Thinking outside the box: a neuroscientific perspective on trust in B2B-relationships

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Abstract

Trust is the birthplace of every social interaction. Therefore the concept of trust is studied by scholars from a broad diversity of academic fields. Industrial marketing is just one of those fields. However, one could argue that scholars within the field of industrial marketing are to some extent thinking within a big known box when studying trust, since they are predominantly influenced by the disciplines of Business, Management, Psychology, Economics and Sociology (a claim that is fleshed out by the results of an exploratory bibliometric research that is submitted in the Appendix of this paper). This results into a cognitive approach on the nature, development and role of trust. By introducing a neuroscientific perspective on distrust, trust and trust-building processes, this theoretical paper enriches the current literature stream on trust within the field of industrial marketing and highlights problems that would have otherwise been under-investigated. Specifically the neural difference between trust and distrust and the neural processes regarding the first impression effect when evaluating trustworthiness are discussed. Insights from neurobiology, such as the role of Oxytocin and Testosterone on trust, are shared as well. Furthermore, an evolution of the 'trust-commitment' relationship into a 'trust-approach motivated behaviour' relation is suggested and the neuroscientific insights are summarized in a conceptual framework which may guide future research on trust within the field of industrial marketing.

Keywords: Neuroscience, Trust, Distrust, Approach-avoidance, First impression, SOR-model, Neurobiology, Bibliometric research, Citation analysis

Competitive paper

INTRODUCTION

"*When you trust people, you have confidence in them – in their integrity and in their abilities. When you distrust people, you are suspicious of them – of their integrity, their agenda, their capabilities, or their track record. It's that simple*" (Covey, 2006 p. 5). This quote above is from an international bestseller on trust named 'the speed of trust' by Stephen Covey. The enormous sales of the book shows the resonance of the concept of trust in practice.

Trust forms the corner stone of business. When customers lose their trust in a brand, the intangible value of the brand will diminish. The recent Volkswagen-case makes a nice example of this phenomenon: with the 'VW emission scandal' the company has violated the public's trust (Winston, 2015). Trust strongly influences relationship commitment, because the most valued relationships are those defined by trust; therefore parties want to commit themselves to such relationships (Morgan and Hunt, 1994). And a committed customer is more likely to be a loyal customer and to promote the brand to other customers: "*Interestingly, the effect of trust on satisfaction and long-term orientation is even substantially larger than the direct effect of economic outcomes (which is not significant) or any of the other antecedents. This attests to the key role of trust in marketing channels*" (Geyskens et al., 1998 p. 242). In other words, trust is crucial for the well-being of the firm. The concept of trust therefore has a substantial footprint on the academic literature within the field of industrial marketing. The last decade the broad conceptual theme of relationships has dominated the B2B-marketing literature, with a specific dominance of the concepts of trust and commitment (Young et al., 2015).

Is there a marketing topic by nature more interdisciplinary than trust? Trust is the cradle of every social interaction, not only interactions in business life. Therefore the concept of trust is studied by scholars from a broad diversity of disciplines. These disciplines differ in their approach on the concept of trust and there appears to be some degree of conceptual confusion (Blomqvist, 1997). Moreover it is argued that scholars within the field of industrial marketing are having a narrow perspective on trust: *"…existing conceptualizations of trust in the literature view trust primarily from a cognitive/rationalistic viewpoint and in doing so ignore the more expressive aspects of human interaction*" (Andersen and Kumar, 2006, p. 522). Therefore, scholars who study and measure trust would benefit from taking an interdisciplinary approach: most importantly to enrich their own research scope and besides that, as a beneficial side effect, there are indications that articles that refer to a more diverse or interdisciplinary set of intellectual products are cited more than articles with a more narrowly focussed bibliography (Steele and Stier, 2000).

To assess the level of interdisciplinarity of current scholars in the field of industrial marketing dealing with the concept of trust and to test the statement that a neuroscientific perspective has not been adopted by this academic stream, an exploratory bibliometric research is performed which is submitted in the Appendix of this paper. A research on all articles on trust, in the context of relationship marketing, published in the top journals in the field of industrial marketing over the period 2012-2015 makes the current foundations of the knowledge of trust visible. These foundations are predominantly formed by the broad academic discipline of 'business and management', and by their neighbouring academic disciplines: economics, psychology and sociology. The next section elaborates on the current perspectives on the concept of trust within the B2B-marketing domain. It can be argued that scholars are, to some extent, thinking within a box and that new insights from other disciplines than the ones mentioned above are not integrated in the current models and conceptualisations. Specifically within the field of neuroscience, studies on trust have

produced some valuable insights. The purpose of this paper is to introduce those insights to the B2B-marketing domain and, by doing so, shape the future research agenda for trust research in industrial marketing.

It can be argued that current theories and empirical research on trust within a B2B context are not complete without "*the most fundamental level of analysis"* (Becker et al., 2011, p. 934). In other words, can we fully grasp the relationship between trust and the resulting market behaviour if we do not take into account the neural processes that are at the heart of this relationship? The author argues that we cannot and that a neuroscientific perspective on trust within a B2B-context both enriches and advances the current knowledge on trust within the field of industrial marketing.

The aim of introducing a neuroscientific perspective is not to replace the current knowledge, but to *connect* it with other knowledge in order to get a better picture. Therefore, integrating a neuroscientific perspective is a clear example of *hierarchical reductionism* in which unification of different fields of knowledge is the norm (Becker et al., 2011, Pinker, 2002). Different research disciplines and accompanying perspectives must not been seen as competitors, but as complementary levels and grounds of analysis that together create synergetic effects. After all, *the strength of one discipline is the weakness of the other, and vice versa*" (Henseler, 2015). I.e., neuroscientific explanations of attitudes and behaviour should not be prioritized above social scientific explanations (also called *neuroessentialism* (Huettel et al., 2009)), but should be seen as equal passengers on the same flight to a wonderful destination. By combining strengths, we are able to better understand the working mechanisms of trust in a B2B-relationship. This paper explores how integrating a neuroscientific perspective can create such synergetic effects by examining in which way neuroscience can shine a new light on existing problems and how it can highlight problems that might otherwise not have been considered.

THE CONCEPT OF TRUST WITHIN THE B2B-MARKETING DOMAIN

With the transition from a transactional to a relational approach of doing business in the early 1980s, in which the IMP Group took a leading role, the concept of trust gained interest by many scholars. And it still does, considering the many publications on the topic in the three leading journals on B2B-marketing (i.e. Industrial Marketing Management (IMM), Journal of Business and Industrial Marketing (JBIM) and Journal of Business-to-Business Marketing (JBBM), see figure 1. In the 1990s the study of trust within a marketing-context was, from a conceptual perspective, at its peak. Many articles published in that period (i.e. Morgan and Hunt, 1994, Doney and Cannon, 1997, Ganesan, 1994, Anderson and Narus, 1990, Anderson and Weitz, 1992, Moorman et al., 1992, Zaheer et al., 1998, Mayer et al., 1995, Moorman et al., 1993, Rousseau et al., 1998) still form the dominant shoulders on which the current scholars lean (see also figure A1 and A2 in the Appendix). Definitions, conceptual models and measurement scales with respect to the concept of trust have accumulated (Akrout and Akrout, 2011), and scholars studied the nature and the role of trust in relation to many other input- and output-variables, on which is elaborated below.

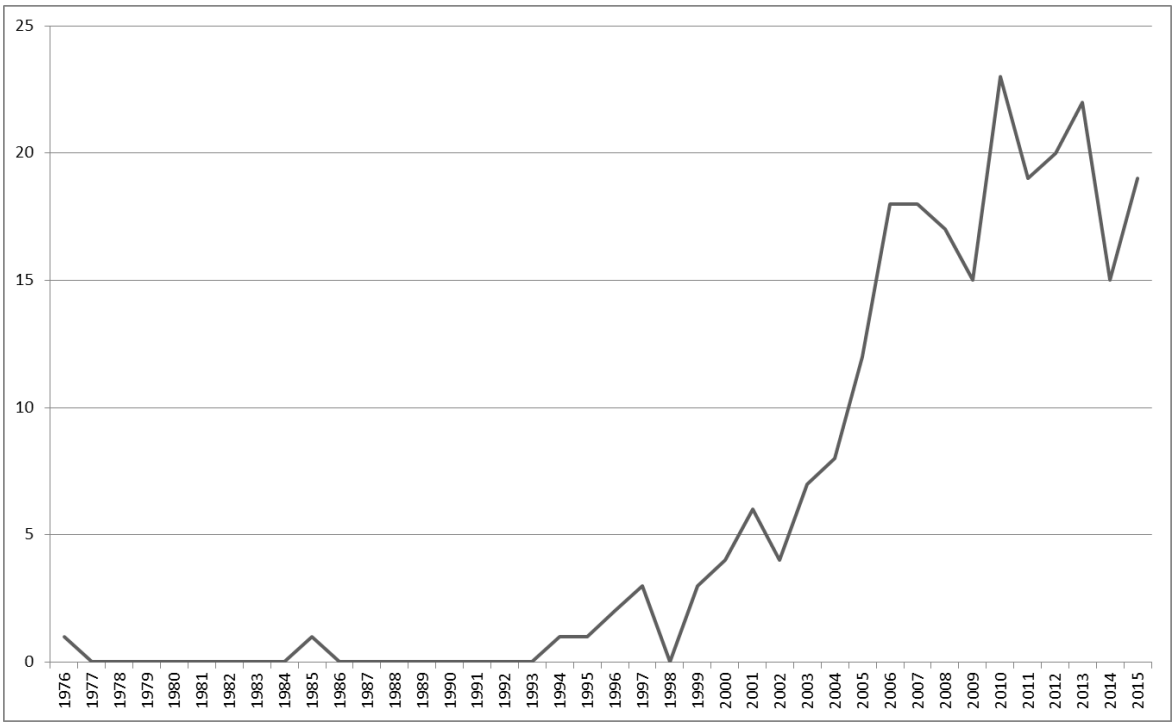

Fig 1 The number of articles with 'trust' in title, abstract or keywords, published in IMM, JBIM and JBBM (source: SCOPUS)

The nature of trust

The first article on trust published in IMM conceptualises trust as "*the customer believes that what the salesperson says or promises to do can be relied upon in a situation where the failure of the salesperson to be reliable will cause problems for the customer"* (Swan et al., 1985, p. 203). This definition is borrowed from the influential American psychologist Julian B. Rotter (1916-2014) who is famous for introducing the cognitive trait 'locus of control' and for his role in the development of the social learning theory. Rotter is the 64th most cited psychologist from the twentieth century (Haggbloom et al., 2002) and his work on trust (Rotter, 1967, 1971, 1980) is heavily cited by marketing scholars. The work of Rotter still influences, directly or indirectly, the work of current scholars on trust within the industrial marketing domain.

