The evaluation of a brand association density metric

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Abstract

Purpose – The purpose of this paper is to propose a new brand association density metric and evaluate its performance in terms of correlations with recall, consideration, brand equity and market share and to compare different data collection methodologies to identify brand associations.

Design/methodology/approach – The authors present results from two studies covering three product categories. The authors use an open free association question and associations to a set of pre-defined brand attributes. The responses to the open free format question are text-mined prior to further analysis.

Findings – The authors find that the brand association density metric performs better than a metric that only uses the number of distinct associations. The authors also find that these metrics work best when derived from open free association data.

Practical implications – First, in addition to focusing on trying to build specific brand associations in consumers' minds, it may be equally important, if not more important, to manage the number and inter-connectedness of the brand's associations. Second, firms should complement their existing survey approaches with open-ended free association questions.

Originality/value – The brand association density concept presented is believed to be new. The empirical comparison between the use of free association to pre-defined attributes is also new.

Keywords Brand associations, Brand equity, Brand image, Measurement, Brand performance, Brand choice

Paper type Research paper

Introduction

Consumer-based brand equity (CBBE) is a key concept in marketing (Hoeffler and Keller, 2003) and has been linked to several positive business outcomes, including: brand extension potential (Aaker and Keller, 1990), willingness to pay a premium (Yoo and Donthu, 2001), Word-of-mouth (WOM) recommendation (Vazquez *et al.*, 2002), slower advertising wear-out effects (Campbell and Keller, 2003), reduced firm risk (Rego *et al.*, 2009), usage and purchase intention (Cobb-Walgren *et al.*, 1995; Vriens and Martins Alves, 2017), sales (Attaman and Ülengin, 2003) and positive stock returns (Madden *et al.*, 2006; Mitzik and Jacobson, 2008). Several brand equity conceptualizations have been proposed: e.g. using scanner data (Kamakura and Russell, 1993), using conjoint (Cobb-Walgren *et al.*, 1995; Ferjani *et al.*, 2009) and several derived from Aaker's (1991) or Keller's (1993) conceptualizations (Yoo and Donthu, 2001; Netemeyer *et al.*, 2004; Pappu *et al.*, 2005; Baalbaki and Guzman, 2016; Christodoulides *et al.*, 2015). In these latter frameworks, brand equity is seen as multi-dimensional; the dimensions include brand image [associations that can differ in terms of favorability, strength and uniqueness (Keller, 1993)] and perceived product quality and unaided awareness, both which can be viewed as associations as well. Hence, brand managers need to understand the role of brand associations.

Branding is memory-based (Walvis, 2008), and according to the spreading activation theory (SAT), memory retrieval depends on the spreading of activation in an associative network consisting of nodes (Quillian, 1967; Collins and Loftus, 1975; Anderson, 1983; Nelson *et al.*, 1993; Janiszewski and Van Osselaer, 2000; Heckler *et al.*, 2014). Nodes refer to concepts (e.g. brand associations) in a semantic network. When a buyer is cued by something associated with a brand, this then activates that brand: for example, "I need toothpaste" may evoke the association Colgate. The more associations a brand has in a consumer's mind, the easier it will be for a consumer to recall and consider the brand (Nedungadi, 1990; Coates *et al.*, 2004; Walvis, 2008).

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Brands that are evoked or recalled first are more likely to be chosen (Thelen and Woodside, 1997; Woodside and Trappey, 1992; Duncan, 2006; Walvis, 2008), and hence, purchased.

This theory has two features that to our knowledge have not yet or not fully been investigated: inter-connectedness and chaining. Chaining and inter-connectedness refer to the fact that associations can be linked to the brand, but they can also be linked to each other. Nelson *et al.* (1993) studied the impact of inter-connectivity on recall and they found that brands with more inter-connectivity and smaller number of associations led to a higher recall, relative to brands with less inter-connectivity and more associations. No research has investigated a potential effect on consideration and market shares.

More recently, neuroscientific studies have confirmed that such spreading of activation depending on associations also happens in the brain (Tompary *et al.*, 2016; Eichenbaum, 2017; Chen *et al.*, 2015).

The paper aims to make the following contributions to the brand associations literature:

- We conceptualize and evaluate a new aggregate-level brand association density measure that combines the number and inter-connectedness of associations into one measure, and we evaluate its reliability and correlations with relevant business metrics such as unaided recall, consideration, attitudinal brand equity and market shares. Unaided recall has been proposed as an important element of CBBE (Cohen, 1966; Alba and Marmorstein, 1987; Nedungadi, 1990; Esch *et al.*, 2012; Krishnan *et al.*, 2013). Consideration has been studied in the literature as an important step in consumer decision-making as well (Nedungadi, 1990; Ballantyne *et al.*, 2007; Veloutsou *et al.*, 2013). Other existing measures such as the attitudinal equity index (Hofmeyr *et al.*, 2008) have shown high correlations with market share. Market share, of course, is the ultimate measure of success and the literature has voiced the need for more results of brand equity on market shares (Kim *et al.*, 2003; Reynolds and Philips, 2005).
- Brand associations can be captured by using a set of pre-defined attributes: respondents can be asked to indicate to say yes or no; or they may be asked to rate the degree to which they believe an association (attribute) pertains to a brand. An alternative is the use of an open-ended free association format question that will simply ask a respondent what associations come to mind when thinking of a brand. We compare the results from using an open free association question with results from using pre-defined attributes. The evaluation of an open-ended free association question is of practical importance. Each may result in incomplete or partially biased results. Pre-defined attributes often are long sections within surveys which can be tedious to complete and rating scales are vulnerable to response style biases (Sonnier and Ainslie, 2011). The respondent may associate the brand with attributes that are not included in the pre-defined list. However, respondents may not give all the associations that come to their mind when responding to a free association question.

