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Article

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A bibliometric review and content analysis of research trends in sensory marketing

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ABSTRACT

Despite the numerous studies on sensory marketing, research that holistically reviews through bibliometric and cluster analysis the ensuing knowledge about this topic remains elusive. This study aims to (1) systematically synthesize, condensate and understand the research regarding sensory marketing, and (2) provides suggestions for a future research agenda to help further advances in this field. In detail, based on the methodology proposed by Tranfield et al. (2003), this study was carried out in four different stages: (1) preparation, (2) quality assurance, (3) data extraction, and (4) data analysis and conclusions regarding a systematic review of 342 articles published from 1984 to 2023. Using the Scopus database, the data were retrieved and after processing, the results were graphically illustrated using VOSviewer software. Based on the cluster analysis resulting from the bibliographic coupling analysis, content analysis of 30 documents was performed through the use of MAXQDA software. Overall, this study clarifies the literature that highlights the sensory marketing gaps, enabling the identification of directions for future research.

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1. Introduction

Sensory marketing strategies are used to trigger positive responses in consumers, facilitating the decision-making process (Kim et al., 2021) and enriching their experience (Wörfel et al., 2022) through multisensory stimuli at the point of sale (Fürst et al., 2021). Sensory cues can be inherent to the intrinsic characteristics of a service or a product (for example, color, texture, and weight), or can be related with the environment, for example, lightning, brightness, smell, or sound (Biswas et al., 2019).

According to Holbrook and Hirschman (1982), sensorial strategies enable the differentiation between brands, namely by contributing to the brands' perceived identity and image by consumers. In this way, organizations attempt to create memorable and positive sensory experiences for consumers and generate hedonic value, which in turn leads to competitive advantage (Wörfel et al., 2022). By creating positive experiences for consumers, customer satisfaction is thus increased (Satti et al., 2022), which can contribute to brand loyalty.

Over the last few years, the increasing interest of the academic community and marketers in this field has been noticed, with several publications being related with the five traditional senses, namely: gustatory (taste), auditory (sound), tactile (touch), visual (sight), and olfactory (smell). Nevertheless, sensory marketing is a vast and complex subject area, where it is difficult to obtain an objective overview of the literature under just one umbrella. In this way, it is crucial to adopt a meta-perspective approach to cover the current knowledge in a more comprehensive way. Moreover, the existence of additional human senses is recognized. The current study aims to encompass the sensational and sensorial perspectives in sensory marketing experiences, going beyond the traditional five senses.

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Through carrying out this bibliometric review with content analysis, it is hoped to overcome this gap, aiming to broaden the knowledge of the field of sensory marketing by mapping it and by identifying the theoretical and structural foundation. Furthermore, through the use of descriptive and statistical analysis with graphical representations, it provides an overview of the activity in the literature by relating the performance of scholars in this field and connected publications, thus enabling the detection of new directions for future research. Indeed, the use of bibliometric analysis consists of a systematic, transparent and bias-free method that enhances the quality of the literature review, as traditional narrative reviews are considered to be biased, as they are based on the author's subjective interpretation, which leads to less objectivity and rigor (Zupic & Čater, 2015).

In detail, it is proposed to answer the following research questions:

RQ1: How has previous sensory marketing research descriptively developed over time?

RQ2: What are the most influential counterparts (authors, institutions, countries, and documents) in this field?

RQ3: Which research gaps provide avenues for future research in sensory marketing?

The second section of the study discusses the research methodology adopted, exposing the data extraction and screening process, followed by the analysis and finding sections with descriptive and bibliometric analysis. Based on the Scopus database, a sample of 342 articles from 794 authors published in 146 journals was used, with a total of 35,779 citations from the period of 1984 to 2023. Through bibliographic coupling, cluster analysis was performed by conducting a content analysis of 30 documents, proposing future research opportunities. Finally, theoretical and managerial implications are discussed, together with future research directions and limitations.

2. Data and methodology

This study is based on a bibliometric review of sensory marketing. A bibliometric review is a quantitative method that applies the statistical analysis of a large volume of bibliographic resources, such as review papers, articles, and books (Khan et al., 2020). According to Hawkins (1977), bibliometric studies correspond to 'quantitative analysis of the bibliographic features of a body of literature', identifying relationships between cited and citing articles with statistical analysis (Wörfel et al., 2022). The objective of this technique is to understand the interconnections between journal citations, in order to summarize the main topics in the current research and even identify new emerging issues (Jia & Mustafa, 2022).

Bibliographic coupling and co-citation are examples of two different techniques used in bibliometric analysis to access the connection of publications based on shared references. Bibliographic coupling was introduced by Kessler (1963) and is considered to be a retrospective technique, as it measures the relationship between two articles based on the common cited references. Should a document be common to two publications, then according to Egghe and Rousseau (2002), they are bibliographically coupled, where the greater the number of references in common, the stronger is the relationship.

On the other hand, the co-citation analysis proposed by Small (1973) is essentially a forward-looking perspective, as it assesses the connection between two or more articles by the number of simultaneously cited documents. In this way, the intensity of co-citation between two articles is determined by the number of publications in which both documents are concurrently cited. In this study, the use of the co-citation technique of Small (1999) is preferred in mature research fields and for the analysis of less-recent publications. As this study aims to investigate the field of sensory marketing, which is a topic that is still in its early stages, bibliographic coupling was the chosen method to apply for content analysis.

2.1. Search strategy and data retrieval process

The bibliographic data used in this study were accessed during the month of March 2023 from the Scopus database, which is widely recognized as one of the most used and more reliable databases for quantitative analyses (Garg et al., 2021).

To identify publications centered on sensory marketing, encompassing both the sensorial and sensational perspectives and aiming for a broader scope beyond the traditional five senses, data collection followed the criteria outlined below: (1) search terms with the keywords 'sensor* marketing', using the Title, Abstract and Keywords (TITTLE-ABS-KEY) fields; (2) English language; (3) double-blind peer-reviewed articles and reviews, and (4) business, management, accounting, and social sciences subject area. No limitation of publication dates was considered in the search. The selected search term aimed to minimize researchers' biases by ensuring that publications encompassed all conceivable iterations related to the subject. This includes studies incorporating terms such as 'visual' and 'atmospheric' to extend beyond the traditional five senses.

The search initially yielded a list of 581 publications and next a manual screening was performed with the aim to exclude all articles that were unrelated with the topic by analyzing keywords and titles. 342 references whose corresponding data text files were extracted were obtained, containing information regarding each publication, such as the journals' name, authors, country, keywords, and organization. The database included articles from a span of almost 40 years, starting from 1984 until 2023, with a concentration of articles from 2016 onwards, as illustrated in [Figure 1](#).

2.2. Research method

The bibliometric overview is presented in a combination of descriptive statistical and network analysis regarding three different levels: documents, journals, and authors (Paul & Bhukya, 2021). Statistical metrics such as the number of citations, citations per document, number of publications and number of journals cited were calculated to evaluate the impact of sensory marketing in the field of marketing.