The *cognitive psychological perspective* on trust, as brought forward by Rotter and as adopted by many scholars within the industrial marketing domain, considers trust as a necessary instrument for efficient adjustment and even survival of human beings within a social context (Rotter, 1967). Rotter, being one of the founding fathers of social learning theory, considers trust as a cognitive choice to rely on the other. This choice is determined by (*generalized) expectancies* that trusting the other will lead to some kind of reinforcement. People can learn to trust or distrust the other by positive or negative experiences from themselves or trusted others. In order to measure interpersonal trust, Rotter developed a scale based on a Likert format which enabled scholars from many different academic disciplines to include a trust variable in their models and to make distinctions between high and low trust individuals (Rotter, 1967).

According the cognitive psychological perspective, trust is about *believing* others to be *reliable*, which is clearly visible in the definition of Swan et al. (1985) at the beginning of this section. Individuals differ in the ease at which they believe in the reliability of the other. High

trust individuals are less likely to lie or cheat, are more likely to give others a second chance and are also less likely to be unhappy, conflicted or maladjusted (Rotter, 1980).

Believing others to be reliable, automatically implies being vulnerable. This makes the decision to trust a risky decision. Based on this accentuation on vulnerability, risk and possible reward a *psycho-economical perspective* on trust emerged in which trust is mostly defined as "*the perceived credibility and benevolence of a target of trust*" (Doney and Cannon, 1997 p.36). This definition recognizes, with respect to the concept of trust, two dimensions: credibility, or the expectancy that you can rely on the other, and benevolence, which means that if you trust somebody you believe that the other has a desire to do good and is therefore motivated to seek joint gain. These two dimensions of trust are also recognised and accepted in other literature (Dimoka, 2010). A full economic perspective on trust is hardly found within the B2B-marketing literature. For example, the perspective from transaction cost economics, where trust is seen as a substitute for costly control and coordination mechanisms (Ireland and Webb, 2007, Bromiley and Cummings, 1995), does not make the foundation of defining trust by industrial marketing scholars.

Besides the development of the cognitive psychological perspective into the psycho-economic perspective, the cognitive psychological perspective also evolved into a *psycho-sociological perspective* in which trust is seen as "*a willingness to rely on an exchange partner in whom one has confidence*" (Moorman et al., 1992, p. 315). Within this psycho-sociological perspective, trust has two dimensions: a psychological dimension in which is trust is seen as a belief (i.e. confidence) and a sociological dimension where trust involves a behavioural intention or actual behaviour (i.e. willingness to rely on the other). (Moorman et al., 1993). Psycho-sociological definitions are considered to be very well suitable when an individual-organizational level of analysis is applied, since the individual belief is combined with experiences and behavioural intentions that individuals have with respect to an organisation (Money et al., 2012).

There is only a subtle difference between the psycho-economical and the psycho-sociological perspective: the economical approach is focussing more on the question whether or not the other party will act in your benefit while the sociological approach is more concentrated around a persons' attitude and behaviour towards one or more to be trusted others. This difference can best be seen by comparing the term credibility of Doney and Cannon (1997), i.e. expectancy that one can rely on the other, to the definition of Moorman et al (1992), i.e. willingness to rely on the other. So, the psycho-economical approach is relatively more about the impression on how the potentially trusted person is behaving towards you, and the psycho-sociological approach is more about your behaviour towards a potentially trusted party. Both the psycho-economical and the psycho-sociological perspective on trust contain two components. This makes the measurement of trust difficult: is it best to measure trust as an overall concept or do you focus at its underlying components, in which case one can place question marks regarding the extent at which those components are intertwined (Geyskens et al., 1998)?

The sociological dimension in the psycho-sociological perspective is derived from a *behavioural perspective* on trust, see figure 2. Within the behavioural perspective, trust is seen as a reciprocal relationship which facilitates cooperation (Hawes et al., 1989). For example Currall and Judge (1995) define trust as "*an individual's behavioural reliance on another person under a condition of risk*" (p. 153) and identify dimensions of trusting behaviour: (1) open and honest communication with the counterpart, (2) entering an informal agreement with the counterpart, (3) maintaining surveillance over the counterpart, and (4) task

coordination with the counterpart. Despite the fact that the behavioural perspective on trust, with its focus on cooperative collaboration, seems to fit the industrial marketing domain the best, it is not the dominant perspective taken by scholars in the field. In general the perspectives which have their roots in cognitive psychology dominate the B2B-marketing literature on trust. "*In fact, as in other areas of marketing research, trust is dominated by cognitivist approaches. Indeed, many approaches are based on knowledge and mechanisms of information processing from beliefs and perceptions. Although the impact of affective states is recognized as essential for understanding trust, especially in interpersonal contexts, little interest has been shown in such states in the conceptualization and measurement of this construct"* (Akrout and Akrout, 2011, p. 3).

Within the late 1990s and the beginning of this millennium, the cognitive approaches on trust were subject to criticism (Andersen and Kumar, 2006, Rousseau et al., 1998). It became slowly accepted that a division could and should be made between cognitive and affective trust (for an excellent elaboration on the difference between cognitive and affective elements of trust see Dowell et al. (2015)). But scholars are having problems with the measurement of these different elements, and there are only a few articles that take into account affective trust, but mostly in a conceptual or qualitative manner (Dowell et al., 2015, Young and Daniel, 2003). Jiang et al. (2013b) take a different approach in which they make the distinction between *interpersonal* trust, which is more affective by nature, and *interorganizational* reliance, which is more cognitive by nature. Their work is one of the few recent works on trust within a B2B-marketing context that is thoroughly discussing the nature of trust. By making a difference between interpersonal trust and interorganizational reliance, not only are they adding value to the often discussed difference between trust at the personal and organizational level, but they also give back a human face to trust. With respect to defining the nature of trust, the field of industrial marketing appears to be at a turning point, and refreshing insights from other disciplines are helpful for guiding directions.

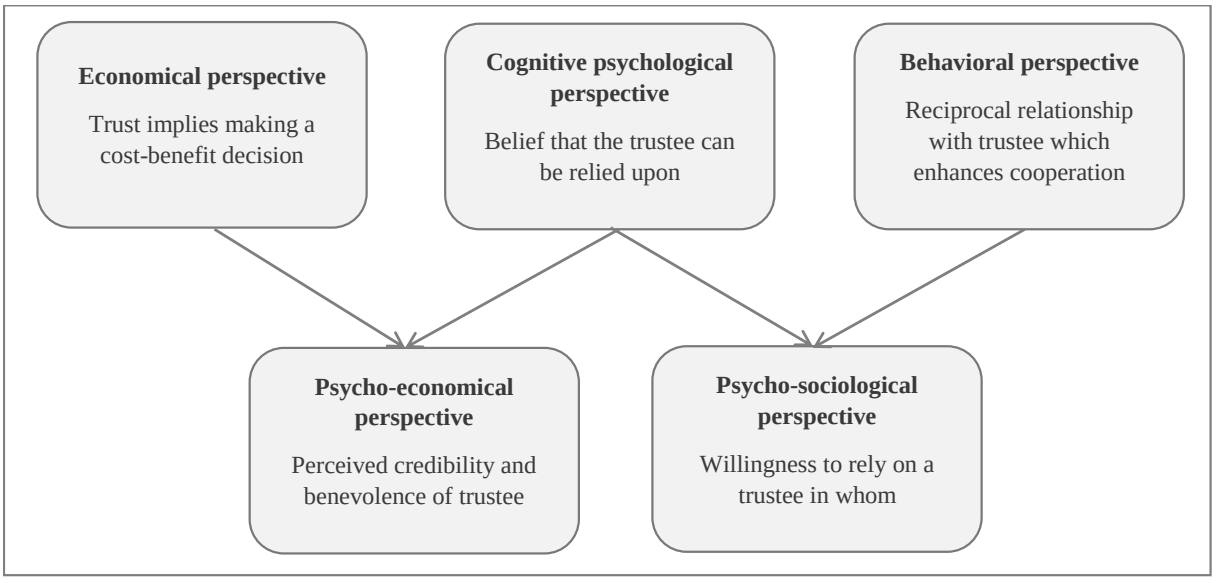

Fig 2 Different perspectives on trust within the industrial marketing domain

Trust development

"*Trust is built over time and starts with a low-risk commitment"* (Swan et al., 1985, p. 204). In general, the development of trust is considered as being a time-consuming and labour-

intensive process (Hawes, 1994). B2B-marketing scholars that are heavily influenced by the psychology domain, focus on the essential personal attributes of the salesperson and on how the salesperson can influence the trust development. To gain the trust of the buyer, the salesperson should behave as a dependable, honest and competent person, must be a master in impression management, exhibit an altruistic motivation of customer orientation and be likable (Swan et al., 1985, Hawes, 1994). This focus on personal attributes suggests that the performance of the salesperson is ultimately a function of his personality traits (Dion et al., 1995).