Below, we first discuss the SAT. Specifically, how elements of this theory are now supported by brain and neuro-scientific research and the importance of the concept of inter-connectedness. Second, we review the extant empirical findings that will demonstrate the gaps in the brand association literature: i.e. the quantification of the interconnectedness and the empirical correlation of brand association density with a variety of marketing metrics. After discussing our hypotheses, we present the results of two studies across three product categories.

The spreading activation theory

Neuroscientific findings have suggested that many brand decisions are memory-based (Walvis, 2008) and likely driven by long-term memory (McClure *et al.*, 2004). An early but still influential theory, the SAT, was proposed by Quillian (1967), and later refined by Collins and Loftus (1975). Other memory theories exist but are more difficult to translate into practical brand metrics while the SAT remains very powerful in explaining data (McNamara, 1992). The SAT has several key elements:

- The SAT views memory search as a network of associations: If two associations are connected then the activation of one association can evoke another association. For example, when a consumer becomes aware of an association (I need whiter teeth), a category (I need toothpaste) or a brand (last time I bought Colgate) that association will spread to other associations in long-term memory if it is connected to those other associations (Collins and Loftus, 1975; Ratcliff and McKoon, 1994). As argued and demonstrated, brands can evoke various associations, but associations can also evoke (various) brands (Holden and Lutz, 1992).
  There are some brain research studies that have been able to support this component of the SAT. Eichenbaum (2017) argues that neuroscience has revealed organizational (e.g. associative) structures and mechanisms within the brain that guide, encode and retrieve information. Ison *et al.* (2015) show that single neurons in the hippocampus encode concept-to-concept associations. Staresina and Davachi (2008) show that the magnitude of hippocampal activation is correlated with the number of associations in memory. 'Re-activation of neural memory traces, i.e. memory reinstatement, in the human medial temporal lobe, depends on cue-associations (Tompary *et al.*, 2016), and can further consolidate the memory trace (Eichenbaum, 2017). Positive brand associations (e.g. the logo of a favorite brand) can activate the reward system in the brain, including the striatum (Schaefer and Rotte, 2007; Schaefer *et al.*, 2011), and activate the corresponding value representations in the brain, affecting decision-making accordingly (Rangel *et al.*, 2008). Finally, Chen *et al.* (2015) show that the specific firing of neurons can predict a specific association (e.g. the association "innovative" will have a different firing pattern than the association "competent").
- A feature, which we believe is somewhat ignored in the branding literature, is the concept of inter-connectedness and chaining (Collins and Loftus, 1975; Nelson *et al.*, 1993; John *et al.*, 2006). Associations can be linked to a focal stimulus, e.g. cavity protection could evoke the Colgate brand. However, associations can also be linked to each other. For example, "clean" and "fresh" may both be linked to Colgate but "clean" and "fresh" could also be

linked to each other. Nelson *et al.* (1993) show that this feature of the SAT matters: the more inter-connections, the more likely it is the focal stimulus will be activated. They studied both target set size (i.e. the number of associations) and the inter-connectivity (measured independently) via an experimental design, in terms of their effect on recall. In their experiments, inter-connectivity is more important than target set size: i.e. recall is higher for brands with "more inter-connectivity and a smaller target set size" relative to brands with "less inter-connectivity and a higher target set size".

Expanding on this notion, Walther (2002) proposed a spreading attitude effect proposing that associations can work through chains: i.e. association A could be linked to association B, which could be linked to association C (the focal stimulus). Dimofte and Yalch (2011) assessed whether associations that are not directly linked to the focal stimulus can help evoke the focal stimulus if they are related to an association that is directly connected to the focal stimulus. For example, the association "fresh" could be linked to the association "clean" and "clean" could be linked to Colgate: and as such "fresh" may increase the likelihood of Colgate being evoked and even enhance liking (Dimofte and Yalch, 2011). Studies of associative memory have shown that a network of associations (sometimes also referred to as schema) can indeed lead to the retrieval of related items. For example, participants asked to recall items they saw in a previously visited office, falsely reported seeing a telephone and pencils, through their strong association with an office space (Brewer and Treyens, 1981). Zeithamova *et al.* (2012) found that the associative organization in the brain supports direct and indirect associations.

See Figure 1 for an illustration of the number of associations and their possible inter-connectedness.

- Another feature of this theory includes criticality, which can be interpreted as the strength of the link: e.g. cavity protection may be more likely to evoke toothpaste than fresh breath will.The number of associations may be more important than the criticality. A study by Alba and Marmorstein (1987), for example, showed that the sheer number of associations was more important than having fewer but more important associations.

The first two elements of SAT, although by no means conclusive, are consistent neuroscientific research findings.

Previous research on Brand associations

Previous studies have examined the impact of the number and type of brand associations on brand recall, brand equity and future purchase intentions. These previous studies along with some summary features of the study design are shown in Table I.