Many tools are available for bibliometric analysis, such as VOSviewer (Visualization of Similarities Viewer), which is becoming increasingly popular in bibliometric studies, due to its superior mapping

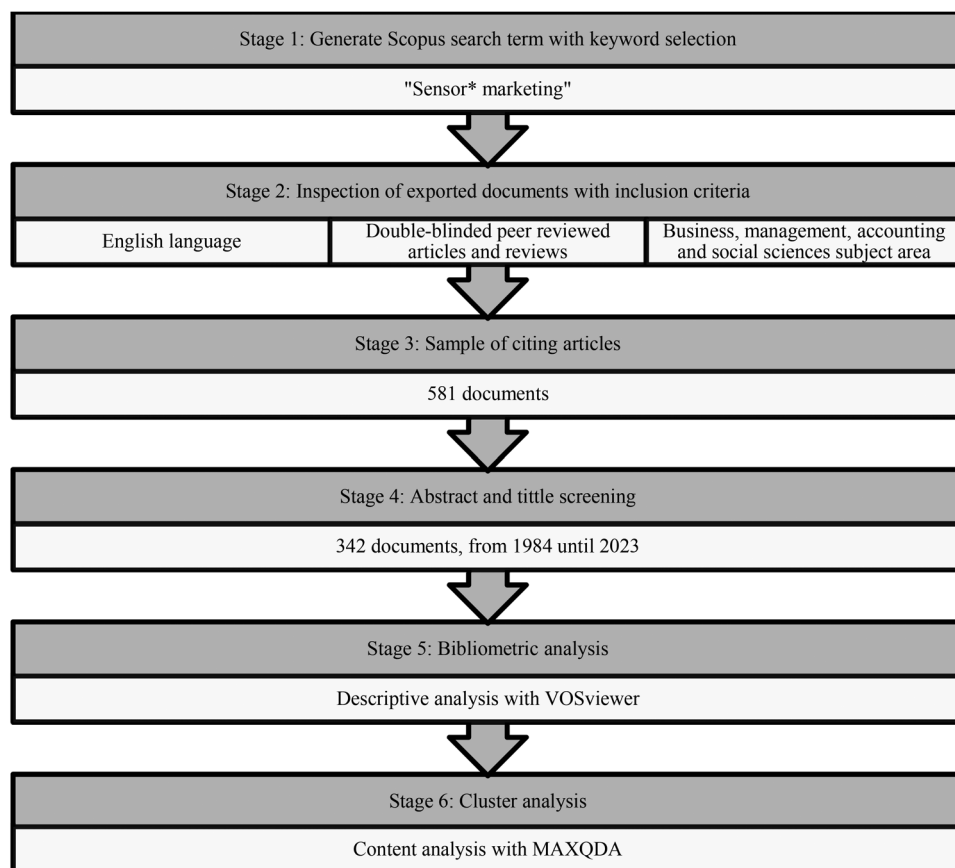


Figure 1. Systematic review methodology.

ability in handling a large set of data (van Eck & Waltman, 2010). In this study, VOSviewer (version 1.6.19) software was used to construct and map the bibliographic data, which was imported from Scopus in the '.csv' extension file format. Through the mapping of routes, this tool computed the strength of the association between different keywords, based on a term co-occurrence matrix (van Eck & Waltman, 2010), which enabled the detection of clusters. At a later stage, MAXQDA (version 2022.6) software was used for text mining in content analysis, where the codes were taken from the selected sample articles of each cluster identified.

Next, the methodological process of this bibliometric review was followed by Tranfield et al. (2003)'s structural approach, based on four different stages: (1) preparation, (2) quality assurance, (3) data extraction, and (4) data analysis and conclusions. In the first stage, the research questions were defined to guide the study, which in turn were responsible for the selection of the database and the keywords for the search. In the second phase, quality assurance was guaranteed by applying criteria such as peer-reviewed academic journals written in English and the qualitative analysis was performed by analyzing titles and abstracts. Next, the third stage of data extraction from the Scopus database was carried out. Finally, Phase 4 encompasses the descriptive analysis, using VOSviewer, coding, and the extraction of data using MAXQDA, followed by content analysis.

3. Results

3.1. Yearly publication

The number of publications on sensory marketing is presented in Figure 2, which depicts the development of documents from the year 1984 to 2023. The first article related to sensory marketing identified in Scopus was published in Psychology and Marketing in 1984, with the title 'Information and sensory overload. Information and sensory overload in psychology and marketing', by Naresh Malhotra. This objective of this article was to overview the research on information and sensory overload in the fields of marketing and psychology (Malhotra, 1984).

Regarding the average annual number of published articles, the period before 2010 was marked by a slow growth for the subject of sensory marketing, with an average of 2 publications per year. Next, this number increased significantly over the last decade, especially since 2016, with a slightly negative rate in 2021, most probably due to the pandemic, with an annual average of 36 articles. The number of publications reached a peak in 2022, with 53 articles.

3.2. Research categories

The 342 articles were written by 794 authors and published in 146 journals, with a total of 35,779 citations. The statistics shown in Table 1 indicate that 89.5% (n=306) of the documents are concentrated in just one category – 'Business, Management, and Accounting'. It is important to clarify that the same document can be classified under more than just one category, which can impact partial and total statistics.

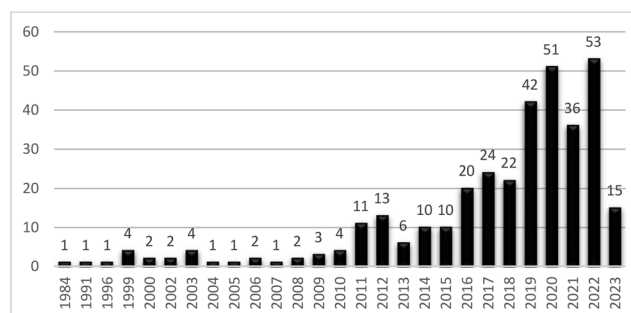


Figure 2. Number of publications per year in Sensory Marketing research since 1984.

Table 1. Number of publications by category.

Scopus categories	Number of publications	% of 342
Business, Management and Accounting	306	89,5 %
Social Sciences	82	24,0 %
Psychology	43	12,6 %
Economics, Econometrics and Finance	40	11,7 %
Agricultural and Biological Sciences	23	6,7 %
Arts and Humanities	17	5,0 %
Computer Science	17	5,0 %
Environmental Science	16	4,7 %
Engineering	13	3,8 %
Energy	12	3,5 %
Decision Sciences	8	2,3 %
Health Professions	6	1,8 %
Medicine	6	1,8 %
Immunology and Microbiology	4	1,2 %
Materials Science	2	0,6 %
Mathematics	2	0,6 %
Earth and Planetary Sciences	1	0,3 %
Veterinary	1	0,3 %

Table 2. Top 20 most productive journals.

