclusion and exclusion step as a peer-reviewed process (Cooper et al. 2018). To avoid the limitations from the interpretation of the results, in this study the four authors were analyzing and comparing the results, to avoid selective reporting. However, this study is a TCCM systematic literature review, so the findings do not take into account bibliographic coupling; they are focused on identifying potential avenues for further research. Researchers and practitioners can use the future research agenda for identifying research priorities.

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References

- Alcañiz, M., E. Bigné, and J. Guixeres. 2019. Virtual reality in marketing: A framework. *Review, and Research Agenda. Frontiers in Psychology* 10:1530. doi:10.3389/fpsyg.2019.01530.
- Al-Kwafi, S. O. 2016. The role of fMRI in detecting attitude toward brand switching: An exploratory study using high technology products. *Journal of Product & Brand Management* 25 (2):208–18. doi:10.1108/JPBM-12-2014-0774.
- Alonso Dos Santos, M., and F. Calabuig Moreno. 2018. Assessing the effectiveness of sponsorship messaging. *International Journal of Sports Marketing & Sponsorship* 19 (1):25–40. doi:10.1108/IJSMS-09-2016-0067.
- Aprilianty, F., M. S. Purwanegara, and W. K. W. Ismail. 2018. Detecting buyer's role effects to achieve collaborative business relationships in the agriculture business, using electroencephalogram (EEG). *International Journal of Agricultural Resources, Governance and Ecology* 14:45. doi:10.1504/IJARGE.2018.090851.
- Ariely, D., and G. S. Berns. 2010. Neuromarketing: The hope and hype of neuroimaging in business. *Nature Reviews. Neuroscience* 11:284–92. doi:10.1038/nrn2795.
- Ascher, D., W. V. Silva, J. Polowczyk, and E. D. D. Silva. 2018. Neurostrategy: An advance through the paradigm epistemological in strategic management? *Academy of Strategic Management Journal* 17 (2):1–20.
- Backhaus, K., M. Steiner, and K. Lügger. 2011. To invest, or not to invest, in brands? Drivers of brand relevance in B2B markets. *Industrial Marketing Management* 40 (7): 1082–1092. doi:10.1016/j.indmarman.2011.09.002.
- Baek, E. C., and E. B. Falk. 2018. Persuasion and influence: What makes a successful persuader?. *Current Opinion in Psychology* 24:53–57. doi:10.1016/j.copsyc.2018.05.004.
- Bagozzi, R. P., and W. J. Verbeke. 2020. Genetic and psychological underpinnings of motivation and satisfaction of industrial salespeople. *Industrial Marketing Management* 85:69–83. doi:10.1016/j.indmarman.2019.08.011.
- Balasubramanian, V., M. Jagannath, and K. Adalarasu. 2013. EEG-based evaluation of viewer's response towards TV commercials. *International Journal of Industrial and Systems Engineering* 13:480. doi:10.1504/IJISE.2013.052611.
- Barraza, P., G. Dumas, H. Liu, G. Blanco-Gomez, M. I. van den Heuvel, M. Baart. 2019. Implementing EEG hyperscanning setups. *MethodsX* 6:428–36. doi:10.1016/j.mex.2019.02.021.
- Borg, S. W., and W. J. Johnston. 2013. The IPS-EQ model: Interpersonal skills and emotional intelligence in a sales process. *Journal of Personal Selling and Sales Management* 33 (1):39–51. doi:10.2753/PSS0885-3134330104.
- Buettner, R. 2016. A user's cognitive workload perspective in negotiation support systems: An eye-tracking experiment. *Pacific Asia Conference on Information Systems (PACIS 2016) at AIS Electronic Library (AISeL)*, Chiayi, Taiwan.
- Butler, M. J., H. L. O'Broin, N. Lee, and C. Senior. 2016. How organizational cognitive neuroscience can deepen understanding of managerial Decision-making: A review of the recent literature and future directions. *Int J Management Reviews* 18 (4):542–559. doi:10.1111/ijmr.12071.