Krishnan (1996) tested four hypotheses on eight product categories. When comparing high equity brands with low equity brands, high equity brands have more associations, net positive associations, unique associations and associations from direct experiences. The brand associations were identified using a free association method (eliciting both positive and negative associations). Uniqueness was analytically determined. The results showed that high equity brands yielded, on average, a higher number of associations relative to weaker brands. In seven out of the eight categories, the "number of associations" hypothesis was confirmed (Krishnan, 1996). The results with respect to valence were less clear. Only in four out of the eight categories did the high equity brand have a higher net positive valence. The results with respect to uniqueness and origin of the associations were even weaker. Chen (2001) investigated the impact of brand associations empirically using a free association task (using a student sample). Respondents were also asked to rank their three most preferred associations. Each association was

Figure 1 An illustration of the brand associations

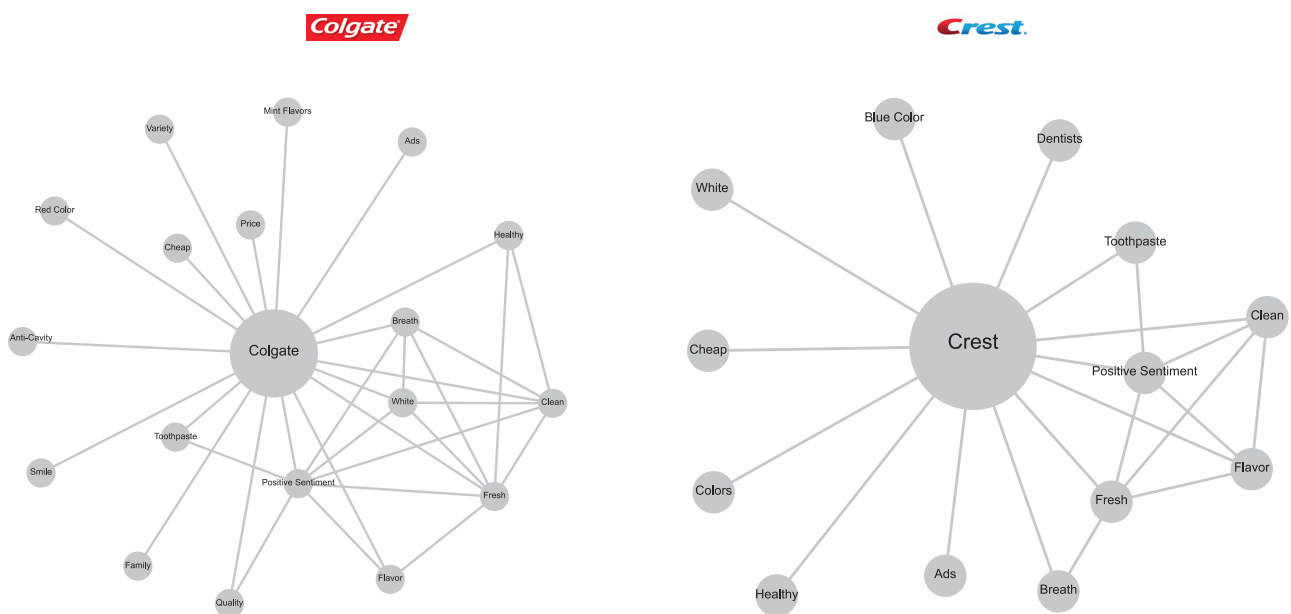

Table I Overview of brand associations studies

Studies	Methodology	Dependent variable	Analysis	No. of associations	Uniqueness	Valence/ Favorability	Inter-connectedness
Krishnan (1996)	Open free association question	Brand equity	*t*-test comparing high equity with low equity brands	Confirmed	Partially confirmed	Partially confirmed	NA
Chen (2001)	Open free association question	Brand equity	*t*-test com paring high equity brands with low equity brands	Confirmed	NA	NA	NA
Romaniuk and Sharp (2003)	Associations of pre-defined attributes	Stated loyalty	linear regression between number of attributes and stated loyalty	Confirmed	Rejected	NA	NA
Romaniuk and Gail lard (2007)	Associations of pre-defined attributes	Brand equity (preference)	*t*-test/ANOVA	NA	Rejected	NA	NA
Vieceli and Shaw (2010)	Associations of pre-defined attributes	First recall	*t*-test between first and second recalled brand	Confirmed	Confirmed	Confirmed	NA
Vieceli (2011)	Associations of pre-defined attributes	First recall	*t*-test between first and second recalled brand	Confirmed	Confirmed	Confirmed	NA
Schnittka *et al.* (2012)	Brand concept mappingvia surveys	Brand equity	Correlations	Confirmed	NA	Confirmed	NA
Koll andvonWallpach (2013)	Open free association question	Brand equity	Linear regression	Confirmed	Confirmed	Confirmed	included but confounded with otherfeatures
Romaniuk and Nenycz-Thiel (2013)	Scanner data and survey (Pick any/ kout of pre-defined attributes)	Past purchases	Brand-level linear regression	Confirmed	NA	NA	NA
Romaniuk (2013)	Associations of pre-defined attributes	Market share	Correlation	Confirmed	NA	NA	NA
Rahman and Areni (2015)	Open free association question	Brand equity	Linear regression	Confirmed	NA	Confirmed	NA
Mülhbacher *et al.* (2016)	Open free association question	Brand equity	fuzzy set qualitative analysis	Confirmed	Confirmed	Confirmed	NA
Stocchi *et al.* (2016)	Associations of pre-defined attributes	Recognition	Ouasi-experiment	Confirmed	NA	NA	NA
This study	Open free association question and associations of pre-defined attributes	First mention, consideration, brand equity and market share	*t*-test and correlations	Confirmed	Rejected	NA	Confirmed

then weighted by preference rank resulting in a weighted number of associations. The *t*-tests were performed to compare the weighted sum of associations between low equity and high equity brands. For example, Nike (considered a high equity brand) was compared with Jump (a low equity brand). The number of associations was higher for high equity brands. Romaniuk and Sharp (2003) investigated how brand loyalty was related to the number of brand perceptions. They compared several models:

- to what extent does a brand's association with a specific brand perception correlate with loyalty;
- to what extent do a group of brand associations correlate with loyalty; and
- to what degree does the number of brand associations correlate with loyalty.

Using linear regression-analysis they found adjusted R^2 values of 0.45, 0.57 and 0.82, respectively. Romaniuk and Gaillard (2007) studied across eight categories the difference in unique associations between preferred and non-preferred brands and found no significant difference in all but one category. Romaniuk *et al.* (2007) studied 17 categories and replicated the results of Romaniuk and Gaillard (2007). Vieceli and Shaw (2010) studied one category and compared differences between first recalled brand versus other brands. They found significant results for both the number of associations, the valence (number of positive associations) and the uniqueness of associations. Vieceli (2011) using the same methodology as Vieceli and Shaw (2010) found significant differences between the first recalled brand versus other brands for the number of associations, the valence and the uniqueness of associations. Schnittka *et al.* (2012) proposed an advanced brand concept mapping approach that adds to the approach of John *et al.* (2006) by adding the element of association favorability. They also developed an overall brand association network value (BANV) metric that they correlated with brand purchase intention and brand probability (derived from a choice-based conjoint). Various specifications of the BANV metric were evaluated. The correlations with purchase intent varied between 0.26 and 0.36, whereas the correlations with the conjoint brand probability varied between 0.16 and 0.24. Koll and von Wallpach (2013) investigated the role and impact of brand associations in the context of match, specifically, how well does management's intended brand associations match with what associations consumers have with the brand using an intra-brand approach. Respondents' associations were collected using the unique corporate association valence approach (Spears *et al.*, 2006). That is, when exposed to a brand, respondents are instructed to write down words or short phrases that come to mind. They then rate each association on a five-point scale from very positive to very negative (valence). To assess brand-match, each association was evaluated with regards to its fit with management's intentions using the firm's brand handbook. Match was calculated as the ratio between the number of matched associations divided by the total number of associations given by the respondent. The dependent variable is comprised of overall response to the brand, overall affect and behavioral intention. In their first study pertaining to a consumer goods brand, brand response was captured via brand trust, desirability and recommendation integrated into single brand response index. Brand response was modeled as a function of the number of associations, valence and match. Using all three variables, they explain 31 per cent of the variance, but the match coefficient was non-significant. Even a match-only model explains a negligible amount of variance. Valence and number of associations were both statistically significant in the model. A second study pertained to a hotel brand. In this study two brand response variables were used: one brand index comprised of trust, desirability and recommendation, and the second used a brand utility value derived from a conjoint exercise. In the brand index model, match was not significant. In the conjoint model it was significant, but its effect was rather small. In both models the number of associations and valence were statistically significant. Romaniuk and Nenycz-Thiel (2013) compared the number of associations between consumers who were 100 per cent loyal to a brand versus consumers who also bought other brands. The number of associations differed significantly across these two groups (across 12 brands and two categories). Romaniuk (2013) analyzed data on soft drink brands (evaluated on ten associations) and found a correlation of 0.74 between the number of associations and market share. Mülhbacher *et al.* (2016) studied sport shoes using a free association question. They found a meaningful relationship between brand strength and a number of associations and uniqueness and favorability of associations. Rahman and Areni (2015) studied the impact of brand associations generated by the free association technique. They grouped association into five buckets:

1 sub-brand associations;
2 parent brand associations;
3 category associations;
4 semantic associations; and
5 competition associations.

A regression analysis showed that sub-brand associations, parent brand associations and category associations significantly affect a brand's overall rating. In their study, associations were weighted by importance as indicated by the order of elicitation and by valence as indicated by the respondents. However, no results on regressions without weighting or valence were reported. As the authors state, their approach is lengthy, likely too expensive because it makes use of individual coders, and the construction of various composite variables (e.g. a parent brand association number) make it less intuitive and more prone to errors.

There is not much research on whether the number of associations is correlated to market share. Romaniuk (2013) reports a correlation 0.74 between her mental market share metric and actual market share.

The concept of uniqueness is not defined in the SAT, and the empirical findings are mixed. Some found uniqueness to have an effect (Carpenter *et al.*,1994; Vieceli and Shaw, 2010; Vieceli, 2011; Koll and von Wallpach, 2013; Mülhbacher *et al.*, 2016; Van der Lans *et al.*, 2016), while others did not (Romaniuk and Gaillard, 2007; Mitzik and Jacobson, 2008; Romaniuk *et al.*, 2007). To date, there are no neuro-scientific studies that have looked at the impact of unique associations (Plassmann *et al.*, 2011).