Name of the journal	Publisher	Number of publications
Psychology and Marketing	Wiley	23
Journal of Business Research	Elsevier	13
Journal of Retailing and Consumer Services	Elsevier	13
Journal of Retailing	Elsevier	11
British Food Journal	Emerald	10
Journal of Consumer Marketing	Emerald	10
Sustainability (Switzerland)	Springer	10
Journal of Consumer Psychology	Wiley	9
European Journal of Marketing	Emerald	8
Journal of Marketing Research	SAGE Journals	8
Tourism Management	Elsevier	7
Journal of Consumer Research	Oxford Academy	6
Journal of Marketing	SAGE Journals	6
Journal of Product and Brand Management	Emerald	6
Asia Pacific Journal of Marketing and Logistics	Emerald	5
International Journal of Contemporary Hospitality Management	Emerald	5
Journal of Destination Marketing and Management	Elsevier	5
Journal of Travel and Tourism Marketing	Taylor & Francis	5
Foods	MDPI	4
Journal of Fashion Marketing and Management	Emerald	4

The second category with the most publications is ‘Social Sciences’, with 82 articles, followed by ‘Psychology’, with 43. Notably, an emerging trend in applying sensory marketing in ‘Computer Science’ over the last five years can be seen, with the application of virtual technologies and augmented reality (Laukkanen et al., 2021).

3.3. Journal distribution

The 342 articles were published in 146 different scientific journals, with a total of 35,779 citations. To analyze the journals’ productivity, the total publications for the top 20 journals were accessed, as highlighted in Table 2. It was possible to infer that articles on sensory research are published in a wide range of journals under different research categories with different approaches, which indicates a significant development in the field. In fact, research in this subject has been dominated by studies on food, which enables the study of the stimulation of all senses, followed by psychology, due to its connection to individual behavior, which explains the number of publications in this type of journal.

The ‘Psychology and Marketing’ journal dominates the list, with more than 23 total documents, followed by ‘Journal of Business Research’ and ‘Journal of Retailing and Consumer Services’, both with 13 publications. These top 20 journals represent 49% of the total sample.

3.4. Country and institution distribution

Country and institution can be considered as important analytical variables that reflect the contribution and the performance of different regions or institutions in this field of research. The co-citation and citation of articles from different institutions or countries can benchmark the collaborative networks and academic level (Guo et al., 2019).

The retrieved data demonstrates the global application of this research topic, as the 342 publications are distributed across 55 countries. Table 3 indicates the Top 10 countries with the most publications, which contribute to 81% of all the published articles in the selected sample. The United States is the country with the highest number of publications, with 102 journals, accounting for almost one third of the total number of publications, followed by the United Kingdom with 34, and France with 25.

Figure 3 presents the country coupling map, which is constructed from the results of the ‘bibliographic coupling’ analysis in VOSviewer. More concretely, it selected ‘countries’ as the unit of analysis, with the minimum number of documents for countries being equal to 1, to ensure obtaining the maximum number of links generated under the countries variable. This analysis enables the measurement of the degree of collaboration of the country to which the article belongs, by linking the number of similar shared references cited by the documents.

Table 3. Top 10 most representative countries.

Co-authorship by country	Documents	Citations	Total link strength
United States	102	7879	52
United Kingdom	34	1616	28
France	25	456	18
China	21	351	16
Germany	20	242	13
Australia	19	671	13
India	17	288	10
South Korea	15	524	9
Sweden	12	713	9
Canada	11	296	11

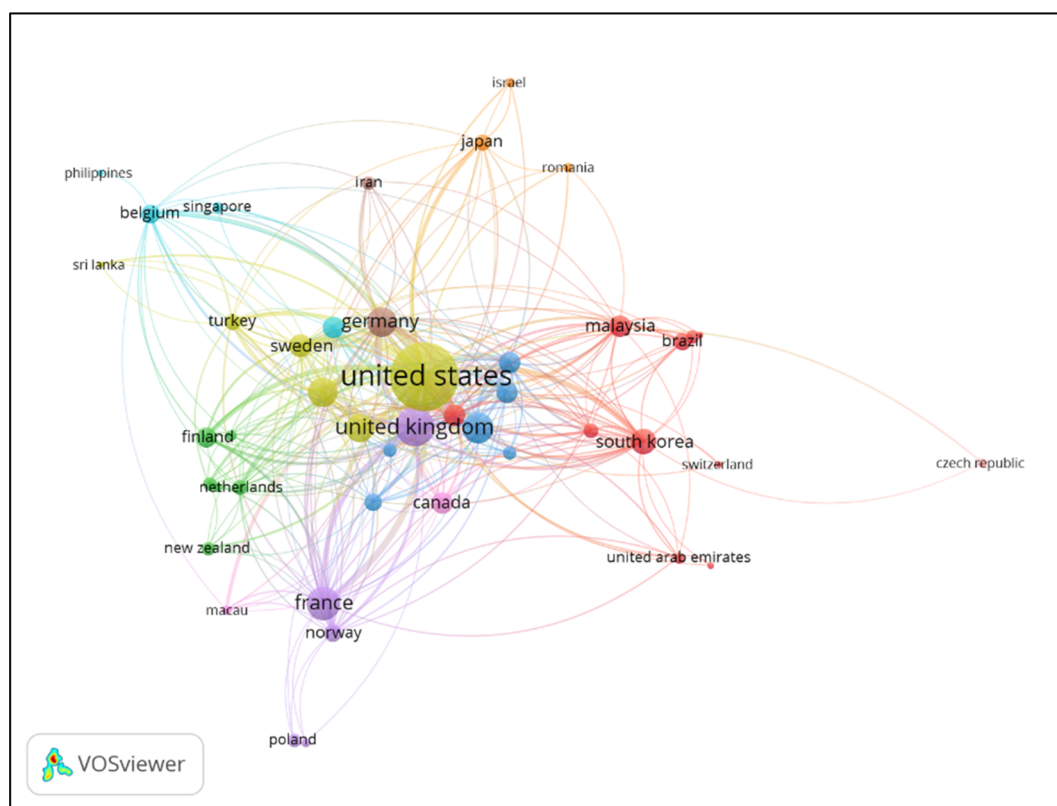


Figure 3. Bibliographic coupling network of countries.

The network visualization shows the presence of 10 different clusters, with the most notable one being the United States, which is colored in yellow. The positioning of the United States as the top-listed country reflects its size, its language facilities, as well as the investment spent on academic and scientific research and the fact that it was the first country to develop the concept of 'atmospherics' in marketing of Philip Kotler (1974). This cluster includes 10 more countries, including Australia, Sweden, and Turkey, meaning that these countries shared the same cited references. The cluster colored in purple includes 5 countries, the most salient being the United Kingdom, followed by France, which provides an insight into the strength of the cooperative relationship in sensory marketing research between different countries.

Table 4 describes the results of the analysis of the organization variable, with the top 5 organizations being responsible for 342 publications among 160 different organizations. Notably, 5 out of the top 10 organizations are American universities, which are considered to be among the most prestigious in the world, with a high reputation rank.