- Camerer, C., and C. Yoon. 2015. Introduction to the journal of marketing research special issue on neuroscience and marketing. *Journal of Marketing Research* 52:423–26. doi:10.1509/0022-2437-52.4.423.
- Casado-Aranda, L.-A., F. Liébana-Cabanillas, and J. Sánchez-Fernández. 2018. A neuropsychological study on how consumers process risky and secure E-payments. *Journal of Interactive Marketing* 43:151–64. doi:10.1016/j.intmar.2018.03.001.
- Ceravolo, M. G., V. Farina, L. Fattobene, E. A. Graziano, L. Leonelli, and G. Raggetti. 2021. Blue and red in financial documents: The influence on attentional mechanisms and behavior. *International Journal of Bank Marketing* 39 (7):1150–65. doi:10.1108/IJBM-10-2020-0527.
- Chen, Y., T. Mandler, and L. Meyer-Waarden. 2021. Three decades of research on loyalty programs: A literature review and future research agenda. *Journal of Business Research* 124:179–97. doi:10.1016/j.jbusres.2020.11.057.
- Chugh, R., N. Gould, M. P. Leach, and A. H. Liu. 2023. B2B buyers' emotions and regulatory focus in justice and switch back decisions. *Industrial Marketing Management* 109:73–89. doi:10.1016/j.indmarman.2022.12.012.
- Cooper, C., A. Booth, J. Varley-Campbell, N. Britten, and R. Garside. 2018. Defining the process to literature searching in systematic reviews: A literature review of guidance and supporting studies. *BMC Medical Research Methodology* 18:1–14. doi:10.1186/s12874-018-0545-3.
- Cucino, V., M. Passarelli, A. Di Minin, and A. Cariola. 2022. Neuroscience approach for management and entrepreneurship: A bibliometric analysis. *European Journal of Innovation Management* 25 (6):295–319. doi:10.1108/EJIM-01-2021-0015.
- Culqui-Salazar, R. E., K. Alvarez-Altamirano, and F. Cordova-Buiza. 2023. Neuromarketing strategies and their relationship with brand advertising in the industrial safety sector. *International Journal of Internet Marketing and Advertising* 19 (1–2):192–207. doi:10.1504/IJIMA.2023.132780.
- Cunningham, W. A., C. L. Raye, and M. K. Johnson. 2004. Implicit and explicit evaluation: fMRI correlates of valence, emotional intensity, and control in the processing of attitudes. *Journal of Cognitive Neuroscience* 16 (10):1717–29. doi:10.1162/0898929042947919.
- Daugherty, T., E. Hoffman, K. Kennedy, and M. Nolan. 2018. Measuring consumer neural activation to differentiate cognitive processing of advertising: Revisiting Krugman.

- European Journal of Marketing* 52 (1/2):182–98. doi:10.1108/EJM-10-2017-0657.
- de Bondt, W., R. M. Mayoral, and E. Valledado. 2013. Behavioral decision-making in finance: An overview and assessment of selected research. *Spanish Journal of Finance and Accounting / Revista Española de Financiación y Contabilidad* 42 (157):99–118. doi:10.1080/02102412.2013.10779742.
- Dezwaef, J., E. Cracco, J. Demanet, T. Desmet, M. Brass, and B. Xin. 2019. Beyond asking: Exploring the use of automatic price evaluations to implicitly estimate consumers' willingness-to-pay. *PLOS ONE* 14 (7):e0219251. doi:10.1371/journal.pone.0219251.
- Dietvorst, R. C., W. J. Verbeke, R. P. Bagozzi, C. Yoon, M. Smits, and A. van der Lugt. 2009. A sales force-specific theory-of-mind scale: Tests of its validity by classical methods and functional magnetic resonance imaging. *Journal of Marketing Research* 46 (5):653–68. doi:10.1509/jmkr.46.5.653.
- Du, R. Y., O. Netzer, D. A. Schweidel, and D. Mitra. 2021. Capturing marketing information to fuel growth. *Journal of Marketing* 85 (1): 163–183. doi:10.1177/0022242920969198.