The empirical research confirms the importance of positive valence on recall (Vieceli and Shaw, 2010; Vieceli, 2011) and

brand equity (Schnittka *et al.*, 2012; Koll and von Wallpach, 2013; Rahman and Areni, 2015; Mülhbacher *et al.*, 2016).

A brand association density metric

In most previous studies, the number of associations is calculated at the individual respondent level and then averaged when comparisons are made between groups. For example, strong versus weak brands or users versus non-users, etc. We propose a new aggregate-level brand association metric that we believe better captures the true number of different associations a brand has multiplied (weighted) by the inter-connectedness (Figure 1). Hence, our metric is based on two components:

1 *The number of different associations across respondents*: If we look at Table II we see that Brand A has 10 different associations counted across respondents, namely, white, red color, smart choice, quality, kids, variety, price, taste, family and trusted. So, this number is directly calculated at the aggregate level. The rationale for that is that each association is an opportunity for the brand to be evoked, which is one possible reason to buy. For Brand B there are also 10 different associations.
2 *A measure of inter-connectedness*: Also, note that each respondent for Brand A only gave one association. Hence, the average number of associations is 1: i.e. there are no inter-connections. For Brand B the average is 2.5. Hence, there are inter-connections.

As per our proposed metric, the brand association density for Brand A is $10 \times 1 = 10$. Brand B also has 10 distinct associations across respondents, but the average number of associations is 2.5. Hence, the brand association density for Brand B is 25.

Our measure is consistent with the SAT (Nelson *et al.*, 1993) and with the extant neuro-scientific findings, which is deemed important for construct validity (Borsboom *et al.*, 2004). The way the number of different associations was calculated in most previous studies is also consistent with the SAT. Though less so than our metric because it does not account for both the number and inter-connectedness of associations.

To empirically evaluate our new metric, we use both an open free association question and we use structured responses to a set of pre-defined attributes. An open-ended survey question (Boivin, 1986), for example, could look like: "Thinking about brand X, please tell us everything that comes to your mind (this can be attributes, logos, usage situations, etc.)". We also used a traditional approach, common in commercial practice, where respondents are shown a list of pre-defined attributes and are asked to indicate which brands they associate with which attribute. The use of rating scales or binary association questions on a set of pre-defined attributes is less consistent with the SAT because we do not know if a respondent had associations other than the ones included in the pre-defined set.

Table II Illustration of number of distinct associations and brand density

Brand A		Brand B	
Respondents	**Associations**	**Respondents**	**Associations**
1	White	1	White, red color and price
2	Red color	2	Red color, family and taste
3	Smart choice	3	Smart choice. Kids and quality
4	Quality	4	Quality and price
5	Kids	5	Kids, family and taste
6	Variety	6	Variety, price and trusted
7	Price	7	Price
8	Taste	8	Taste and trusted
9	Family	9	Family, price, red color and kids
10	Trusted	10	Trusted
Average	1	Average	2.5

Hypotheses

Brands that are recalled first are more likely to be considered and chosen (Duncan, 2006; Nedungadi, 1990; Walvis, 2008). The empirical evidence to date indicates that a higher number of different brand associations should lead to better recall, consideration, higher attitudinal brand equity (Krishnan, 1996; Chen, 2001; Romaniuk and Sharp, 2003; Koll and von Wallpach, 2013; Rahman and Areni, 2015) and should have higher market shares though no evidence has been published. Based on theoretical (Collins and Loftus, 1975), neurological (Eichenbaum, 2017; Walvis, 2008), and the empirical research summarized in Table I, we aim to test the following hypotheses:

H1a. The higher the brand association density, the more the brand will be recalled first relative to brands with lower brand association density.

H1b. The higher the brand association density, the more the brand will be considered relative to brands with a lower brand association density.

H1c. The higher the brand association density, the higher overall brand equity of that brand relative to brands with a lower brand association density.

H1d. The higher the brand association density, the higher the market share of that brand relative to brands with a lower brand association density.

As our brand density measure captures both number of associations across respondents and the inter-connectedness, it should lead to more opportunities for a brand to get activated, considered, and chosen relative to just considering the number of different associations or just the inter-connectedness. Hence, as *H2* we have:

H2. The correlations between brand association density and recall, consideration, brand equity and market share will be higher than the correlations between a number of different associations and first mention, consideration, brand equity and market share.

We would expect *H1* and *H2* to hold up for open free association responses and responses from a pre-defined set of brand attributes. Both measurement approaches have their pros and cons. The degree to which our hypotheses can be confirmed under both methods adds to its convergent validity.

Also, comparing the results from an open free format question with the results from pre-defined attributes is of practical interest as indicated in the introduction.

Study 1

Study 1 pertained to two product categories: smartphones and beer. For Smartphones, a sample of 400 USA consumers responded to a 15-min device-agnostic survey in November, 2015. The smartphone sample had an average age of 42 with a standard deviation of 13.9, 47.3 per cent were male and 52.7 per cent were female. Respondents had to own a smartphone (non-employer provided) or had to be in the process of acquiring a new smartphone in the next 12 months. We asked respondents which brand they would consider buying for personal use. Respondents could type in any brand and we recorded the order in which brands were entered. This question gave us a measure of brand saliency measured as the first brand that comes to mind (our measure of brand recall). Brand associations were captured via a simple open-ended question. For the two most salient brands and one unconsidered brand, the following prompt was given to the respondent:

> We would like you to share your thoughts in your own words or phrases. There is no right or wrong answer. The more detail the better. Please think about brand X. What pops into your mind? It can be images, feelings, anything at all that you like or dislike, positive or negative thoughts.