3.5. The most influential articles

According to Svensson (2010), the citation count analysis of a publication represents the influence of a document. Accordingly, Table 5 depicts the results of the top 10 most-cited documents in the sensory marketing field published between 1984 and 2003, which accounts for more than 5,000 citations (n=5,093) of a total of 13,239 citations (38.47%).

Table 4. Top 10 organizations.

Organization	Number of documents
University of South Florida	8
University of Michigan	7
University of Oxford	7
Cornell University	6
Boston College	6
Linnaeus University	6
Leibniz University Hannover	5
BI Norwegian Business School	5
Middlesex University	5
Kent State University	5

Table 5. Top 10 documents by global citations.

Title	Authors	Year	Source	Citations	Links
Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty?	Brakus, J.J., Schmitt, B.H., Zarantonello, L.	2009	Journal of Marketing	2057	63
An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior	Krishna, A.	2012	Journal of Consumer Psychology	667	126
Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes	Degeratu, A.M., Rangaswamy, A., Wu, J.	2000	International Journal of Research in Marketing	556	4
Vital dimensions in volume perception: Can the eye fool the stomach?	Raghubir, P., Krishna, A.	1999	Journal of Marketing Research	295	9
Store atmospherics: A multisensory perspective	Spence, C., Puccinelli, N.M., Grewal, D., Roggeveen, A.L.	2014	Psychology and Marketing	288	47
Sensory marketing: The multisensory brand-experience concept	Hultén, B.	2011	European Business Review	260	8
It just feels good: Customers' affective response to touch and its influence on persuasion	Peck, J., Wiggins, J.	2006	Journal of Marketing	251	32
Sensory marketing, embodiment, and grounded cognition: A review and introduction	Krishna, A., Schwarz, N.	2014	Journal of Consumer Psychology	250	55
Multisensory design: Reaching out to touch the consumer	Spence, C., Gallace, A.	2011	Psychology and Marketing	242	16
Managing sensory expectations concerning products and brands: Capitalizing on the potential of sound and shape symbolism	Spence, C.	2012	Journal of Consumer Psychology	227	17

The highest ranked document is 'Brand Experience: What Is It? How Is It Measured? Does It Affect Loyalty?' by Brakus et al. (2009), published by the Journal of Marketing, being the most-cited publication, with 2,057 citations. These authors developed a conceptualized model of brand experience that is embodied in four dimensions, namely: sensory, intellectual, behavioral, and affective. With regards the sensory dimension, the authors defend that the experience dimensions are evoked by brand-related stimuli, which can affect consumer satisfaction and brand loyalty.

The second-ranked paper in the list, with 667 citations, is 'An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior', published in the Journal of Consumer Psychology in 2012 by Aradhna Krishna, that lays the foundation for research in sensory marketing topic. This review established an overview of research on sensory perception, encompassing the five senses dimensions as a marketing tool to create judgment, perception, and to influence behavior (Krishna, 2012).

The remaining document in the ranking has 556 citations and is entitled 'Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes', by Degeratu et al. (2000), that was published in 2000 by the International Journal of Research in Marketing. The aforementioned publication was an empirical study that aimed to investigate how consumer choices are affected by different store environments in traditional versus online stores, marking a relevant transition towards online marketing research at the beginning of the millennium. The results revealed that sensory search attributes, namely visual cues related to a product, have a lower impact on consumer choices online than in traditional stores.

3.6. Author Keyword Co-occurrence analysis

In the total of 1,085 author keywords among 342 publications, 794 keywords (73.18%) appeared only once; 45 keywords appeared 5 or more times (4.15%); and only 7 keywords were identified in at least 10 publications, representing 0.65% ('sensory marketing', 'consumer behavior', 'brand experience', 'experiential marketing', 'advertising', 'consumer behavior' and 'touch'). Table 6 summarized the top 10 author keywords, in which the keyword 'sensory marketing' was the word most often applied to synthesize the main subject of the research, with 121 occurrences.

To explore the current research status and in order to identify future potential relationships between terms in sensory marketing, a co-occurrence analysis was carried out, which focused on the content of the publications. Keyword co-occurrence analysis is a technique that extracts keywords from the publications, enabling the examination of the document's content. In this way it is possible to enrich the study of the sensory marketing field by interpreting co-citation analysis, which represents the past research, or bibliographic coupling, as utilized in this research (Donthu et al., 2021).

These results enable the development of new potential insights in the research field of sensory marketing, helping consolidate the literature in the future. In detail, Figure 4 shows the results of author keywords co-occurrence, in which the keywords chosen appeared at least 3 times, resulting in 98 keywords, with 399 links. Each keyword is symbolized by a node, where the greater the occurrence, the greater the size of the node. The nodes are clustered into 11 different clusters, illustrated by different colors, where the distance between clusters reflects the degree of relation between them.

In the last 5 years of sensory marketing research, the shift towards 'experiential marketing' and the application of marketing sensory cues in the tourism industry was noticed. In turn, this observation

Table 6. Top 10 keywords.

Keyword	Occurrences	Total link strength
Sensory Marketing	121	545
Consumer Behavior	25	115
Brand Experience	19	72
Experiential Marketing	19	69
Advertising	12	52
Consumer Behavior	11	41
Touch	11	54
Emotion	9	44
Marketing	9	44
Color	8	43



Figure 4. Network mapping of co-occurrences of author keywords.

demonstrates the emerging research in empirical experiences and consumption with senses, rather than just relating sensory marketing to a retail shopping activity.

Of note, is the emergence of new terms after 2020, namely 'virtual reality', 'sensory imagery', 'mental imagery', and 'online retailing', which reflects a growing enthusiasm for sensory research related to various fields, specifically in the digital environment. In addition, over the last few years, the olfaction and haptic senses ('olfaction', 'scent', 'haptics', and 'touch') have become more popular than the other senses, which might reflect that researchers are re-exploring subjects that are considered to have been over-researched in past research, as shown in [Figure 5](#).

3.7. Author distribution

Sensory marketing has become an attractive field for a growing number of researchers. The top 10 most productive among the 794 authors is described in [Table 7](#). This statistical measure of the number of published papers should be additionally analyzed with other significant variables, namely: the quality of the journal, length of the document, and quantity of authors per work. In addition, it is important to reflect that some known researchers may not appear in the analysis, owing to the criteria used in this study, for example, the year of indexing the journals in the Scopus database. According to the results, Dipayan Biswas from the University of South Florida is the most productive, with 10 (2.92%) of the 342 publications, followed by the American researcher Aradhna Krishna, from the University of Michigan. Biswas specialized in sensory and digital marketing, and his key research interests are the food, retail and health sectors. The runner-up of the top 10 list is a behavioral scientist and well-known researcher, who is considered to be one of the foremost experts in the field of sensory marketing.

To further investigate the association and collaboration among the 794 authors, a co-authorship analysis using VOSviewer was conducted, where [Figure 6](#) maps the networking, where only 18 connected items were identified. Not surprising, the most productive and influential authors scored the highest in terms of co-authorship, where Dipayan Biswas has a total of 20 link strength, which means that Biswas has collaborated with 20 authors, followed by Aradhna Krishna and Charles Spence, both with 10.