- Dumont, L., F. Larochelle-Brunet, H. Théoret, R. Riedl, S. Sénécal, P.-M. Léger, and F. Tremblay. 2018. Non-invasive brain stimulation in information systems research: A proof-of-concept study. *PLOS ONE* 13 (7):e0201128. doi:10.1371/journal.pone.0201128.
- Fellows, L. K. 2004. The cognitive neuroscience of human decision making: A review and conceptual framework. *Behavioral and Cognitive Neuroscience Reviews* 3 (3):159–72. doi:10.1177/1534582304273251.
- Ferguson, J. L., and M. Mohan. 2020. Use of celebrity and non-celebrity persons in B2B advertisements: Effects on attention, recall, and hedonic and utilitarian attitudes. *Industrial Marketing Management* 89:594–604. doi:10.1016/j.indmarman.2019.02.003.
- Fifel, K. 2018. Readiness potential and neuronal determinism: New insights on libet experiment. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience* 38 (4):784–86. doi:10.1523/JNEUROSCI.3136-17.2017.
- Fugate, D. L. 2007. Neuromarketing: A layman's look at neuroscience and its potential application to marketing practice. *Journal of Consumer Marketing* 24 (7):385–94. doi:10.1108/07363760710834807.
- Gabler, C. B., V. A. Vieira, K. B. Senra, and R. Agnihotri. 2019. Measuring and testing the impact of interpersonal mentalizing skills on retail sales performance. *Journal of Personal Selling and Sales Management* 39 (3):222–37. doi:10.1080/08853134.2019.1578661.
- González-Morales, A., J. Mitrovic, and R. C. Garcia. 2020. Ecological consumer neuroscience for competitive advantage and business or organizational differentiation. *European Research on Management and Business Economics* 26:174–80. doi:10.1016/j.iemeen.2020.05.001.
- Guerrero Medina, C. A., M. Martínez-Fiestas, L. A. Casado Aranda, and J. Sánchez-Fernández. 2021. Is it an error to communicate CSR strategies? Neural differences among consumers when processing CSR messages. *Journal of Business Research* 126:99–112. doi:10.1016/j.jbusres.2020.12.044.
- Harris, J. M., J. Ciorciari, and J. Gountas. 2018. Consumer neuroscience for marketing researchers. *Journal of Consumer Behaviour* 17 (3):239–52. doi:10.1002/cb.1710.
- He, L., T. Freudenreich, W. Yu, M. Pelowski, and T. Liu. 2021. Methodological structure for future consumer neuroscience research. *Psychology & Marketing* 38:1161–81. doi:10.1002/mar.21478.
- Healey, M. P., and G. P. Hodgkinson. 2015. Toward a theoretical framework for organizational neuroscience. In *Organizational neuroscience*, ed. D. A. Waldman, and P. A. Balthazard, vol. 7, 51–81. Leeds, UK: Monographs in Leadership and Management. Emerald Group Publishing Limited.
- Hinterhuber, A. 2015. Violations of rational choice principles in pricing decisions. *Industrial Marketing Management* 47:65–74. doi:10.1016/j.indmarman.2015.02.006.
- Hodgkinson, G. P. 2015. Reflections on the interplay between cognition, action and outcomes in industries and business markets: What have we learned so far and where might we go next? *Industrial Marketing Management* 48:12–25. doi:10.1016/j.indmarman.2015.03.011.
- Hodgkinson, G. P., and M. P. Healey. 2014. Coming in from the cold: The psychological foundations of radical innovation revisited. *Industrial Marketing Management* 43 (8):1306–13. doi:10.1016/j.indmarman.2014.08.012.
- Hodgkinson, G. P., R. P. Wright, and J. Anderson. 2015. Emotionalizing strategy research with the repertory grid technique: Modifications and extensions to a robust procedure for mapping strategic knowledge. In *Cognition and strategy*, ed. G. Gavetti, and W. Ocasio, vol. 32, 505–47. Leeds, UK: Advances in Strategic Management. Emerald Group Publishing Limited.