After their first response respondents were probed once more, "Anything else?". The presentation of the brands was determined randomly to avoid that a dominant brand would always be first. These open free association responses were text analyzed. Such open free response questions have been found to be reliable (Olsen and Muderrisoglu, 1979; Haddock and Zanna, 1998). This approach to free association is common in marketing research (Rahman and Areni, 2015) and has been found to yield more associations than other methods (McNamara, 1992; Steenkamp and Van Trijp, 1997). In total, we covered seven smartphone brands in our study as follows: Samsung, Apple, LG, Motorola, HTC, Nokia and Blackberry. Respondents also evaluated these brands on a set of pre-defined brand attributes. The brand attributes were provided by one of the category brands and constituted what they would typically include in a brand survey. We had eight emotional statements and eight functional statements. Statements that are pre-defined as "emotional" are very common in commercial brand surveys and have been shown to be relevant (Ebrahim *et al.*, 2016).

A similar survey design was used for the beer survey (N = 900). The sample consisted of 68 per cent men and 32 per cent women, and the average was 39 years with a standard deviation of 10. The beer market is more complicated as there are not only many brands and sub-brands but also the consumption of beer is occasion-driven. To reflect that, we defined three consumption occasions. Ideally, we would want to weigh the results based on the occasion frequency, but we did not have access to such data. The brand attributes were provided by one of the category brands and constituted what they would typically include in a brand survey. We had eight emotional statements and eight functional statements. See Table III for a list of the pre-defined attributes used for the beer and smartphone study.

Table III Pre-defined Brand attributes

Functional	Emotional
Beer	
High alcohol content	Lose all inhibitions
Light taste	Socialize more easily
Complex flavor	Valuable moments with loved ones
Full bodied flavor	Escape from daily hassles
Premium quality	Part of my daily routine
Low calories	Feel like a true connoisseur
Smooth to drink	Reflects a superior lifestyle
Unique taste	Boost of energy
Smartphones	
Good pre-loaded apps	Add fun to everyday life
Long battery life	Getting things on the move
Good sized screen	Conveys a sophisticated lifestyle
User-friendly display	Be ahead of the pack
Lightweight	Manages the necessities of life
Very durable	To always have help close by
Very innovative features	Feel part of life around me
Superior camera	Expands my social interactions

Text analytics/coding protocol

The verbatim from the open-ended questions were analyzed using a combination of IBM SPSS Text Analysis for Survey software and manual coding. The software uses natural language processing, which analyzes text as phrases and sentences whose grammatical structure provides context for the meaning of a response. The tool automatically locates and collects key terms from responses into concepts (e.g. "easy", "fast" and "sound"). It also collects these items into higher level groupings of types and patterns. Types are a collection of similar terms such as positive comments (e.g. "excellent", "good" and "like") or negative comments (e.g. "bad" and "dislike"). Patterns are combinations of concepts and types, such as positive comments about "sound." While extraction of concepts, types and patterns is automatic, the user can fine-tune the extraction (e.g. requesting for extractions that the tool may miss, defining synonyms and excluding words from extraction). We also manually reviewed the written responses and created the association categories. Two researchers independently reviewed the responses and created the set of different associations. They compared their results and resolved any discrepancies. For our study, the size and the nature of the responses (i.e. respondents just write down associations; there are no or few full sentences), manual coding is very doable. In cases of extreme large sample sizes where manual coding would not be practically feasible, we can rely on more sophisticated text analytics protocols (Chen *et al.*, 2018). In the final step, we created categories from the extracted results based primarily on frequency.

Evaluation

First, we evaluated our brand association metrics on split-sample reliability. To ensure each of our metrics is reliable, we calculate an aggregate split sample reliability. For the number of associations, we calculate reliability by a simple across brands between samples correlation based on the total number of associations and an across brands Jaccard's coefficient based

on exact matches. For brand association density, we simply calculated an across brands between samples reliability. All reliability results were very high (ranging from 0.83 to 0.99).

Second, as our brand association density metric is an aggregate level metric we can only evaluate this metric at the aggregate level. We evaluate our metrics via correlations as follows: recall as measured by the percentage that the brand is mentioned first; consideration rate; attitudinal brand equity (Hofmeyr *et al.*, 2008); and actual market share numbers. These metrics were decided because theory predicts these affect recall, consideration and choice (i.e. market share). Also, because unaided recall, brand consideration and brand equity are typical components of commercial brand studies commissioned by global brands. For any managerial useful metric, a correlation with market share is key. In Study 1 pertaining to beer and smartphones, the source of the market share data was Nielsen and it was provided to us by one of the brands.

Findings of Study 1

The aggregate level results are shown in Table IV. We calculate the correlation of our association metrics with percentage first mention, brand consideration, brand equity metric and market share estimates.