Later on, the psychological influences on the marketing literature on trust mixed with influences form the field of economics. The work of Doney and Cannon (1997) became the most important piece with respect to trust development. They identified five distinct processes by which trust can develop in business relationships: a calculative process (a cost-benefit analysis of trusting the other), a prediction process (forecasting the behaviour of the other), a capability process (determining the others' credibility), an intentionality process (determining the others' intentions) and a transference process (the transference of trust from one party to the other). These processes are all cognitive processes and are, according to Doney and Cannon, applicable to both trust and distrust.

Current work on trust development in a B2B-marketing context has highlighted the role of some antecedents of trust, such as intercultural competences (Elo et al., 2015) and interpersonal liking (Abosag and Naudé, 2014), and on the power-trust relationship (Jain et al., 2014, Cuevas et al., 2015). However, scholars on trust nowadays place more emphasis on the role of trust with respect to different output-variables.

The role of trust

Trust is considered to be the key mediating variable between characteristics of the trustee and output-variables as commitment and loyalty. The intertwined relationship between trust and commitment has been specifically brought forward by Morgan and Hunt (1994), which is until now the mostly cited article by B2B-marketing scholars studying trust (see Appendix). Where trust is more seen as an attitude, commitment is the motivation or behavioural intention that follows from that attitude. Just like trust, commitment encompasses an affective component, which reflects the general positive feeling from the buyer, and a calculative component, reflecting the degree of difficulty in replacing the supplier (Kumar et al., 1994, Jain et al., 2014). From commitment it is an easy step towards satisfaction and loyalty, where loyalty is considered as having multiple dimensions such as repurchase intention, or positive word of mouth (Harris and Goode, 2004, Vlachos et al., 2009). The concepts of trust, commitment and loyalty can therefore be considered as the 'Three Musketeers' of relationship marketing.

Current work on trust in a B2B-marketing context predominantly studies trust in relation to other variables. The role of trust has for example been brought in relation to the birth and continuation of business relationships (Mandják et al., 2015, Cuevas et al., 2015, Valtakoski, 2015, Jack and Powers, 2015, Munksgaard et al., 2015, Ekici, 2013, Kusari et al., 2013), the performance of alliances and collaboration networks (Jiang et al., 2015, Jain et al., 2014, Filieri et al., 2014, Jiang et al., 2013a, Zhang and Zhou, 2013), export market orientation (Chang and Fang, 2015), the adoption of disruptive technology (Obal, 2013) and of course to satisfaction, commitment and loyalty (Yang, 2015, Graca et al., 2015, Abu Saleh et al., 2014, Human and Naudé, 2014).

NEUROSCIENTIFIC PERSPECTIVE ON TRUST

With the research focus of industrial marketers on the role of trust in relation to different output-variables, examinations of the nature and development of trust are tasting defeat. Despite the enormous amount of research on the concept of trust, trust is often ill-defined (Akrout and Akrout, 2011, Jiang et al., 2013b). In this section it is investigated how a neuroscientific perspective can shine a new light on this deadlock. Such a new perspective can enrich the current literature on the nature and development of trust and can highlight problems that would otherwise not have been considered. A neuroscientific perspective on the nature of trust, the trust building processes and the mediating role of trust is described below.

The nature of trust (and distrust)

Within the brain trust is associated with higher activation in the caudate nucleus (associated with the anticipation on positive rewards), the putamen (associated with the prediction of rewards) and the anterior paracingulate cortex (associated with predicting behaviours of others: 'mentalizing'), and with lower activation in the orbitofrontal cortex (associated with calculating uncertainty) (Dimoka, 2010). Dimoka (2010) tested the dimensions of trust as distinguished by Doney and Cannon (1997), i.e. credibility and benevolence, and found that they cannot completely be separated, since in the brain they both involve the same areas (caudate nucleus and putamen: areas associated with a sense of reward). By the research of Dimoka (2010) it can be roughly stated that credibility and discredibility involve the more cognitive domains in the brain (prefrontal cortex) and that benevolence and malevolence the more emotional domains (limbic system). So when looking at the neural correlates of trust, it is reconfirmed that the overall concept of trust entails both a cognitive and an affective component, but also that these components are very much intertwined.

The trust literature within the field of industrial marketing focusses on the concept of trust and not at its counter ego distrust. On all the articles on trust included in the bibliometrical research (2012-2015), see Appendix, there was no article on distrust. That is probably because distrust is often seen as the reverse of trust. Although trust and distrust are verbally just two opposite words on the same spectrum, neuroscience has shown that the concepts of trust and distrust actually involve distinct areas within the brain. In the brain, distrust is associated with a higher activation of the insula (associated with a fear of loss) and the amygdala (associated with the processing of intense emotions and socially relevant information)(Winston et al., 2002, Dimoka, 2010). Distrust is "*a belief that a partner will be incompetent, exhibit irresponsible behaviour, violate obligations, and will not care about one's welfare or even intend to act harmfully. … Distrust is not just the absence of trust, but the active expectation that the other party will behave in a way that violates one's welfare and security*" (Cho, 2006 p. 26). Thus, where trust is associated with a feeling of safety and reward, a state of distrust is a mental warning signal to keep away: "*distrust denotes a perception of vulnerability due either to fear of the other's motives, intentions, and prospective actions, or to vague forebodings that things are not as they appear and something unpredictable may occur*" (Schul et al., 2008 p. 1293). Therefore, distrust will lead someone to reject an offer, but probably a distrusted supplier will not even make it to the stage of making proposals. To see distrust not as a low level of trust, but as another construct, results in remarkable findings. For example, competence of the trustee does not increase trust, but in fact decreases distrust (Cho,

2006), and distrust is likely to have a greater effect on price premiums than trust (Dimoka, 2010).

The neural difference between trust and distrust is, in a complete different context, also seen in a neural representation of the Prospect theory (Kahneman and Tversky, 1979). When framed as profits (resulting in risk avoidant behaviour) the older ventromedial system in the brain gets active, where for losses (resulting in risk seeking behaviour) the neocortical dorsomedial system is activated which is the more "*calculational part of the brain*" (Smith et al., 2002, p. 717). Therefore, risk avoidant behaviour is probably more natural or instinctive choice behaviour, while risk seeking has a more calculative character (Smidts, 2002). A likewise distinction can also be seen for the concepts of trust (i.e. risk seeking behaviour) and distrust (i.e. risk avoidant behaviour).

From a neurobiological perspective it is shown that hormones, of which people are mostly unaware of the effect they have on their behaviour, are influencing trust. For example, the hormone Oxytocin increases trust and Testosterone decreases trust. Oxytocin is a neuropeptide (i.e. a neuronal messenger in the brain) that is strongly associated to social attachment and has a positive effect on interpersonal trust (Kosfeld et al., 2005, Merolla et al., 2013). "*Oxytocin specifically affects an individual's willingness to accept social risks arising through interpersonal interactions*" (Kosfeld et al., 2005 p. 673), and therefore the intranasal administration of Oxytocin enhances trust and increases the bids investors make in a financial trust game. When experiences learn that trust is betrayed, it is shown that subjects with increased Oxytocin levels (due to a nasal spray) do not adjust their trust perception of the other, while subjects without increased Oxytocin levels do decrease their trust perception (Baumgartner et al., 2008). It might even be the case that cultural differences in trust are related to variations in the intake of Oxytocin due to biological, social and environmental factors: "*nations that have higher incomes, cleaner environments, and that consume more food containing phytoestrogens appear to have higher levels of generalized trust*" (Zak and Fakhar, 2006 p. 424). Where the hormone Oxytocin increases trust, the hormone Testosterone decreases trust (Boksem et al., 2013). This is probably due to the competitive and perhaps antisocial behaviour that Testosterone is causing.

So a neuroscientific perspective shows that the nature of trust and distrust differ. Where trust is associated with a sense of reward, distrust is associated with a sense of fear and being unsafe. It is likely that one automatically makes the evaluation whether or not to distrust the other, and that the decision to trust takes longer and is more calculative by nature. Furthermore credibility and benevolence, as identified by (Doney and Cannon, 1997) are difficult to completely distinguish but credibility might be more cognitive by nature and benevolence more emotional. Finally, people might differ in the ease of trusting others because they differ in their levels of Oxytocin.