- Huang, J., S. Choo, Z. H. Pugh, and C. S. Nam. 2021. Evaluating effective connectivity of trust in human–automation interaction: A dynamic causal modeling (DCM) study. *Human Factors* 64 (6):1051–69. doi:10.1177/0018720820987443.
- Hubert, M., and P. Kenning. 2008. A current overview of consumer neuroscience. *Journal of Consumer Behaviour* 7 (4–5):272–92. doi:10.1002/cb.251.
- Huyghebaert, T., N. Gillet, C. Fernet, F.-J. Lahiani, S. Chevalier, and E. Fouquereau. 2018. Investigating the longitudinal effects of surface acting on managers' functioning through psychological needs. *Journal of Occupational Health Psychology* 23:207–22. doi:10.1037/ocp0000080.
- ISBM – Institute for the Study of Business Markets. n.d. Traditional research priorities. ISBM – Institute for the Study of Business Markets. <https://isbm.org/research-priorities/>. Accessed September 26, 2023.
- Iyer, G. R., S. Hong Xiao, A. Sharma, and M. Nicholson. 2015. Behavioral issues in price setting in business-to-business marketing: A framework for analysis. *Industrial Marketing*

- Management* 47:6–16. doi:10.1016/j.indmarman.2015.02.001.
- Javor, A., M. Koller, N. Lee, L. Chamberlain, and G. Ransmayr. 2013. Neuromarketing and consumer neuroscience: Contributions to neurology. *BMC Neurology* 13 (1):1–12. doi:10.1186/1471-2377-13-13.
- Karmarkar, U. R., and H. Plassmann. 2019. Consumer Neuroscience: Past, Present, and Future. *Organizational Research Methods* 22 (1):174–195. doi:10.1177/1094428117730598.
- Koschate-Fischer, N., and K. Wüllner. 2017. New developments in behavioral pricing research. *Journal of Business Economics* 87 (6):809–75. doi:10.1007/s11573-016-0839-z.
- Krueger, F., and A. Meyer-Lindenberg. 2019. Toward a Model of interpersonal trust drawn from neuroscience, psychology, and economics. *Trends in Neurosciences* 42 (2):92–101. doi:10.1016/j.tins.2018.10.004.
- Lam, S. K., T. E. DeCarlo, and A. Sharma. 2019. Salesperson ambidexterity in customer engagement: Do customer base characteristics matter? *Journal of the Academy of Marketing Science* 47 (4):659–80. doi:10.1007/s11747-019-00650-0.
- Laureiro-Martínez, D., S. Brusoni, N. Canessa, and M. Zollo. 2015. Understanding the exploration–exploitation dilemma: An fMRI study of attention control and decision-making performance. *Strategic Management Journal* 36 (3):319–38. doi:10.1002/smj.2221.
- Lawrence, E. J., P. Shaw, V. P. Giampietro, S. Surguladze, M. J. Brammer, and A. S. David. 2006. The role of ‘shared representations’ in social perception and empathy: An fMRI study. *Neuroimage: Reports* 29 (4):1173–84. doi:10.1016/j.neuroimage.2005.09.001.
- Lee, E.-J., and J. H. Yun. 2019. Moral incompetency under time constraint. *Journal of Business Research* 99:438–45. doi:10.1016/j.jbusres.2017.10.043.
- Lee, N., L. Brandes, L. Chamberlain, and C. Senior 2017. This is your brain on neuromarketing: Reflections on a decade of research. *Journal of Marketing Management* 33:878–92. doi:10.1080/0267257X.2017.1327249.
- Lee, N., and L. Chamberlain. 2007. Neuroimaging and psychophysiological measurement in organizational research. *Annals of the New York Academy of Sciences* 1118 (1):18–42. doi:10.1196/annals.1412.003.
- Lee, N., L. Chamberlain, and L. Brandes. 2018. Welcome to the jungle! The neuromarketing literature through the eyes of a newcomer. *European Journal of Marketing* 52:4–38. doi:10.1108/EJM-02-2017-0122.