We observe the following. First, for both beer and smartphones, the correlations between the number of brand associations and brand association density with the first mention, brand consideration, brand equity and market shares are as expected. The correlations with brand association density are all positive and (fairly) high. This confirms *H1a-H1d*. The brand association density correlations are higher (in all but two cells) than the correlations based on the number of associations. This confirms *H2*. For beer, the number of associations based on pre-defined attributes seems to work poorly overall. Metrics based on open free association responses correlate more strongly with first mention, brand consideration, brand equity and market shares than those based on responses to pre-defined attributes for both categories. For the number of distinct pre-defined attributes responses, the correlations cannot even be computed for smartphones, as there is no across brand variation.

Study 2

A sample of 401 consumers in Mexico responded to an online survey sent out in the summer of 2016 by market research firm Ipsos. The sample was 100 per cent female (upon request of one of the toothpaste brands who offered input into selecting the pre-defined attributes). Respondents were co-decision makers in toothpaste purchases, of 18-55 years of age and completed a 15 min online survey. The average age was 33 with a standard deviation of 10.

The study focused on toothpaste brands, specifically Colgate, Crest, Sensodyne and Freska. Design-wise, Study 2 is the same as Study 1. First, we asked respondents to think about toothpaste brands and state which ones came first to mind. Next, for three brands we asked them to state everything that came to their mind when thinking of a said brand. In addition to these open-ended questions, respondents also indicated whether they associated the brands with a given set of 16 pre-defined brand attributes; eight of which were functional and eight were emotional. This set of brand statements were provided by one of the brands who participated in this study; they represent the aspects the brand managers deem important to assess and evaluate their brand and its competitors on. See Table V for a list of pre-defined attributes.

Text analytics protocol and evaluation

The process for text-mining and evaluation of metrics was the same as for Study 1. We evaluated the metrics on split-sample reliability, and the results ranged from 0.79 to 1. All measured metrics were deemed to be reliable. The market share data was provided to us by one of the toothpaste brands.

Results for Study 2

Table VI shows aggregate level results:

First, the correlations of brand association density with the percentage first mention, brand consideration, brand equity and market shares are as expected confirming *H1a-H1d*. Second, these correlations are higher (for all but one case) when based on brand association density as opposed to the number of distinct associations. This confirms *H2*. Third, the correlation with the number of distinct associations breaks down when based on pre-defined attributes. Metrics based on open free association

Table V Pre-defined brand attributes (Toothpaste)

Functional attributes	Emotional attributes
For whole family	In a good mood
Full mouth protection	Being myself among others
Trustworthy	I am a good example for others
Recommended by dentists	Secure
Preventing caries	I have total control over my oral care
Fresh breath	I made a smart choice
Whiter teeth	Seductive
Innovative	Fully stimulated

Table IV Aggregate-level correlations with first mention, brand consideration, brand equity and market shares (beer and smartphones)

	Beer			Smartphones			
Types of associations metrics	**First mention**	**Consideration**	**Market share**	**First mention**	**Consideration**	**Attitudinal equity**	**Market share**
Number of distinct open free associations	0.76	0.95	0.58	0.96	0.96	0.98	0.87
Number of distinct pre-defined attributes associations	0.42	0.51	0.12	Fail	Fail	Fail	Fail
Brand association density based on open free associations	0.77	0.95	0.64	0.98	0.97	0.98	0.93
Brand association density using pre-defined attribute associations	0.35	0.45	0.04	0.99	0.99	0.98	0.91

Table VI Aggregate-level correlations with first mention, brand consideration, brand equity and market shares

Types of association metrics	Toothpaste			
	First mention	Consideration	Attitudinal equity	Market share
Number of open free associations	0.87	0.88	0.97	0.86
Number of pre-defined associations	FAIL	FAIL	FAIL	FAIL
Brand association density based on open free associations	0.96	0.87	1	0.95
Brand association density based on pre-defined attribute associations	0.78	0.86	0.92	0.77

responses correlate more strongly with market share, first mention, brand consideration and market shared than those based on pre-defined attributes. For pre-defined attributes responses, the correlation with the number of distinct associations measure cannot even be computed as there is no across brand variation.

Discussion

We evaluated two brand association metrics: the number of associations across respondents and an aggregate-level brand association density metric across two commonly used data collection methods. All metrics were found to have good split-sample reliability. In terms of their correlation with first mention, brand consideration, brand equity and market share, our brand association density metric showed the highest correlations. In all cases, the brand association density metric derived from open free associations fares best. The simple count of the number of associations metric, when calculated from pre-defined attributes, fails in two of our three product categories. Our brand association density metric fares reasonably with pre-defined attributes, except for beer where it fails.

There are three reasons why brand association density should be the preferred metric. First, it performs better overall. Second, if one only has access to pre-defined attribute brand responses, the number of distinct associations may just not differentiate between brands. Third, there is diagnostic value. We observed a higher number of total distinct associations for Samsung relative to Apple, while having a significantly lower market share. Apple's brand density metric is higher than Samsung's. Hence, Samsung would be better off focusing on getting more inter-connected associations instead of just more associations. This is consistent with the experimental results of Nelson *et al.* (1993).

We also noted that all the correlations in the beer category are lower. This is likely the result of the beer market being a very fragmented market with many brands and that it is driven by occasion specific needs. Also, physical availability is less homogeneous than it is for smartphone and toothpaste brands.

Finally, based on our current results, the free association question seems to be better suited to capture both the number of associations and the density. The open free format responses may be closer to the actual voice of the customer. The use of pre-defined attributes on the other hand, may mean we may miss associations respondents have because if they are not pre-defined they will not be captured. However, this does not mean that this will always be the case: i.e. we cannot conclude that free association will always work better.