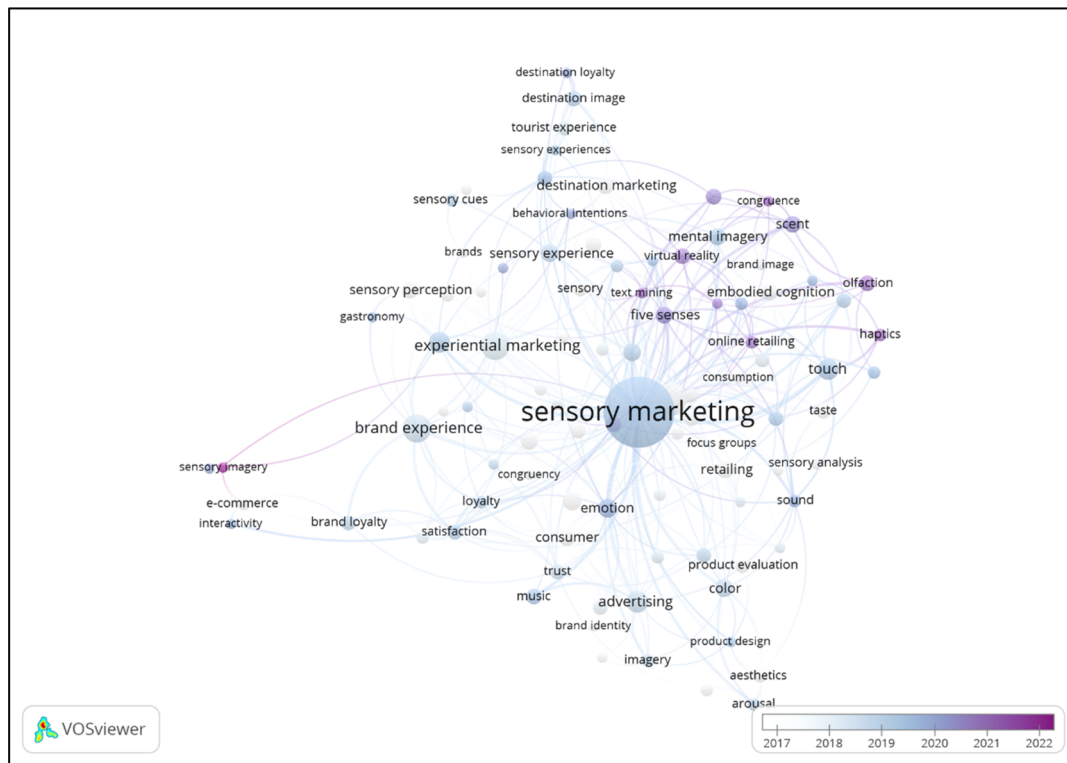


Figure 5. Overlay visualization of most frequent author keywords.

Table 7. Top 10 authors by publications.

Author	Documents	Citations	Total link strength
Dipayan Biswas	10	536	20
Aradhna Krishna	8	1474	10
Charles Spence	7	954	10
Henrik Hagtvedt	6	264	6
Courtney Szocs	5	318	9
Janina Haase	5	63	9
Klaus-Peter Wiedmann	5	63	9
Dora Agapito	4	375	9
Júlio Mendes	4	375	9
Erhard Lick	4	81	6

Regarding the results of this analysis, it is possible to conclude that there is no obviously dominant position, thus presenting an opportunity for authors to enhance the research of sensory marketing literature by collaborating with other researchers and explore new potential fields of research. When two different documents cite the same document, bibliometric coupling occurs, that shows the strength of a specific publication regarding a set of other documents. Figure 7 represents the bibliographic coupling of authors, allowing one to visually identify which ones are correlated and to measure the intensity of the link. The visual map reveals five different well-defined clusters, with the lines showing the same citations by authors.

3.8. Cluster analysis

The mapping of clusters generated by bibliometric coupling (Figure 7 above) was defined with a minimum of citations defined to be equal to 10 among the 342 final documents of the research, using the Scopus database. Through the use of VOSviewer software, the visual mapping revealed 5 different clusters, which indicate a group of related items, colored in red, green, blue, yellow, and purple respectively among the 183 links of documents.

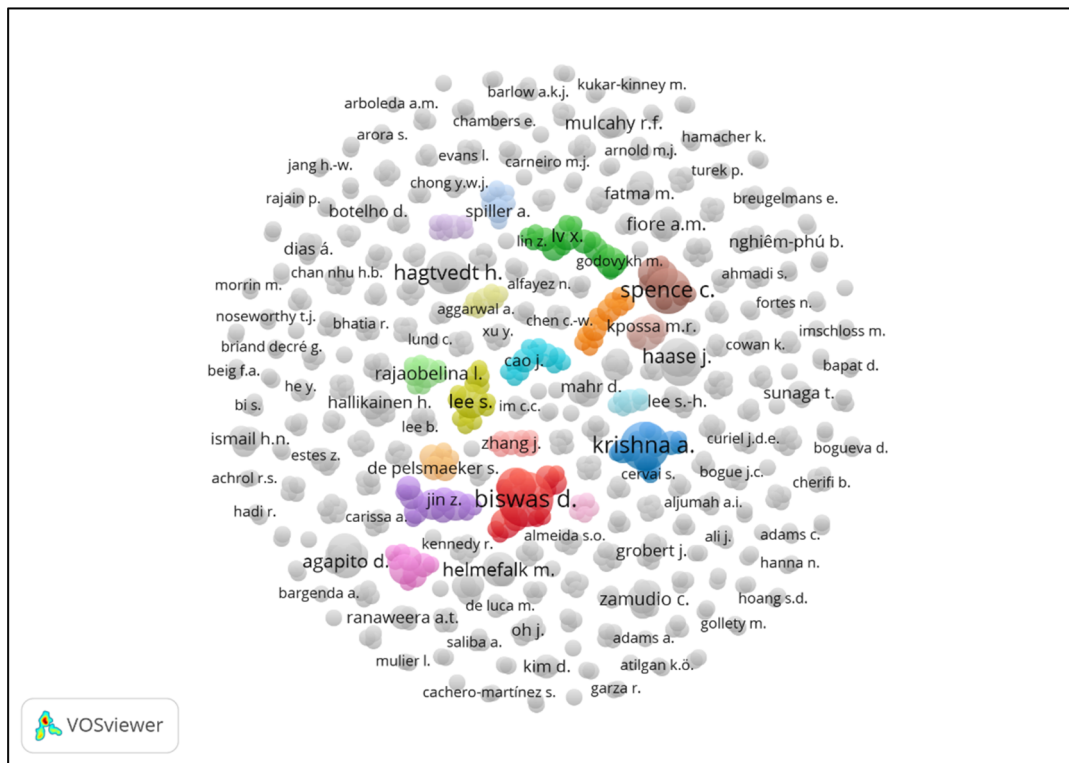


Figure 6. Network mapping for co-authorship analysis.