Trust-building processes

Recently there has been a paradigm shift in the psychology of reasoning (Elqayam and Over, 2012). Where traditionally reasoning is seen as a cognitive and calculative process, the last decades the dual processing theory is gaining influence (Evans, 2008). The dual processing theory is suggesting two processes: a fast and automatic process (which Kahneman (2011) labels 'System 1') and a slow cognitive process ('System 2'). These two processes can be explained from the development of the brain from an evolutionary perspective. System 1 relates to the older parts of the brain (the instinctive reptilian brain and the emotional

mammalian brain) and System 2 relates to the thinking brain, the neocortex (MacLean, 1990). The trust-building processes used in B2B marketing literature, such as described by Doney and Cannon (1997), can be well understood from the traditional perspective on reasoning. But, following the dual processing perspective, these trust-building processes are probably preceded by automatic and instinctive processes.

Neuroscientists have shown that just 100 milliseconds are sufficient to create a first impression of someone's trustworthiness and that additional time only increases confidence in the judgments made (Willis and Todorov, 2006). This quick, or instinctive, impression of another person's trustworthiness makes sense from the above described evolutionary perspective; a rapid trustworthiness evaluation is crucial for modulating behaviour toward strangers (Bzdok et al., 2011). From an evolutionary perspective, it is in our benefit to quickly form an impression whether or not to *distrust* the other, since the other might do harm. Therefore this first impression whether or not to *avoid* the other goes automatically (Chen and Bargh, 1999, Winston et al., 2002). The automatic response is of instinctive nature, and is related to the well-known fight-or-flight response. The emotional response evolves directly after the automatic response. Most important in the emotional response is the amygdala, the most prominent part of the mammalian brain (Kalat, 2004), which is located in the forebrain and is part of the limbic system (also called the emotional system in the brain). The amygdala connects information in a quick, automatic and obligatory process creating emotional responses (Adolphs, 2002). At the point in time where the amygdala is activated, the individual is still consciously unaware of the stimulus (Adolphs, 2002), suggesting that the first responses with respect to trust stimuli (antecedents of trust) are of a relative instinctive nature.

To make a first impression facial cues are extremely important. When we look at someone's face, the brain constructs a representation of what it sees in a way that specific features of the face are distilled. Perceptual processing of facial features can then be linked to the generation of judgments about the person, which in the brain involves the amygdala and other areas, like regions of the prefrontal cortex and regions of somatosensory-related cortices (Adolphs, 2002). The amygdala is significantly more activated when subjects view faces that they later rate as untrustworthy than when they view those rated as trustworthy, even when corrected for the fact that expressions of anger or sadness negatively correlate with trust, and happiness positively correlates with trust (Winston et al., 2002). "*It seems plausible that viewing people who look untrustworthy would produce emotional responses and changes in feeling in the perceiver, and that such feelings might be used, in part, to make social judgments*" (Adolphs, 2002 p. 193). This feeling is probably reflected by activation in the insula: "*One suggested role for the insula is the mapping of autonomic changes as they affect the body where such mappings form the basis of 'gut feelings' about emotive stimuli*" (Winston et al., 2002 p. 280). One of the facial cues people use in their trustworthiness evaluation is gender. People are influenced by a general bias to regard male faces as untrustworthy and female faces as trustworthy (Dzhelyova et al., 2012).

Crucial in the making of first impressions is the amygdala. An ALE-meta-analysis on fMRI-studies with respect to trust and attractiveness shows that where the amygdala was first dominantly associated with the processing of negative emotional stimuli, the amygdala is actually associated with processing all socially relevant stimuli (Bzdok et al., 2011). This means that activation of the amygdala does not only play a crucial role for the processing of distrust, but also for the processing of trust. In general there can be cautiously assumed that the amygdala is the filter of information with respect to social decision making (Bzdok et al., 2011).

The impressions of System 1 are picked up by System 2 (Kahneman, 2011). This might be in the form of post-rationalizations (Johansson et al., 2005). For example, when System 1 tells you to distrust the other, System 2 produces argumentations for this instinct. When the quick decision has been made that avoidance is not necessary (so that the other is not distrusted), one can start to wonder whether the other can be trusted. This is where the trust-building processes come up. Since trust involves risk-taking behaviour, one starts to make a cost-benefit analysis. Such an analysis is slow and calculative by nature. In the last section there has been described that trust in the brain involves the brain areas that can be associated with the prediction of reward, the calculation of uncertainty and with mentalizing the other. This relates closely to the five processes identified by Doney and Cannon (1997).

In an event-related hyper-fMRI study (hyper-fMRI means that multiple subjects, each in a separate MRI scanner, can interact with one another while their brains are simultaneously scanned) Frank Krueger and colleagues (2007) investigated the neural correlates of trust by letting two strangers interact online in a sequential reciprocal trust game. They show that the paracingulate cortex (PCC) is involved in building a trust relationship . The anterior PCC is activated for understanding intentions involving social interaction (Walter et al., 2004). Anterior PCC activation also takes place when social interaction was foreseen but had not actually taken place, so the PCC might be involved in *mentalizing* future social interaction (Walter et al., 2004, McCabe et al., 2001). This mentalizing is unique for human beings, implying that is consists of a higher cognitive order (Krueger et al., 2007).

So, the evaluation of the trustworthiness of the other involves a fast, automatic, instinctive and emotional process (which may best be summarized by '*first impression processes*'), in which a quick judgment is made whether or not to avoid the other, and a slow and calculative process in which an individual compares the benefits of trusting with the costs of cheating by the other. The evaluation in the first stage is mostly determined by perceptual information, such as facial cues (Yang et al., 2011). In the second stage more information is retrieved from memory and assessed (Rudoy and Paller, 2009). These two stages in evaluating someone or something are also visible when people evaluate brand extensions. Based on EEG-research it was shown that people first make a quick similarity-based evaluation of a brand extension, which is followed by a late analytic and category-based evaluation (Ma et al., 2014).

The mediating role of trust

As argued before, conceptualizations of trust suffer from conceptual confusion (Blomqvist, 1997). It is difficult to completely grasp the full concept with all its conscious and unconscious elements. Therefore verbal measurements of trust (i.e. by interviews and/or surveys), by which the results or answers depend on the conscious and rational part of the human brain, suffer from violations of construct validity (Boshoff, 2012). At the same time, the concepts of trust and commitment are identified to play a key mediating role between personal and organizational antecedents and economic consequences (Morgan and Hunt, 1994). *Economically*, it is of specific relevance to be able to measure the *effect* of trust on economic life, and, more specifically, its effect on the buying process. Trust in a potential business partner is in itself rather worthless if it does not lead to a purchase contract. Therefore, trust has to entail an *approach-related behavioural intention* to be economically worthwhile. Within an advertising context it has been demonstrated by an EEG-study that commercials that provoke an approach-motivated behaviour had a greater commercial success (Ohme et al., 2010).

The difference between the approach system and the avoidance system is explained by the 'Davidson-model', and it can be measured by asymmetries in electroencephalographic (EEG) activity over the frontal cortex (Davidson, 2004, Davidson, 1993). The general 'rule' of the Davidson-model is that greater left-sided frontal asymmetry on the alpha-band is associated with approach-related behaviour and greater right-sided frontal asymmetry with withdrawal- or avoidance-related behaviour. It is important to stress that greater left-sided frontal asymmetry on the alpha band does not implicate a positive emotion per se; anger and cognitive dissonance evoke approach-related behaviour as well (as measured by a greater left-sided frontal asymmetry on the alpha band). From an evolutionary perspective the relationship between anger and approach-related behaviour can be explained by the tendency to attack (Harmon-Jones, 2004).

There are multiple indications that trust can be directly related to approach-motivated behaviour (Chen and Bargh, 1999, Kosfeld et al., 2005, Todorov, 2008). In a recent EEG-study by Vecchiato et al. (2014) it was found that when the faces of politicians were evaluated as trustworthy, this evoked an approach-motivated behavioural intention in the brain, as measured by a greater left-sided asymmetry on the alpha band. It is likely that Oxytocin increases approach-related behaviours while inhibiting withdrawal-related behaviours (Kemp and Guastella, 2011). This is probably because Oxytocin reduces activity in the amygdala. The amygdala appears to serve as a mediator between stimuli and behaviour: "*Assessing an individual's trustworthiness might be related to a broader categorization into 'good guy, bad guy', guiding approach versus avoidance behaviour*" (Bzdok et al., 2011 , p. 210).

TOWARDS A NEW CONCEPTUALISATION OF (DIS)TRUST AND TRUSTBUILDING

The neuroscientific insights presented above are conceptualised in figure 3. The figure is based on the Stimulus-Organism-Response-model (SOR), which sprouts from the psychophysiological framework for marketing research (Wang and Minor, 2008). SOR-models found their scientific entry in the 1960's in the field of consumer psychology, and were the response to the Input-Output-models in which the consumer was seen as a rational entity and perceived as a 'black box'(Jacoby, 2002). Within an SOR-model, it is explicated that a stimulus creates an internal reaction within the human being, or organism. This internal reaction has psychological antecedents and physiological consequences (for example increased heart rate or skin conductance). The internal reaction within the organism creates a response in the form of behaviour or behavioural intention.

When an individual is confronted with a person or organisation and he needs to make a trustworthiness evaluation, System 1 will first generate a first impression. This first impression process is automatic, instinctive and emotional by nature and is led by perceptual information. Within the brain the amygdala plays a crucial role in this process. When the person or organisation is distrusted, the amygdala creates an immediate 'warning signal' to keep away (avoidance behaviour). The first impressions generated by System 1 are transferred to System 2, in which a slow analytic judgment is made. This process is within a marketing context described by Doney and Cannon (1997) and split into five processes: a calculative, prediction, capability, intentionality and transference process. Neuroscientific research showed that trust indeed involves areas in the brain that are associated with the prediction of

reward, the calculation of uncertainty and mentalizing (Dimoka, 2010). The development of trust is likely to create an approach-motivated behaviour or behavioural intention.