Implications

First, our results shed a new light on the current branding practice where brand managers allocate their marketing budget to build very specific brand associations in consumers' mind. Focusing only on building specific associations may not be an optimal strategy. Instead, it may pay off to also drive the total number of associations. This is supported by our findings and previous literature. Our findings are consistent with Romaniuk and Sharp (2003) and neuroscientific studies that have shown that (the number of) brand associations can alter value signals in the brain (Staresina and Davachi, 2008; Plassmann, *et al.*, 2012; Zeithamova *et al.*, 2012) and affect decision-making as a result (Rangel *et al.*, 2008). In addition, for brand associations to work best they need to come to mind unaided (e.g. via an open free association question).

Second, brand managers should also ensure that the associations consumers have about their brand are inter-connected. This may even be more important than the sheer number of associations (Brewer and Treyens, 1981; Nelson *et al.*, 1993).

Third, in real purchase situations, consumers will rely on their memory, but will also be influenced by marketing stimuli attracting their attention. We would surmise, that verbal marketing stimuli should use words that consumers themselves might use; these are very different than what marketing directors define (Tables II and III) as this may increase salience.

Fourth, brand density calculated from open free association responses is a compelling metric and brand managers should consider adopting this approach as a brand tracking metric. There are several reasons for this. An open-ended question requires very little survey real-estate and is closer to the voice of the customer. Also, it is not subject to response scale bias (Leuthesser *et al.*, 1995; Vriens and Martins Alves, 2017).

Finally, it is a metric that can be calculated, albeit somewhat differently, from online consumer-generated data (Vriens *et al.*, 2017), which is increasingly used in brand research.

Limitations and future research

First, the branding literature has included the use of valence: i.e. associations may be positively perceived or maybe negatively perceived (Till *et al.*, 2011). The previous empirical results on valence were confirmed, but its effect seemed modest (Schnittka *et al.*, 2012). We did not collect valence data as it adds significantly to the survey burden and is often not commercially practical. We reviewed the open responses in Study 1 and Study 2 and most were neutral or positive. It might be that sentiment and valence become more important in extreme cases where the brand battles a crisis. In the beer category, it remains a possibility that valence would have made the results substantially better. In extreme cases, e.g. the VW Diesel emission crisis, we would expect this to be more important (Vriens, *et al.*, 2017).

Second, in the branding literature, it is argued that different attributes (associations) have different weights (i.e. some are

more important than others). Asking about such weights adds significantly to the survey burden, but it might help. In our study, we derived weights from regression analysis (brand equity as dependent variable and pre-defined associations as independent variables). Adding these weights to our calculations did not improve our results. However, if we would measure importance in different ways it might. The brand concept mapping methodology (John *et al.*, 2006; Börger *et al.*, 2017) is an appealing alternative methodology to capture brand associations, including their valence, importance and inter-connections. We do not know if this methodology would result in higher correlations. More research is needed to understand when and how much valence and association importance matter.

Third, alternatives to the SAT have been proposed (Janiszewski and Van Osselaer, 2000; Stocchi *et al.*, 2016). These theories argue that cues may compete for predictive value. That might explain the lower correlation we found in the beer category: some beer brands have many associations, but they do not match their market share. One alternative theory, the theory of source of activation confusion was operationalized by Stocchi *et al.* (2016). We calculated their method using our data, but it did not result in better correlations. For example, the source of activation confusion score using free association data for beer resulted in a correlation with market share of 0.25, for smartphones this correlation was 0.92 and for toothpaste it was 0.95.

Fourth, further research and confirmation is needed to understand under which conditions an open free association question works best. In our studies, for smartphones pre-defined attributes worked, as well as free association data, whereas for beer and toothpaste the free association was much better.

Fifth, it is argued that brands that have something unique to offer should fare better. However, on uniqueness the extant empirical literature and our own results do not fully support that notion: i.e. in the reviewed literature, six studies found uniqueness to matter and three rejected the uniqueness hypothesis. We tested a metric that took uniqueness into account and its performance was mixed. For the beer category, our brand association density based on open free associations taking uniqueness into account, achieved a correlation of 0.64 with market share, the same as the correlation without uniqueness. For smartphones, the correlation between the brand association density metric based on open free responses and market share was slightly higher (0.96) than the correlation without uniqueness (0.95). For Toothpaste, the correlation was 0.96 (compared to 0.95 for the non-uniqueness metric). These results are in line with studies by Romaniuk and Sharp (2003), Romaniuk and Gaillard (2007) and Romaniuk *et al.* (2007). To date, no neuro-scientific studies have looked into the potential impact of uniqueness. Hence, this issue may warrant further research, and if neural correlates can be found. Some have argued that salience (the ease with which the brand can be spotted or found) may be more important than uniqueness. Brain research has found that value signals and salience signals reside in different parts of the brain (Litt *et al.*, 2011), and research has found the effect of salience on choice (Milosavljevic *et al.*, 2012).

Sixth, recently the use of implicit measurement has been proposed (Vriens and Martins Alves, 2017). We do not know if measuring pre-defined brand associations using implicit measurement might work better. We would expect this as implicit association are more strongly embedded in memory. We leave the above as topics for future research.

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