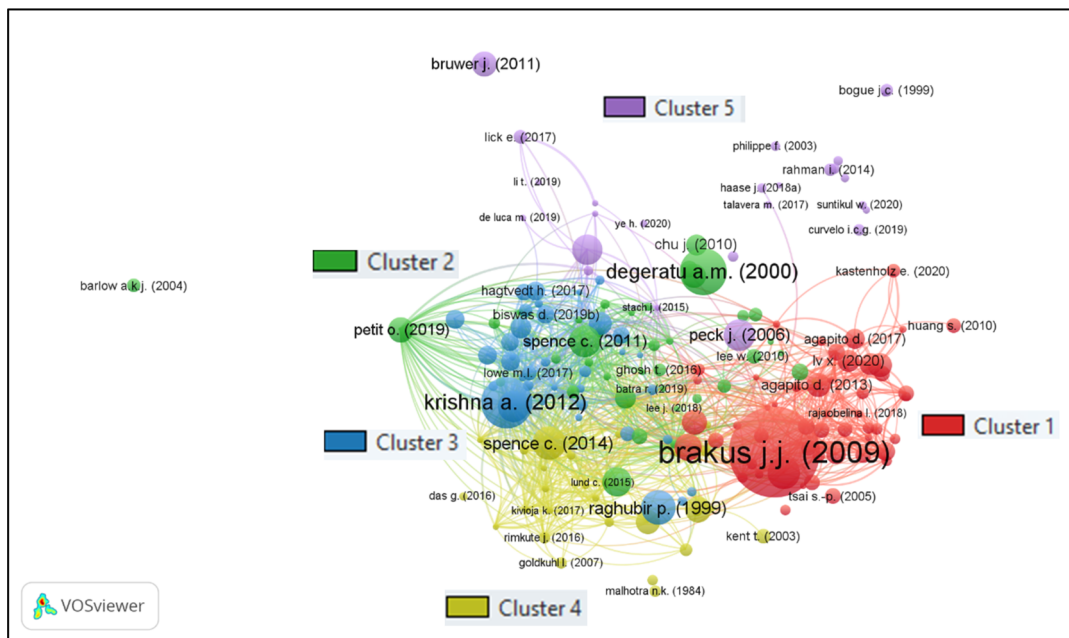


Figure 7. Bibliographic coupling.

Next, through the utilization of MAXQDA software, the codification and categorization of clusters was obtained by performing a content analysis of 30 articles – the top 6 most-cited documents in each cluster. Content analysis enables the thematic inference of a particular subject to be derived (Mody et al., 2021) by carrying out the review of the text of a document either manually, or atomically with software.

3.8.1. Cluster 1 – Human senses in customer experiences

The first cluster, named ‘Human senses in customer experiences’, which is colored red in [Figure 7](#) above, comprises 52 articles, that resulted in 4,990 citations from 2005 to 2021. This cluster embraces most of the research on sensory marketing, in which understanding human senses becomes the major research focus. Human senses, specifically the traditional five senses of touch, taste, smell, sound, and sight, are used to collect information. The sensory attributes of a product or environment stimulate consumers and influence their emotions, feelings, perceptions, and purchase intentions (Kim & Perdue, 2013).

The human senses’ classification is a non-consensual topic, in which the traditional division into five senses proposed by Aristotle is the most used framework to operationalize methodologies in studies that aim to study multisensory dimensions (Agapito et al., 2013). The lack of sensitivity regarding this subject is mainly due to the complexity and the multidisciplinary nature of the research. The traditional five senses, referred to as ‘exteroceptive senses’, evoke information about the external environment, albeit neuroscience theory proposes that the sensory stimulations received by the human brain can additionally be influenced by internal prompts regarding body awareness, which in turn is considered to be derived from interoceptive senses (Agapito et al., 2013). In further detail, for scientists, interoceptive senses include vestibular sense (related to balance), visceral sense, proprioceptive sense (related to movement via the musculoskeletal system), and internal milieu sense (related with temperature and pain).

Human senses are valuable features of an individual’s behavior and experiences (Agapito et al., 2013). Previous academics developed the paradigm of emplacement and sense of place, positing that sensory interrelationships engage the cultural, physical, and social features of individuals. According to Hultén (2011), the definition of sensory experience encompasses an individual’s perception of a service or a product that challenges the human senses and mind. Companies can thus create value for consumers when they have an experience of using goods or services. More specifically, through multisensory brand experiences, companies can create value for consumers by interacting with them by stimulating the five human senses, which in turn generates customer experiences, value, and brand image.

The findings of the studies conducted by Hultén (2011) reveal the importance of firms in applying sensory experiences in value-generation processes. Indeed, strategies evoking sight senses (emphasize light, color, and graphic elements) are considered to be one of the most significant in communicating a brand’s value and identity. On the other hand, fragrances are also used to improve brand recall and brand recognition, impacting both consumer’s mood and emotional state. A sound sensory strategy aims to create memories and inspire people, whereas taste strategies are a multisensory approach, with a synergy between other senses. Lastly, haptic strategies are used to strengthen the identity of a brand through psychological and physical interactions with consumers.

Sensory marketing strategies are used by companies to differentiate their brand from competitors, especially when the functional and rational attributes of the service or the good are often the same, for instance, quality or price attributes (Hultén, 2011). Brand experience encompasses four different dimensions, namely: sensory, intellectual, affective, and behavioral (Brakus et al., 2009). By conceptualizing brand experience, these authors state that brand-related stimuli ‘constitute subjective, internal consumer responses’, that are mainly feelings, sensations, behavioral responses, and cognitions. Brand-related stimuli evoked in consumers are thus related to the brands’ identity and its respective communication, related environment, and packaging. Brand experiences consequently impact both loyalty and consumer satisfaction (Brakus et al., 2009).

The empirical studies of Troye and Supphellen (2012), in which the taste sense was manipulated to infer how sensory perceptions are biased when consumers engage in self-production brand experiences, concluded that a positive relationship exists between those variables. Furthermore, engaging in self-production experiences, such as cooking or assembling a piece of furniture, leads to a positive evaluation of the final outcome by consumers. In this way, marketers who induce consumers’ behaviors through sensory cues should rely on self-production experiences to increase consumer satisfaction. For Bolton et al. (2014), brands can enhance the service consumption experience by offering both memorable human touch experiences and designing emotionally engaged experiences, for instance by co-creation opportunities. Consumer emotional sentiments, such as feelings of belonging, love, well-being, happiness, and warmth, can all be boosted by these co-creation opportunities, which in turn result in

companies achieving better performance. As explained by Agapito et al. (2013), memorable experiences can be attainable by stimulating all the human senses, which engages consumers personally.