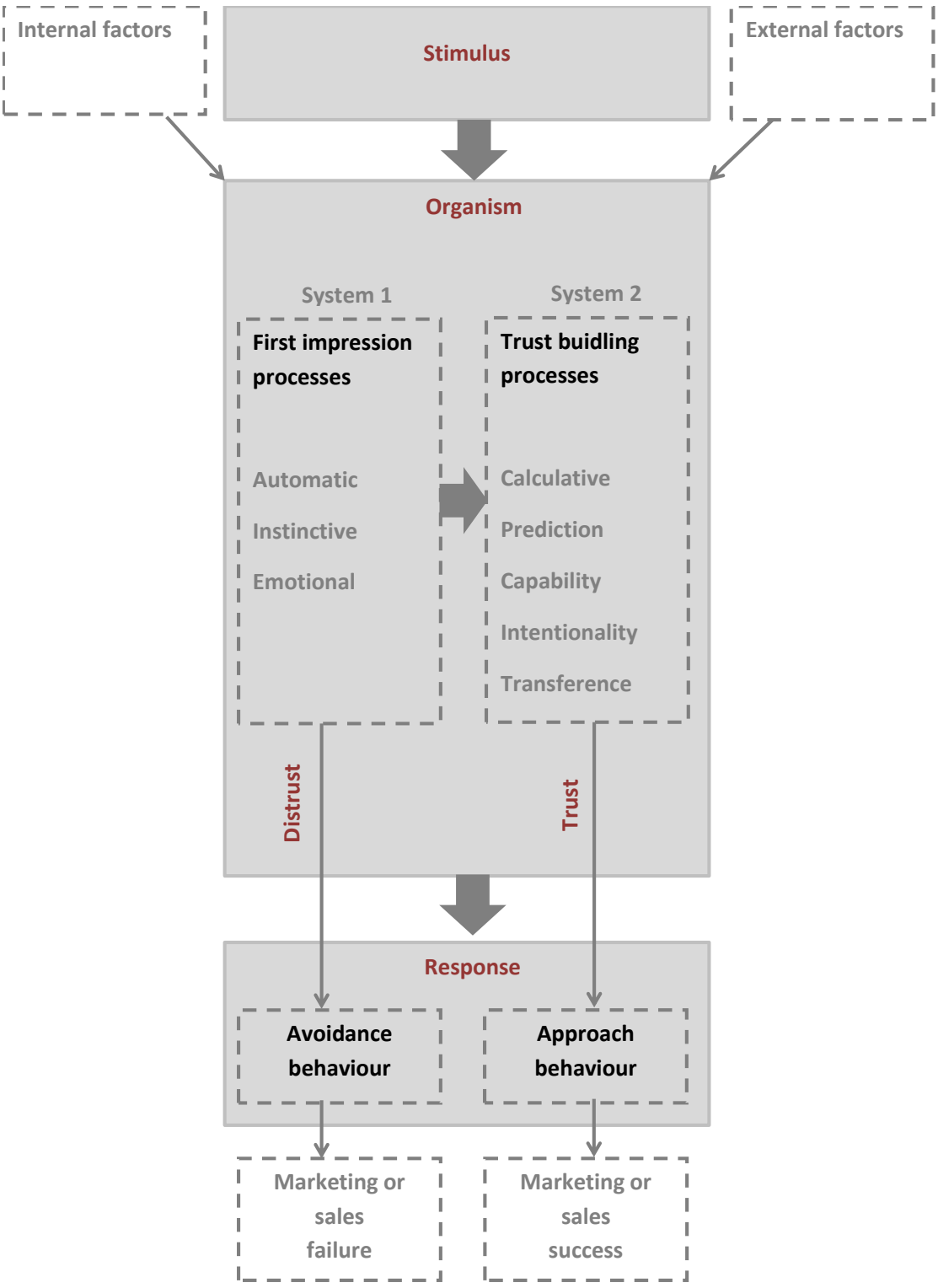

Fig 3 *Conceptual framework on distrust, trust and trust-building based on a neuroscientific inquiry. In the figure the following elements are combined: the psychophysiology framework (Stimulus-Organism-Response) for marketing research (Wang and Minor, 2008), the dual processing theory: System 1 and 2 (Kahneman, 2011), the automatic first impression processes (Willis and Todorov, 2006), the trust-building processes (Doney and Cannon, 1997), the difference between trust and distrust (Dimoka, 2010) and the avoidance- or approach- behavioural intention (Davidson, 2004).*

There are internal factors that are influencing the trust-building processes, such as the level of Oxytocin in the body and personality traits. For example, people differ in their resting patterns of frontal EEG asymmetry, which has trait-like properties and causes individual differences in emotional responses. Persons with greater left- than right-sided asymmetry in the resting brain report higher levels of dispositional positive affect, whereas persons with greater right-sided asymmetry report higher levels of dispositional negative effect (Tomarken et al., 1992). Even babies tend to cry more when separated from their mother if they have greater right-sided asymmetry in the resting brain (Davidson and Fox, 1989). From this perspective frontal EEG asymmetry might be seen as a moderator of trust (Davidson, 2004). It might also be the case that frontal EEG asymmetry is a mediator of emotion, but this is not a proven fact (Coan and Allen, 2004). This trait-like property of trust has an effect on an individual's personal and economic life. In normal environments (i.e. environments where one can depend on routine strategies) people with a high level of trust should do better than people who distrust. But, when one cannot depend on routine strategies, individuals who distrust outperform individuals who trust (Schul et al., 2008). Another internal factor influencing the evaluations being made is sleep. An experiment by Anderson and Dickinson (2010) showed that subjects that were deprived from sleep were less likely to place full trust in an anonymous partner when playing a trust game.

The external factors that are influencing the trust-building processes involve the impact of people's environment on their judgments. From the Prospect theory (Kahneman and Tversky, 1979) we already know that the way a message is framed is influencing the decision people make. From an EEG-study it appears that within a trustworthiness-evaluation task subjects' brain activity differs with respect to the source from which they get their information (Boudreau et al., 2009). It has also been shown that when consumers are distracted from their evaluation task, they will make a different evaluation then when they have full attention for the task (Biswas et al., 2009). Furthermore, when encountering a new environment one judges this environment based on the perception of his own environment (O'Brien et al., 2014).

DISCUSSION

The field of neuroscience produces new insights every day. As Barack Obama said on the BRAIN Initiative (2013): *"As humans we can identify galaxies light years away and we can study particles smaller than an atom, but we still haven't unlocked the mystery of the 3 lbs of matter that sits between our ears"* (www.npr.org). This paper showed that insights from neuroscience could enrich and broaden the existing industrial marketing literature. Every day the field of neuroscience is working on revealing the mystery of the brain, making new insights available that could be useful for the marketing science.

Neuroscientific research techniques are more and more used within the B2C marketing domain. At the same time we don't know for sure whether transferring neuroscientific insights to the field of industrial marketing is always legitimate. Choice behaviour in an industrial context might be completely different than choice behaviour in a B2C-context. Industrial buying decisions are mostly more complex and characterized by group decision making, supporting the idea that B2B-buying is more rational than B2C-buying (Lynch and Chernatony, 2004). At the other hand, since there is in general much more interpersonal interaction in B2B markets than in B2C markets and the quality of this interpersonal interaction depends on a personal click between the actors, it makes sense that the role of

emotion is underestimated in a B2B context (Makkonen et al., 2012, Lynch and Chernatony, 2007). Therefore, neuroscientific research techniques should become part of the 'standard' equipment of B2B-marketers, just as it is becoming for the B2C-marketers, which would enable the field to study the neuroscientific foundations of choice behaviour within the context of industrial marketing (Hinterhuber, 2015).

The conceptual framework presented in figure 3 enables scholars within the field of industrial marketing with an enriched and broadened perspective on the role of trust which may guide future research in different ways. At the conceptual level, the construct validity can be improved by measuring the full scope of the concept of trust, i.e. both the affective and cognitive component and the two stages of processing. When trust and distrust are seen as different concepts, the economic consequences of trust and distrust can be measured separately. The determinants of trust in a business context are rather well examined, but there is a lack of research on the determinants of distrust, and studies in that direction could help industries to avert distrust. Interestingly, it is very well possible that the concepts of trust and distrust differ, in a way that they are not just two opposites at the same continuum, but that their behavioural consequences are two ends at the same construct (i.e. approach versus avoidance, sales success versus sales failure). This does not hold for every construct though. For example trust may lead to loyalty, but distrust might not lead to disloyalty. The ways in which a neuroscientific perspective might specifically shape the future research agenda are presented in the next section.

Trust and its consequence commitment both have no economic value *in itself*. The economic value lies in what results from that trust and commitment. Therefore the presented conceptualisation suggests 'approach-motivated behaviour' as mediating variable since it evolves a perspective on attitude-level towards a perspective on the level of behavioural intention, which is related more closely to having true economic value.