- Lim, D. H., D. S. Chai, S. Park, and M. Y. Doo. 2019. Neuroscientism, the neuroscience of learning. *European Journal of Training & Development* 43 (7/8):619–42. doi:10.1108/EJTD-03-2019-0033.
- Lim, W. M. 2018. What will business-to-business marketers learn from neuro-marketing? Insights for business marketing practice. *Journal of Business-To-Business Marketing* 25 (3):251–59. doi:10.1080/1051712X.2018.1488915.
- Lindgreen, A., C. A. Di Benedetto, R. J. Brodie, and M. van der Borgh. 2020. How to undertake great cross-disciplinary research. *Industrial Marketing Management* 90:A1–5. doi:10.1016/j.indmarman.2020.03.025.
- Lindgreen, A., C. A. Di Benedetto, and F. Kock. 2021. How to develop original, courageous ideas in business marketing research. *Industrial Marketing Management* 95:A1–4. doi:10.1016/j.indmarman.2020.04.011.
- Ma, Q., L. Zhang, and M. Wang. 2018. “You win, you buy”-how continuous win effect influence consumers’ price perception: An ERP study. *Frontiers in Neuroscience* 12:691. doi:10.3389/fnins.2018.00691.
- Marcus, L. J., E. J. McNulty, L. B. Flynn, J. M. Henderson, P. V. Neffenger, R. Serino, and J. Trenholm. 2020. The POP-DOC loop: A continuous process for situational awareness and situational action. *Industrial Marketing Management* 88:272–77. doi:10.1016/j.indmarman.2020.05.019.
- Marketing Science Institute. 2020. Research priorities 2020–2022. Accessed 12 September 2023.
- Markovic, S., N. Koporcic, M. Arslanagic-Kalajdzic, S. Kadic-Maglajlic, M. Bagherzadeh, and N. Islam. 2021. Business-to-business open innovation: COVID-19 lessons for small and medium-sized enterprises from emerging markets. *Technological Forecasting & Social Change* 170. doi:10.1016/j.techfore.2021.120883 120883.
- McFarland, R. G., and A. L. Dixon. 2021. The impact of salesperson interpersonal mentalizing skills on coping and burnout: The critical role of coping oscillation. *Journal of Personal Selling and Sales Management* 41 (4):285–300. doi:10.1080/08853134.2021.1898412.
- Mesly, O. 2015. Wealth maximization in the context of blind trust – a neurobiological research. *Journal of Behavioral Finance* 16 (3):250–66. doi:10.1080/15427560.2015.1065263.
- Mobbs, D., C. C. Hagan, R. Yu, H. Takahashi, O. FeldmanHall, A. J. Calder, and T. Dalgleish. 2015. Reflected glory and failure: The role of the medial prefrontal cortex and ventral striatum in self vs other relevance during advice-giving outcomes. *Social Cognitive and Affective Neuroscience* 10 (10):1323–28. doi:10.1093/scan/nsv020.
- Mogaji, E., B. Czarnecka, and A. Danbury. 2018. Emotional appeals in UK business-to-business financial services advertisements. *International Journal of Bank Marketing* 36 (1):208–27. doi:10.1108/IJBM-09-2016-0127.
- Moher, D., A. Liberati, J. Tetzlaff, D. G. Altman, and PRISMA Group*, T. 2009. Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *Annals of Internal Medicine* 151 (4):264–69. doi:10.7326/0003-4819-151-4-200908180-00135.
- Mora Cortez, R., D. I. Gilliland, and W. J. Johnston. 2020. Revisiting the theory of business-to-business advertising. *Industrial Marketing Management* 89:642–56. doi:10.1016/j.indmarman.2019.03.012.
- Muñoz-Leiva, F., M. E. Rodríguez López, F. Liebana-Cabanillas, and S. Moro. 2021. Past, present, and future research on self-service merchandising: A co-word and text mining approach. *European Journal of Marketing*. doi:10.1108/EJM-02-2019-0179.

- Murray, M. M., and J. Antonakis. 2019. An introductory Guide to organizational neuroscience. *Organizational Research Methods* 22 (1):6–16. doi:10.1177/1094428118802621.