3.8.2. Cluster 2 – digital sensory marketing

This cluster includes 37 documents published from 2000 to 2022, corresponding to a total of 2,468 citations. The cluster is composed of those items colored in green, as shown in Figure 7, pointing to the importance of the focus on sensory marketing in digital channels. In digital, sensory interaction is limited to visual and auditory inputs (Petit et al., 2019). Indeed, online shopping limits the physical examination of objects in terms of touch, trial and feel (Chu et al., 2010). The haptic sense is considered to be the human sensory modality that cannot be fooled, which results in consumers being more confident about purchasing a product which they are able to touch, rather than just buying something that they can only see (Spence & Gallace, 2011). The touch sense provides the most reliable way to inspect and evaluate the hedonic value of a specific product. In this way, when a consumer is shopping online, it is crucial that retailers induce tactile interactions by resorting to other sense modalities, as virtual haptic devices are still unrealistic and are far from being commercially viable for sale to consumers.

In this environment, brands try to stimulate tactile cues by means of synesthetic associations, specifically through visual content (Spence & Gallace, 2011). For instance, images of a fluffy teddy bear evoke soft sensations in terms of haptic cues. In addition, through sound, marketers can also bring to mind the haptic attributes of a product, for example, the sound of a crack of chips potato, thus enabling consumers to enhance their perception of the texture of the product. Moreover, recent studies have demonstrated how marketers effectively apply visual cues in online channels, for instance, by using light-colored products displayed in the upper part of the visual field (Petit et al., 2019), as lighter objects presented in the upper part of the visual field are perceived to be lighter (in weight). Accordingly, the cross-modality between the position and lightness of colored products improves the accuracy and speed of the recognition of these items. Petit et al. (2019) described how visual features impact the online experience and improve web atmospheres, making the involvement more enjoyable, aesthetically pleasing and immersive for consumers.

Another key point regarding digital channels is how product category affects consumer behavior in online channels, specifically when it is related to food, as it involves a higher risk (Chu et al., 2010). Indeed, online shopping is more suitable for non-sensory products, as evidenced by the success of online shopping of books, CDs and electronics, and it is less appropriate for products with more sensory attributes (Pauwels et al., 2011). Consumers want to avoid health risks, and as they cannot physically interact with the product and obtain specific information such as 'sell-by-date', they tend to resort to brand names. When consumers have a limited availability on the information of products in online retailing, they tend to resort to previous evaluations regarding the attribution of brand values (Degeratu et al., 2000). To corroborate those finding, studies by Chu et al. (2010) revealed that the online-offline difference is greater for food products regarding brand loyalty and price sensitivity than for non-food items. With regards sensory products, the online-offline difference related to brand loyalty and price sensitivity is larger when compared with non-sensory products. Retailers and marketers thus tailor different marketing strategies in different channels according to specific product categories and sensory and non-sensory products.

In sum, sensory experiences are becoming a neurophysiological science, potentialized by the development of digitalization and virtual media that enlarge the scope of consumer sensations (Achrol & Kotler, 2012). However, with the emergence of virtual reality and quantum physics applied to sensory experiences, it is necessary to study and develop the vast amount of theory on this topic and its impact on consumer behavior that is based on theoretical and methodological tools.

3.8.3. Cluster 3 – the visual sense

The third cluster, that is named the visual sense, colored blue in Figure 7, is formed by 37 documents, which resulted in 2,720 citations from 1999 to 2022. This cluster embraces most of the research related to the human sense of vision. Vision is considered to be the dominant sense by Krishna (2012) and has been studied considerably within the context of advertising. Previous work demonstrated that visual

factors such as ambient lighting, the size of the plate, and packaging color, can have an impact on consumption decisions and restaurant dining behavior (Biswas et al., 2019).

Ambient lighting is considered to be an effective tool for marketers to influence consumers' behavior, cognitive associations, and stimulation levels (Biswas et al., 2017). For instance, fine-dining restaurants usually have dim lights and relaxing music, whereas fast-food restaurants often have a faster rhythm of music and bright lights. The reason for this is the fact that higher intensity of light enhances mental alertness and task performance, whereas more light suppresses the production of melatonin, which is responsible for sleep biorhythms. To illustrate, Biswas et al. (2017) concluded that when the luminance of ambient lights is low, the preference for consuming unhealthy foods is higher, explained by the fact that dim (vs. bright) light decreases mental alertness.

Another aspect related to vision is packaging, which can be managed to attract consumers' attention and generate interest in a product by enhancing its visual salience (Krishna et al., 2017). In fact, researchers have discovered that consumers concentrate longer on more visually salient objects than the less noticeable ones, and that they are thus more likely to purchase them. Indeed, more salient items have a greater impact on choice rather than consumer preference, inducing consumers to touch it, which consequently increases impulse buying behavior. With respect products' volume characteristics, Raghunir and Krishna (1999) concluded that package shape influences the volume perception of the object and, as a result, inversely impacts perceived consumption and the amount consumed. For example, the less consumers perceive that they are drinking, the more that they will drink to compensate for it. Furthermore, larger packages, which represent a larger perceived volume, has been proven to increase purchase intention.

Another powerful visual sensory marketing tool used by marketers is related to color engagement, presence of an image of the product, and visual orientation. Firstly, past studies have showed that shorter-wavelength colors, such as blue, induce more relaxing sensations in consumers than longer-wavelength colors, such as red (Krishna et al., 2017). Moreover, the latest studies revealed a positive relationship between the visual orientation of objects that facilitate the mental simulation of interaction and purchase intention (Krishna & Schwarz, 2014). To illustrate this phenomenon, when a fork is placed towards the dominant hand side of the consumer next to a piece of cake in advertising, it facilitates the mental simulation of reaching for the fork and proceeding to eat the cake. Indeed, a handedness-object-orientation match aids consumers in simulating the interaction with the product, and thus increases their purchase intentions. Finally, the presence of an image of the product being sold on packaging can also boost consumers' purchase intention, being a product quality indicator. In the cases of food items, the image of the product on the packaging can help consumers better imagine the products' intrinsic characteristics, such as flavor, smell, texture, sound, and look. Additionally, by seeing the picture of the food item, consumers' physiological responses increase – e.g. salivation – and accordingly increase their desire to eat it.

3.8.4. Cluster 4 – multisensory marketing

The multisensory marketing cluster, represented in yellow in Figure 7, consists of 31 articles, representing 1,188 citations between 1984 and 2021. Topics within this cluster include research about multisensory marketing strategies, which aim to engage consumers across multiple senses to influence their behavior. A significant portion of the research concerning store atmospherics concentrates on individual elements of the environment, however, it is essential to evaluate the effects of cues that engage multiple senses in the environment (Spence et al., 2014). Indeed, servicescapes are perceived by consumers in a holistic way, implying that retailers need to carefully manage the store atmosphere in order to influence consumers' perceptions of value, and consequently their behavior. Furthermore, congruent multisensory experiences are considered to be more pleasant and engaging for consumers than environments with lower sensorial stimulations.