At the methodological level this paper might create an urge for adopting new research techniques. Regarding customers as human beings that are bounded rational implicates to see them as persons making judgments based on factors of which they are aware, but also of which they are unaware. The SOR-model helps to analyse customer decision behaviour with all the conscious and unconscious processes that guide or influence that behaviour. The SOR-model forms an excellent framework for psychophysiological research in the marketing domain, but it requires new research skills. Therefore the main discussion question is whether the benefits of *adopting* a neuroscientific perspective on trust within a business context outweigh the costs of acquiring new skills and adopting insights from a discipline that is so far alienated from ours. To the opinion of the author they do, but it requires a huge investment, both in time and money. For a discipline studying collaborations so much, it might be a good time to collaborate itself with a discipline that is capable of enriching the current research practice so that we get a more complete picture of the factors of success and failure of buyer-seller-relationships and collaborations in business life.

CONCLUSION AND RESEARCH AGENDA

Industrial marketing scholars studying trust have been inspired by the academic disciplines of business, management, economics, psychology and sociology, and in doing so have exhibited a cognitive approach on the concept of trust. They use, to a great extent and for a good reason, the same strong shoulders on which they lean in many directions and positions. In this paper

these shoulders (for example Rotter, Morgan and Hunt, Doney and Cannon) have been presented. It could be argued that industrial marketing scholars regarding the concept of trust tend to think within a box, and that this box is black. In other words, most studies on trust are based on the same, cognitive, way of reasoning, in which the processes that occur within the human individual are being ignored or under-investigated. That is not necessarily problematic, but by thinking outside the box new thoughts on trust might arise.

By introducing a neuroscientific perspective it was shown that there is a reason to doubt the perception that trust and distrust are opposite poles on the same axis. Since distrust is currently under-investigated, this might create an urge for further inquiries into the nature and development of distrust within a B2B-context. By studying the neural correlates of both trust and distrust more becomes clear about the nature of these constructs. For example, the neural correlates of trust show that trust is associated with the prediction of and anticipation on rewards, with a state of mentalizing and with calculating uncertainty. When taking a neurobiological perspective it was displayed that the hormones Oxytocin and Testosterone are of considerable influence, and that they have a respectively positive and negative effect on trust. Variations in the intake of Oxytocin might even create individual and cultural differences in trust. The presented conceptual framework based on a neuroscientific perspective relates distrust to avoidance behaviour and trust to approach behaviour. Approach and avoidance can be measured by frontal EEG asymmetry. Furthermore is shows that distrust is often quickly developed by automatic, instinctive and emotional processes, whereas the development of trust also includes a more calculative process.

The exhibited neuroscientific perspective on trust might shape the future research agenda in many ways. First, to fully grasp the nature of both trust and distrust, the neural correlates of these constructs should be investigated within a B2B-context. The current knowledge on the neural correlates of trust is established by letting subjects play (trust) games. A reproduction of the hyper-fMRI study of Krueger et al. (2007) within an actual business setting would be worthwhile. Furthermore the relation between trust and distrust on one hand and approach and avoidance motivated behaviours on the other deserves a priority rank at the industrial marketing research agenda.

Second, this paper has created research challenges and opportunities with respect to the measurement of both trust and distrust. Since these constructs both have a cognitive and affective component, and since we are partly unaware of the manifestation of these components, applying neuroscientific research techniques (such as EEG or fMRI) is of added value. It should also be investigated if there are ‘easier ways to Rome’, for example by integrating BIS/BAS-scales as a proxy for approach versus avoidance behaviour (Carver and White, 1994).

A third research opportunity lies in the investigation of antecedents of both trust and distrust. Do trust and distrust have different antecedents? And what is the role of gender? There are indications that females are more quickly considered as trustworthy (Dzhelyova et al., 2012) and, from a neurobiological perspective it might be that females place more trust in others. When more females are at the negotiation table, does this lead to more collaborations? In general, the role of hormones at the negotiation table is worth a thorough investigation.

Fourth, with respect to distrust development there is an open meadow full of research opportunities. Distrust is often a quick and automatic response to a certain stimulus, but it is very well possible that an initial low-trust-level transforms into distrust. In that case, what are the trigger points that cause a low level of trust to evolve in distrust? The same open meadow of research opportunities exists for the consequences of distrust. Can the construct of distrust

help to explain the high rate of fiascos with respect to the introduction of innovations? Can it help explaining the failure of forming strategic alliances? And how can such failures be overcome? What is the effect on price premiums within a B2B-context?

A fifth research opportunity lies in the examination of personal differences with respect to trust and distrust. What is the importance of 'the right men at the table'? Are strategic alliances often the outcome of a group of people that by nature trust others sooner? What happens to a group when somebody joins that has trust-difficulties, for example because of a high level of Testosterone? Can somebody, by neurofeedback, be trained to exhibit behaviours that cause others to have more trust in him? What is the role of sleep? If sleep deprivation makes us less likely to place full trust in the other (Anderson and Dickinson, 2010), what happens if negotiations take place until deep in the night?

And sixth, since there is reason to assume that there are cultural differences in the 'ground level' of trust based on differences in the intake of Oxytocin, what is the effect on patterns of trade and the forming of international alliances?

Finally, this paper has provided a starting point for conceptualising distrust, trust and trust-building by integrating a neuroscientific perspective. Now might be a good time to test this conceptual framework within a B2B-context and to improve it. Furthermore, the foundation of the presented conceptual framework itself, the SOR-model, invites for an exploration with respect to other constructs besides trust as well. In the end, conceptualisations based on SOR-models transform the black box approach into investigations of the grey matter.

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APPENDIX EXPLORATORY BIBLIOMETRIC RESEARCH ON TRUST

A neuroscientific perspective on trust within the context of industrial marketing is extremely rare. To flesh out this statement an exploratory bibliometric research has been conducted among 69 articles on trust published in IMM, JBIM and JBBM within the period 2012-2015. The time period 2012-2015 is relatively small, therefore the results can only been seen as exploratory. At the same time, introducing neuroscience in the marketing domain is a very recent development, and if neuroscientific work would have been used by industrial marketing scholars, that would have been done the last couple of years. The results show that indeed the neuroscientific perspective did not find its way into the industrial marketing domain, considering the concept of trust.

Introduction to bibliometrics

Bibliometrics, in the context of scientific disciplines, is the application of metrics in order to describe the science (Andrés, 2009). It is mostly used for journal ranking, the investigation of research networks, the extraction of dominant themes or methods used within a scientific discipline and for measuring and understanding the citing behaviour of authors and journals. Here, by concentrating at citation analysis, the focus lies on this last application. Analysing the citing behaviour of authors belongs to the discipline of *social epistemology* in which the utilization of intellectual products is studied (Shera, 1972). Citation analysis assumes that citations have symbolic value and are products of social behaviour (Small, 1978).

Bibliometric research in the past has revealed some interesting citing behaviours. For example there appears to be two prototypical structures of citation behaviour: scholars in the natural sciences tend to focus on recently published research while ignoring foundational work, whereas scholars in the behavioural sciences show opposite behaviour by focussing on foundational work, while ignoring recent publications (Hargens, 2000). There has also been found two prototypical structures of self-citation behaviour: top-performance research groups tend to have less self-citations because authors from other research groups will cite them anyway and lower-performance research groups need more self-citations as a way of promoting their own work (Raan, 2008).

Eugene Garfield is the 'godfather' of bibliometrics and his work caused the real breakthrough of the field (Andrés, 2009). He developed the *Science Citation Index*, an interdisciplinary database in which journals and articles from various disciplines are integrated. Especially the interdisciplinary characteristic of his index was innovative; prior indices were discipline-oriented (Andrés, 2009). Nowadays scholars have all the means to take an interdisciplinary approach in their research, but do they?

Bibliometrics and interdisciplinarity

'*Interdisciplinarity occurs when knowledge, experience, technology or expertise is transferred among the worlds via borrowing, collaboration and/or boundary crossing*'(Steele and Stier, 2000, p. 477). Rafols and Meyer (2010) present two approaches to investigate interdisciplinarity by using bibliometrics. The first approach is a top-down approach in which references are categorized by predefined categories to study their proportions and/or relations. This approach is measuring the disciplinary diversity by using citation analysis. The second approach is a bottom-up approach in which references are clustered and mapped to study the

similarity at network-level, also called network coherence. The bottom-up approach often uses co-citation analysis or bibliographic coupling. Both approaches have disadvantages. The top-down approach is using predefined categories, *´which may miss emergent or dynamic phenomena in science*' (Rafols and Meyer, 2010, p. 269). At the other hand, the bottom-up approach is only feasible for investigations at the micro- or meso-level. The combination of the two approaches would give the most nuanced view, whenever that nuance is necessary. For example, Backhaus et al. (2011) performed both a top-down (citation analysis) and a bottom-up (co-citation analysis) approach to investigate the structure and evolution of business-to-business marketing; a research question that clearly asked for nuance. With respect to the level of interdisciplinarity in bibliographies in B2B-journals, their research showed that journals from the discipline of psychology have minor impacts on B2B research. However, mostly only a top-down approach is used. Examples are the research of Hurd (1992) which showed that over 49 per cent of the journals cited by scientists in a chemistry department of a university was classed in other disciplines and the study of Choi (1988) in which even 70 per cent of the literature cited in anthropology journals was classed in other disciplines. The field of anthropology could therefore be seen as a 'receiving' discipline.

Methodology

An exploratory bibliometric research is performed to reveal the shoulders on which the current industrial marketing scientific community stands when discussing trust and to assess whether there are some neuroscientific shoulders. To identify the intellectual structure of this research field, a citation analysis is performed (top-down approach) in which the distribution of references among categories (i.e. different disciplines) is measured. Studies of interdisciplinary research, by using citation analysis, mostly used measures like '*Citations Outside Category (COC)*' (Chubin et al., 1984), by which a lot of data gets lost: COC-measures label references only as within or without a category, and are therefore not a good measure of broad diversity (Steele and Stier, 2000). It is better to focus at the distribution of references among categories, which is done in this exploratory investigation.