- Öberg, C. 2023. Neuroscience in business-to-business marketing research: A literature review, co-citation analysis and research agenda. *Industrial Marketing Management* 113:168–79. doi:10.1016/j.indmarman.2023.06.004.
- Ortega-Gijon, Y. N., and C. Mezura-Godoy. 2019. Usability evaluation of brain computer interfaces: Analysis of methods and tools. 2019 IEEE International Conference on Engineering Veracruz (ICEV), Boca del Rio, 1–8, Veracruz, Mexico, 14/10/2019 - 17/10/2019, IEEE. doi:10.1109/ICEV.2019.8920409.
- Pandey, S. K., and A. Mookerjee. 2018. Assessing the role of emotions in B2B decision making: An exploratory study. *Journal of Indian Business Research* 10 (2):170–92. doi:10.1108/JIBR-10-2017-0171.
- Papen, M.-C., T. Niemand, F. U. Siems, and S. Kraus. 2019. The effect of stress on customer perception of the frontline employee: An experimental study. *Review of Managerial Science* 13 (4):725–47. doi:10.1007/s11846-017-0258-8.
- Paul, J., and A. R. Criado. 2020. The art of writing literature review: What do we know and what do we need to know? *International Business Review* 29 (4):101717. doi:10.1016/j.ibusrev.2020.101717.
- Paul, J., and A. Rosado-Serrano. 2019. Gradual internationalization vs born-Global/International new venture models. *International Marketing Review* 36 (6):830–58. doi:10.1108/IMR-10-2018-0280.
- Philiastides, M. G., and P. Sajda. 2007. EEG-informed fMRI reveals spatiotemporal characteristics of perceptual decision making. *The Journal of Neuroscience: The Official Journal of the Society for Neuroscience* 27 (48):13082–91. doi:10.1523/JNEUROSCI.3540-07.2007.
- Pirraglia, E., F. Giuliani, R. De Cicco, C. Di Bernardino, and R. Palumbo. 2023. The role of emotions in B2B product advertising on social media: A family business case study. *Journal of Family Business Management* 13 (1):146–65. doi:10.1108/JFBM-12-2021-0157.
- Plassmann, H., V. Venkatraman, S. Huettel, and C. Yoon. 2015. Consumer neuroscience: Applications, challenges, and possible solutions. *Journal of Marketing Research* 52 (4):427–35. doi:10.1509/jmr.14.0048.
- Posner, M. I., and G. J. DiGirolamo. 2000. Cognitive neuroscience: Origins and promise. *Psychological Bulletin* 126 (6):873–89. doi:10.1037/0033-2909.126.6.873.
- Randall, W. S., D. R. Nowicki, G. Deshpande, R. F. Lusch, D. Michael Harvey, and D. Timothy Kiessling. 2014. Converting knowledge into value. *International Journal of Physical Distribution & Logistics Management* 44 (8/9):655–70. doi:10.1108/IJPDLM-08-2013-0223.
- Rawnaque, F. S., K. M. Rahman, S. F. Anwar, R. Vaidyanathan, T. Chau, F. Sarker. 2020. Technological advancements and opportunities in neuromarketing: A systematic review. *Brain Informatics* 7:10. doi:10.1186/s40708-020-00109-x.
- Revilla-Camacho, M.-Á., F.-J. Cossío-Silva, and C. Mercado-Idoeta. 2018. Neuromarketing as a Subject of Legitimacy. In *Organizational Legitimacy*, ed. E. Díez-De-Castro, and M. Peris-Ortiz, 105–19. Cham: Springer International Publishing.
- Riedel, R., and A. Javor. 2012. The biology of trust: Integrating evidence from genetics, endocrinology, and functional brain imaging. *Journal of Neuroscience, Psychology, and Economics* 5 (2):63–91. doi:10.1037/a0026318.
- Rilling, J. K., and A. G. Sanfey. 2011. The neuroscience of social decision-making. *Annual Review of Psychology* 62 (1):23–48. doi:10.1146/annurev.psych.121208.131647.