The SCOPUS database presents 76 articles on trust from the three leading B2B journals (IMM, JBIM and JBBM) in the period 2012-2015. These 76 articles all have 'trust' in their title, abstract or key words, and represent 31 per cent of all the articles ever published on 'trust' in IMM, JBIM and JBBM (245 articles). Of these 76 articles, the articles are selected that are directly related to the broad field of relational marketing. At the end of this appendix the articles that are included (69 articles) and excluded (7 articles) in the exploratory research are shown. The 69 articles included in the bibliometrical research have 5288 references (websites and references to dictionaries or statistical yearbooks excluded), which gives an average of 76.6 references per article. The 5288 references are spread out over 3593 different sources and are categorized over disciplines using the Social Sciences Citation Index.

Results

Figure A1 shows that the commitment-trust theory of Morgan and Hunt (1994) forms, with 48 citations, the most popular source. This is a predictable outcome, since the work of Morgan and Hunt is in the complete industrial marketing field one of the most important sources (Backhaus et al., 2011). Figure A1 shows the other dominant work directly on trust as well, i.e. Doney and Cannon (1997), and two dominant works on the context within trust is studied:

relationship marketing (Dwyer et al. (1987) and Ganesan (1994)). The top ten references show roughly three categories, which can also be identified among the other 5278 references: articles on trust, articles on the broader topic of relationship marketing and methodological articles. The only two articles in the top ten list that are published in a journal from the psychology domain are both methodological by nature. The youngest article from this top ten list is Podsakoff et al. (2003). The average age of the most popular ten references is almost 25 years (i.e. 1991,8). This is in line with the finding of Hargens (2000) that within the behavioural sciences scholars tend to focus on classic works instead of recent publications.

Fig A1 *Top ten references (the right column shows the number of citations out of 69 articles).*

Morgan, R.M., Hunt, S.D., The commitment-trust theory of relationship marketing (1994) Journal of Marketing	**48**
Dwyer, F.R., Schurr, P.H., Oh, S., Developing buyer-seller relationships (1987) The Journal of Marketing	**31**
Doney, P.M., Cannon, J.P., An examination of the nature of trust in buyer-seller relationships (1997) Journal of Marketing	**29**
Ganesan, S., Determinants of long-term orientation in buyer-seller relationships (1994) Journal of Marketing	**29**
Anderson, J.C., Narus, J.A., A model of distributor firm and manufacturer firm working partnerships (1990) The Journal of Marketing	**25**
Fornell, C., Larcker, D.F., evaluating structural equation models with unobservable variables and measurement error: Algebra and statistics (1981) Journal of Marketing Research	**23**
Anderson, J.C., Gerbing, D.W., Structural equation modeling in practice: A review and recommended two-step approach (1988) Psychological Bulletin	**20**
Anderson, E., Weitz, B., The use of pledges to build and sustain commitment in distribution channels (1992) Journal of Marketing Research	**20**
Moorman, C., Zaltman, G., Deshpande, R., Relationships between providers and users of market research: The dynamics of trust within and between organizations (1992) Journal of Marketing Research	**19**
Podsakoff, P.M., MacKenzie, S.B., Jeong-Yeon, L., Podsakoff, N.P., Common method biases in behavioral research: A critical review of the literature and recommended remedies (2003) Journal of Applied Psychology	**18**

From the 5288 references, there are 839 citations to a work that has 'trust' or a derivative of the term trust in the title. These 839 are spread over 379 different works, of which the top ten is shown in figure A2. In the top ten list, the article of Bradach and Eccles is the only one from another discipline.

The two most important journals to which is referred are the Journal of Marketing and Industrial Marketing Management, as is shown by figure A3. Almost twenty per cent of all the references have these journals as their source. So one could say that if a scholars' literature review on the topic of trust is represented by one hand, than one finger is always pointing towards the Journal of Marketing or Industrial Marketing Management. The top ten journals together account for more than 40 per cent of all the references in the bibliometric dataset. Remarkable is that all the journals to which is mostly referred are having their roots within the domains of Business and Management (according to the SSCI). In the top 25 there are only two journals from another domain than Business and Management, namely the Journal of Applied Psychology (with 0.8% of total references on the 19th place) and the Psychological Bulletin (with 0.6% of total references on the 24th place). These two psychological journals are *not* in the top 25 list because of their contribution on the concept of trust, but because in both there was a methodological article that was highly cited: Anderson and Gerbing (1988) in the Psychological Bulletin (20 times cited) and Podsakoff et al. (2003) in the Journal of Applied Psychology (18 times cited). In the top 50 list of journals, there are

only 5 journals that do not have their roots in the domains of Business and Management (as highlighted in figure A3).

Fig A2 *Top ten references with 'trust' in title (the right column shows the number of citations out of 69 articles).*

Morgan, R.M., Hunt, S.D., The commitment-trust theory of relationship marketing (1994) Journal of Marketing	**48**
Doney, P.M., Cannon, J.P., An examination of the nature of trust in buyer-seller relationships (1997) Journal of Marketing	**29**
Moorman, C., Zaltman, G., Deshpande, R., Relationships between providers and users of market research: The dynamics of trust within and between organizations (1992) Journal of Marketing Research	**19**
Zaheer, A., McEvily, B., Perrone, V., Does trust matter? Exploring the effects of interorganizational and interpersonal trust on performance (1998) Organization Science	**17**
Mayer, R.C., Davis, J.H., Schoorman, F.D., An integrative model of organizational trust (1995) Academy of Management Review	**14**
Moorman, C., Deshpande, R., Zaltman, G., Factors affecting trust in market research relationships (1993) Journal of Marketing	**12**
Rousseau, D.M., Sitkin, S.B., Burt, R.S., Camerer, C., Not so different after all: A cross-discipline view of trust (1998) Academy of Management Review, 23 (3)	**10**
Seppänen, R., Blomqvist, K., Sundqvist, S., Measuring inter-organizational trust a critical review of the empirical research in 1990-2003 (2007) Industrial Marketing Management	**10**
Bradach, J.L., Eccles, R.G., Price, authority, and trust. From ideal types to plural forms (1989) Annual Review of Sociology	**9**
Dyer, J.H., Chu, W.J., The role of trustworthiness in reducing transaction costs and improving performance: Empirical evidence from the United States, Japan, and Korea (2003) Organization Science	**9**

Figure A3 already gives the impression that industrial marketers studying trust predominantly shop around for inspiration and foundation of their academic work within the domains with which they are familiar, i.e. Business and Management. To further investigate the citation behaviour of scholars on trust within the field of industrial marketing, the 5288 references are categorized according to the (expanded) Social Sciences Citation Index (SSCI). The results of this top-down approach on the investigation of interdisciplinarity are shown in figure A4. A distribution of the articles from journals of the domains Business, Management, Economics, Psychology, Sociology, Law and Philosophy is shown in figure A5. These domains are selected based on the inquiry of Blomqvist (1997) on the many faces of trust, in which he defined social psychology, philosophy, economics, contract law and marketing as the main domains for an interdisciplinary perspective. The domains of Sociology and Psychology are not as abundant as one would expect on an interdisciplinary topic like trust. Furthermore, figure A4 and A5 show already two obvious lacunas in the bibliographies of scholars on trust: Law and Philosophy. Furthermore, there are only some citations to works in the natural sciences, like Biology (only one citation) and Neuroscience (only 4 citations). One can conclude from these results that articles on trust published in IMM, JBIM and JBBM (2012-2015) have a rather narrow bibliography, in the sense that the domains of Business and Management are dominant, the domains Psychology, Economics and Sociology have a minor impact, and citations to other domains occur only sporadically.

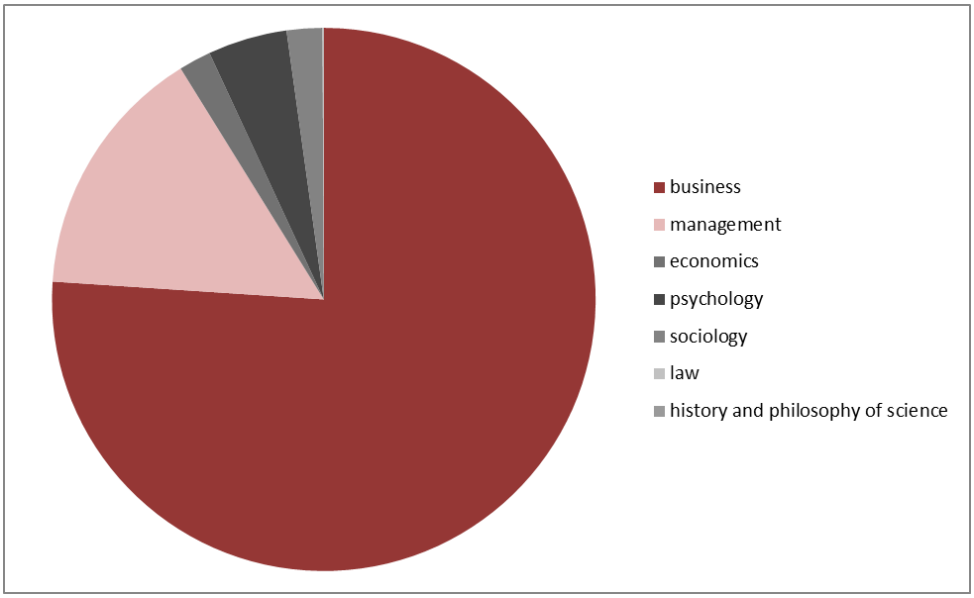
Fig A3 *Journals to which is cited the most by currents B2B scholars on trust*

	Journal	Number of references	% of total (=5288)	Cumulative %
1	Journal of Marketing	547	10,3%	
2	Industrial Marketing Management	438	8,3%	18,6%
3	Journal of Marketing Research	257	4,9%	23,5%
4	Academy of Management Review	169	3,2%	26,7%
5	Journal of Business Research	159	3,0%	29,7%
6	Journal of the Academy of Marketing Science	156	3,0%	32,6%
7	Strategic Management Journal	151	2,9%	35,5%
8	Journal of Business & Industrial Marketing	124	2,3%	37,8%
9	Academy of Management Journal	98	1,9%	39,7%
10	Organization Science	93	1,8%	41,5%
11	European Journal of Marketing	82	1,6%	43,0%
12	Journal of Operations Management	81	1,5%	44,5%
13	Administrative Science Quarterly	70	1,3%	45,9%
14	Journal of International Business Studies	67	1,3%	47,1%
15	Journal of Retailing	56	1,1%	48,2%
16	International Journal of Research in Marketing	44	0,8%	49,0%
17	Management Science	44	0,8%	49,8%
18	Journal of Management	44	0,8%	50,7%
19	Journal of Applied Psychology	43	0,8%	51,5%
20	Journal of Service Research	41	0,8%	52,3%
21	Journal of Consumer Research	40	0,8%	53,0%
22	Journal of Management Studies	39	0,7%	53,8%
23	Harvard Business Review	36	0,7%	54,4%
24	Psychological Bulletin	33	0,6%	55,1%
25	Journal of International Marketing	32	0,6%	55,7%
26	American Journal of Sociology	30	0,6%	56,2%
27	Organization Studies	30	0,6%	56,8%
28	Journal of Business-to-Business Marketing	29	0,5%	57,4%
29	Journal of Services Marketing	28	0,5%	57,9%
30	Journal of Supply Chain Management	26	0,5%	58,4%
31	Journal of Personal Selling & Sales Management	26	0,5%	58,9%
32	Journal of Personality & Social Psychology	25	0,5%	59,3%
33	International Marketing Review	24	0,5%	59,8%
34	International Journal of Service Industry Management	22	0,4%	60,2%
35	Journal of Marketing Management	20	0,4%	60,6%
36	MIS Quarterly	20	0,4%	61,0%
37	International Business Review	18	0,3%	61,3%
38	Psychology and Marketing	18	0,3%	61,6%
39	International Journal of Operations & Production Management	18	0,3%	62,0%
40	Journal of Business Logistics	18	0,3%	62,3%
41	Supply Chain Management: An International Journal	17	0,3%	62,7%
42	Journal of Business Ethics	16	0,3%	63,0%
43	American Sociological Review	15	0,3%	63,2%
44	Decision Sciences	15	0,3%	63,5%
45	Management Decision	15	0,3%	63,8%
46	Journal of Marketing Theory & Practice	15	0,3%	64,1%
47	Marketing Letters	15	0,3%	64,4%
48	Journal of Product Innovation Management	14	0,3%	64,6%
49	International Journal of Production Economics	13	0,2%	64,9%
50	International Journal of Physical Distribution & Logistics Management	13	0,2%	65,1%
51	Industrial Management & Data Systems	13	0,2%	65,4%

Fig A4 Distribution of references according to SSCI

business	3016
business finance	6
management	600
operations research and management science	4
economics	76
agricultural economics and policy	2
social psychology	52
experimental psychology	7
clinical psychology	11
biological psychology	2
applied psychology	53
multidisciplinary psychology	58
mathematical psychology	4
sociology	84
social sciences, mathematical methods	8
interdisciplinary social sciences	1
social issues	3
public administration	2
political science	4
international relations	8
urban studies	1
law	2
ethics	5
history and philosophy of science	1
history	1
cultural studies	1
hospitality, leirsure, sport and tourism	5
communication	1
education	1
information science	13
computer science, information systems	3
computer science, interdisciplinary applications	13
computer science, artificial intelligence	2
automation and control systems	2
mathematics, interdisciplinary applications	1
industrial engineering	20
multidisciplinary engineering	1
environmental engineering	6
environmental studies	2
green, sustainable science and technology	1
food science and technology	2
biochemistry and molecular biology	1
astronomy	2
transportation	3
nursing	1
ergonomics	1
journals not in SSCI	400
book	674
conference paper / working paper / other references	121

Fig A5 *The (not so) many faces of trust (Blomqvist, 1997): the distribution of journal citations over the seven main disciplines regarding trust*



Discussion

For further bibliometric research, a robustness check of the findings presented here is worthwhile. For example, do the older articles on trust have a more or less diverse bibliography than the young articles studied here? One could argue that the older articles on trust are more interdisciplinary because the industrial marketing discipline was still establishing itself and therefore investigated possible contributions of other disciplines more. At the other hand, one could also argue that in modern times it is easier to have a more interdisciplinary approach since, by the rise of the internet and the upcoming of search engines like Google Scholar, the threshold of searching for articles in other disciplines is lower.

Furthermore, it might be interesting to also use a bottom-up approach (i.e. co-citation analysis of bibliographic coupling to reveal network structures) to give a more nuanced perspective on the interdisciplinarity of the trust-literature within the field of industrial marketing. For the purpose of this paper, i.e. to investigate the contribution of the neuroscientific perspective, a top-down approach was sufficient, but to assess the complete level of interdisciplinarity a bottom-up approach would give more in-depth insights. It is also worthwhile to investigate the visible benefit of having an interdisciplinary approach, by studying whether articles with a more diverse bibliography are cited more, as was found for the environmental sciences (Steele and Stier, 2000).

Included and excluded articles for the exploratory bibliometric research

	Included
1	Mandják T., Szalkai Z., Neumann-Bódi E., Magyar Má., Simon J.,"Emerging relationships: How are they born?"(2015)Industrial Marketing Management
2	Jiang X., Jiang F., Cai X., Liu H.,"How does trust affect alliance performance? The mediating role of resource sharing" (2015) Industrial Marketing Management
3	Valtakoski A.,"Initiation of buyer-seller relationships: The impact of intangibility, trust and mitigation strategies" (2015) Industrial Marketing Management
4	Cuevas J.M., Julkunen S., Gabrielsson M.,"Power symmetry and the development of trust in interdependent relationships: The mediating role of goal congruence" (2015) Industrial Marketing Management
5	Dowell D., Morrison M., Heffernan T.,"The changing importance of affective trust and cognitive trust across the relationship lifecycle: A study of business-to-business relationships" (2015) Industrial Marketing Management
6	Capaldo A., Giannoccaro I.,"Interdependence and network-level trust in supply chain networks: A computational study" (2015) Industrial Marketing Management
7	Graca S.S., Barry J.M., Doney P.M.,"Performance outcomes of behavioral attributes in buyer-supplier relationships" (2015) Journal of Business and Industrial Marketing
8	Elo M., Benjowsky C., Nummela N.,"Intercultural competences and interaction schemes - four forces regulating dyadic encounters in international business" (2015) Industrial Marketing Management
9	Gorton M., Angell R., Dries L., Urutyan V., Jackson E., White J.,"Power, buyer trustworthiness and supplier performance: Evidence from the Armenian dairy sector" (2015) Industrial Marketing Management
10	Zhang C., Wu F., Henke J.W., Jr.,"Leveraging boundary spanning capabilities to encourage supplier investment: A comparative study" (2015) Industrial Marketing Management
11	Jack E.P., Powers T.L.,"Managing strategic supplier relationships: Antecedents and outcomes" (2015) Journal of Business and Industrial Marketing
12	Chang Y.-S., Fang S.-R.,"Enhancing Export Performance for Business Markets: Effects of Interorganizational Relationships on Export Market Orientation (EMO)" (2015) Journal of Business-to-Business Marketing
13	Yang S.Q.,"Understanding B2B customer loyalty in the mobile telecommunication industry: A look at dedication and constraint" (2015) Journal of Business and Industrial Marketing
14	Munksgaard K.B., Johnsen R.E., Patterson C.M.,"Knowing me, knowing you: Self- and collective interests in goal development in asymmetric relationships" (2015) Industrial Marketing Management
15	Lai W.-H., Woodside A.,"Heuristics-in-use in industrial interfirm-collaborating clusters" (2015) Journal of Business and Industrial Marketing
16	Guenzi P., Panzeri F.,"How salespeople see organizational citizenship behaviors: An exploratory study using the laddering technique" (2015) Journal of Business and Industrial Marketing
17	Chang H.H., Tsai Y.-C., Chen S.-H., Huang G.-H., Tseng Y.H.,"Building long-term partnerships by certificate implementation: A social exchange theory perspective" (2015) Journal of Business and Industrial Marketing
18	Sharma N., Young L.C., Wilkinson I.,"The nature and role of different types of commitment in Inter-Firm relationship cooperation" (2015) Journal of Business and Industrial Marketing
19	Jain M., Khalil S., Johnston W.J., Cheng J.M.-S.,"The performance implications of power-trust relationship: The moderating role of commitment in the supplier-retailer relationship" (2014) Industrial Marketing Management
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