- Robertson, D. C., C. Voegtlin, and T. Maak. 2017. Business ethics: The promise of neuroscience. *J. Bus. Ethics* 144 (4):679–697. doi:10.1007/s10551-016-3312-6.
- Russo, V., M. Bilucaglia, C. Casiraghi, S. Chiarelli, M. Columbano, A. Fici, and F. Rivetti, C. Rossi, R. Valesi, M. Zito. 2023. Neuroselling: Applying neuroscience to selling for a new business perspective. An analysis on teleshoping advertising. *Frontiers in Psychology* 14:1238879. doi:10.3389/fpsyg.2023.1238879.
- Sanfey, A. G. 2007. Social decision-making: Insights from game theory and neuroscience. *Science (New York, NY)* 318 (5850):598–602. doi:10.1126/science.1142996.
- Schalk, G., D. J. McFarland, T. Hinterberger, N. Birbaumer, and J. R. Wolpaw. 2004. BCI2000: A general-purpose brain-computer interface (BCI) system. *IEEE Transactions on Biomedical Engineering* 51:1034–43. doi:10.1109/tbme.2004.827072.
- Seng, K. P., and L.-M. Ang. 2018. Video analytics for customer emotion and satisfaction at contact centers. *IEEE Transactions on Human-Machine Systems* 48 (3):266–78. doi:10.1109/thms.2017.2695613.
- Shahtalebi, S., and A. Mohammadi. 2018. A bayesian framework to optimize double band spectra spatial filters for motor imagery classification. *ICASSP 2018 - 2018 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)*, Calgary, AB, 15.04.2018 - 20.04.2018, 871–75, IEEE. doi:10.1109/ICASSP.2018.8461374.
- Shaw, S. D., and R. P. Bagozzi. 2018. The neuropsychology of consumer behavior and marketing. *Consumer Psychology Review* 1:22–40. doi:10.1002/arcp.1006.
- Shepherd, G. M. 2009. *Creating modern neuroscience: The revolutionary 1950s*. New York, US: Oxford University Press.
- Singh, M., S. Dhir, and H. Mishra. 2024. Synthesizing research in entrepreneurial bootstrapping and bricolage: A bibliometric mapping and TCCM analysis. *Management Review Quarterly* 74 (1):487–520. doi:10.1007/s11301-022-00308-2.
- Singh, N., S. Singh, and S. Nagaraj. 2023. Editorial for the special section on “neuromarketing in predicting consumer behavior: The efficiency & effectiveness”. *Journal of Consumer Behaviour*. doi:10.1002/cb.2285.
- Smidts, A., M. Hsu, A. G. Sanfey, M. A. S. Boksem, R. B. Ebsstein, S. A. Huettel, J. W. Kable, U. R. Karmarkar, S. Kitayama, B. Knutson, et al. 2014. Advancing consumer

- neuroscience. *Marketing Letters* 25 (3):257–67. doi:10.1007/s11002-014-9306-1.
- Snyder, H. 2019. Literature review as a research methodology: An overview and guidelines. *Journal of Business Research* 104:333–39. doi:10.1016/j.jbusres.2019.07.039.
- Society for Neuroscience. 2019. Mission and strategic plan. Accessed 30 September 2023. <https://www.sfn.org/about/mission-and-strategic-plan>.
- Soon, C. S., M. Brass, H.-J. Heinze, and J.-D. Haynes. 2008. Unconscious determinants of free decisions in the human brain. *Nature Neuroscience* 11 (5):543–45. doi:10.1038/nn.2112.
- Spence, C. 2019. Neuroscience-inspired design: From academic neuromarketing to commercially relevant research. *Organizational Research Methods* 22 (1):275–98. doi:10.1177/1094428116672003.
- Stanton, S. J., W. Sinnott-Armstrong, and S. A. Huettel. 2017. Neuromarketing: Ethical implications of its use and potential misuse. *Journal of Business Ethics* 144:799–811. doi:10.1007/s10551-016-3059-0.
- Sung, B., N. J. Wilson, J. H. Yun, and E. J. Lee. 2020. What can neuroscience offer marketing research?. *APJML* 32 (5): 1089–1111. doi:10.1108/APJML-04-2019-0227.
- Thomas, A. R., N. A. Pop, A. M. Iorga, and C. Ducu. 2017. *Ethics and neuromarketing*. Cham: Springer International Publishing.
- Tranfield, D., D. Denyer, and P. Smart. 2003. Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management* 14 (3):207–22. doi:10.1111/1467-8551.00375.
- Tuncdogan, A., A. Lindgreen, F. van den Bosch, and H. Volberda. 2019. Guest editorial: Psychological micro-foundations of business-to-business decision making. *Industrial Marketing Management* 83:128–33. doi:10.1016/j.indmarman.2019.11.005.
- van Zeeland, E., and J. Henseler. 2018. The behavioural response of the professional buyer on social cues from the vendor and how to measure it. *Journal of Business & Industrial Marketing* 33 (1):72–83. doi:10.1108/JBIM-06-2016-0135.
- Vences, N. A., J. Díaz-Campo, and D. F. G. Rosales. 2020. Neuromarketing as an emotional connection tool between organizations and audiences in Social Networks. A Theoretical Review. *Frontiers in Psychology* 11:1787. doi:10.3389/fpsyg.2020.01787.
- Verbeke, W. J. M. I., W. J. R. Rietdijk, W. E. van den Berg, R. C. Dietvorst, L. Worm, and R. P. Bagozzi. 2011. The making of the Machiavellian brain: A structural MRI analysis. *Journal of Neuroscience, Psychology, and Economics* 4 (4):205–16. doi:10.1037/a0025802.
- Verhulst, N., A. De Keyser, A. Gustafsson, P. Shams, and Y. Van Vaerenbergh. 2019. Neuroscience in service research: An overview and discussion of its possibilities. *JOSM* 30 (5):621–649. doi:10.1108/JOSM-05-2019-0135.
- Vom Brocke, J., A. Hevner, P. M. Léger, P. Walla, and R. Riedl. 2020. Advancing a NeuroIS research agenda with four areas of societal contributions. *European Journal of Information Systems* 29 (1):9–24. doi:10.1080/0960085X.2019.1708218.
- Wang, R. W. Y., S.-P. Huarng, and S.-W. Chuang. 2018. Right fronto-temporal EEG can differentiate the affective responses to award-winning advertisements. *International Journal of Neural Systems* 28 (3):1750030. doi:10.1142/S0129065717500307.
- Wang, Y. J., and M. S. Minor. 2008. Validity, reliability, and applicability of psychophysiological techniques in marketing research. *Psychology & Marketing* 25 (2):197–232. doi:10.1002/mar.20206.
- Weber, J. 2018. Does it matter how one assesses moral reasoning? Differences (biases) in the recognition versus formulation tasks. *Business & Society* 57 (7):1440–64. doi:10.1177/0007650316675611.
- Wuyts, S. 2021. 2021 ISBM B2B trend study. Institute for the Study of Business Markets (ISBM). Accessed January 13, 2022.
- Xu, L., B. Becker, and K. M. Kendrick. 2019. Oxytocin facilitates social learning by promoting conformity to trusted individuals. *Frontiers in Neuroscience* 13:56. doi:10.3389/fnins.2019.00056.
- Yang, T., and S.-P. Kim. 2019. Group-level neural responses to service-to-service brand extension. *Frontiers in Neuroscience* 13. doi:10.3389/fnins.2019.00676.
- Yeasmin, F. 2024. Systematic literature review on performance drivers of Ph. D. success: Utilizing PRISMA, TCCM, and an 8-step approach. *Cogent Education* 11 (1):2308438. doi:10.1080/2331186X.2024.2308438.
- Young, R. O. 2017. *Persuasive communication: How audiences decide*. New York NY, London: Routledge Taylor & Francis Group.
- Zhang, J. Z., O. Netzer, and A. Ansari. 2014. Dynamic targeted pricing in B2B relationships. *Marketing Science* 33 (3):317–37. doi:10.1287/mksc.2013.0842.