Individually, the visual atmosphere cues in terms of color, brightness, shape, and size can influence the level of stimulation and the person's emotional state. Previous empirical studies demonstrated a positive relationship between brightness and the amount of time spent in a store and longer browsing (Spence et al., 2014). Accordingly, retailers are advised to adapt the brightness in their stores by either reducing the ambient illumination or increasing the lightning, with the aim to determine the consumers' optimal level of stimulation. Besides the visual cues, shopper patronage behavior is also positively influenced by the presence of music in the store atmosphere (Spence et al., 2014), especially if consumers

like it and recognize it. Previous studies concluded that increasing the volume of music playing in a supermarket induced consumers to rush shopping and spend less time in the store. However, those same results demonstrated that customer satisfaction and purchase intention were not affected by the volume of the music (Spence et al., 2014). Studies applied to the food sector revealed that classical music increases the average time spent in a restaurant (Spence et al., 2014), and therefore retailers should be aware of the different sound attributes (e.g. tempo, volume, and rhythm) and also the semantic meanings associated with specific stores to achieve the optimal level of stimulation. Cross-modality studies with sound and smell cues demonstrated that when the scent and music are congruent, customers provide more positive evaluations for the store environment, express greater satisfaction and reveal higher levels of impulse buying behavior (Spence et al., 2014).

Over the last few years, an increasing number of academic research regarding the olfactory sense has been carried out, at which some studies have reported olfactory sense as being the closest sense to the brain's emotional complex. Goldkuhl and Styvén (2007) stated four different aspects of scents in services marketing: pleasantness, presence, relationship between fragrance and memory, and congruity with the service. Regarding pleasantness (or unpleasantness), the intensity of the scent is a crucial element to be considered when designing sensory marketing strategies. The latest empirical studies show a positive relationship between pleasant odors and purchasing and repurchasing buying intentions, as well as the amount of time spent shopping. In this way consumers perceive a pleasant environment smell, that in turn increases their willingness to pay more to acquire a certain service or a product (Ardelet et al., 2022). Related to presence (or absence), ambient scent induces consumers to visit and return to a store, constructing a positive image and perception of the store and the quality of the product. When applied to services, olfactory cues should be used to attract consumers rather than dissuade them, meaning that it is crucial to analyze the components of scent. To corroborate those findings, studies conducted by Fiore et al. (2000) revealed that the presence of a pleasant fragrance influences sensory experiences, albeit the intensity of the cue does not necessarily increase sensory pleasure. Sensory olfactory cues can evoke memories more emotionally than other sensory stimuli, being a distinct marketing tool to develop loyalty to a brand or service (Rimkute et al., 2016). Although certain odors could be difficult for consumers to identify, Goldkuhl and Styvén (2007) stated the importance of matching the congruity between the smell and the product or service being offered.

For academics, the haptic sense involves the sensory-discriminative qualities of temperature, smoothness, and softness (Kotler, 1974; Spence et al., 2014). Touching a product can make consumers more likely to buy it and be willing to pay more, although consumers do not like to purchase something that has already been touched by others (Spence et al., 2014). Cross-modality studies of haptic sense and visual sense revealed a connection between softness and smoothness, and greater luminance, implying that retailers need to use a higher level of light when attempting to convey softness in their products. On other perspective, the gustative sense can provoke intense positive reactions in consumers, but also negative ones, as humans recall more vividly the positive experiences of food consumption than a single visual, tactile, auditory, or olfactory experience.

To conclude, visual, auditory, olfactory, haptic, and taste stimuli all individually affect consumers' perceptions and behaviors, and their combined influence in a congruent way is even greater than the sum of their parts. This reveals the importance for marketers to design approaches with multiple sensory stimulations while maintaining the congruency between the different atmospheric cues (Spence et al., 2014). As an example, previous studies (Spence et al., 2014) proposed that employing consistent multi-sensory strategies might help managers in regulating the perceived wait times and Hultén's (2011) research conducted in a Swedish IKEA store demonstrated that implementing multisensory changes to the environment (softening the lighting and introducing a pleasant scent), resulted in a 50% longer duration of physical interactions between shoppers and glassware displays, and also influenced shoppers' purchase intentions and increase sales.

3.8.5. Cluster 5 – the gustative sense

The final cluster, represented in purple in Figure 7, comprises a total of 26 documents published between 1999 and 2020, representing 1,167 citations. These articles address studies regarding the sense of flavor, that is usually categorized into five different characteristics, namely: salty, sour, sweet, bitter, and umami

(Bredie & Møller, 2012) and is considered to be one of the most multisensory day-to-day experiences (Lick et al., 2017). Eating or drinking is a holistic multisensory experience, as when we are eating or drinking, we can smell the item, visualize its color and format, touch it, and even hear certain noises, such as crunching chips (Lick et al., 2016).

Crossmodal studies between flavors and visuals aspects, revealed that curved shapes of foods and beverages increase the sensitivity of sweetness perception, when compared to angular shapes. In addition, studies by Lick et al. (2017) found that the color of the label of wine bottles interferes with consumers' flavor expectations. For instance, if marketers want to create expectations of a fruity wine, they should apply a red or orange colored label on wine bottles. Indeed, studies applied to the beverage industry concluded that label imagery and package design influence purchase intention, as it affects consumers' perceptions of the brand's identity (Rahman et al., 2014). As it is not possible to directly access the flavor of wines, labels become the pivotal source of information to persuade consumers to buy the product and generate sales (Lick et al., 2017). On the other hand, crossmodal studies between flavors and sound exposes that consumer 'match bitter foods with low-pitched sounds, and sour-tasting foods with sounds having a higher pitch' (Crisinel & Spence, 2010).

Customer tastes are rapidly and continuously changing, in which the development of technology applied in the food industry and the decreasing lifecycles of products are challenging marketers to become more competitive (Bogue et al., 1999). Accordingly, a market-oriented new product development approach is crucial to identify and satisfy consumers' needs, where intrinsic attributes such as flavor are the most important determinant of food choices (Bogue et al., 1999).

4. Conclusions

4.1. Theoretical contributions

While various narrative literature reviews on sensory marketing already exist (Stead et al., 2022; Wörfel et al., 2022; Zha et al., 2022) with a few employing bibliometric reviews, to the best of our knowledge this study using bibliometric and cluster analysis marks a novel step in summarizing and reflecting on the last 40 years of research in sensory marketing. For this purpose, a cross-disciplinary approach was used, that encompasses Business, Management and Accounting, Social Sciences, and Psychology, with the aim to gain a better understanding of theoretical, topical, and thematic issues. Indeed, the study conducted by Zha et al. (2022) aimed to expand the knowledge of experiences provided by brands. Through co-citation analysis spanning over 25 years, the study identified five different clusters and knowledge fields: atmospherics, product evaluation, sensory marketing, service marketing, and experiential marketing. While the selected research keywords for that study, 'sensory experience' and 'sensory brand experience', were effective in retrieving relevant data, it is acknowledged that some crucial papers might have been missed. This is partly because the brand experience literature as a whole is still relatively new, for instance when compared to atmospherics studies. In comparison to previous studies, this current investigation introduces a novel approach by employing bibliographic coupling analysis over the last 40 years of sensory marketing. This method was chosen due to its ability, as suggested by Kleminski et al. (2022), to capture more unique information compared to traditional direct citation or co-citation analysis. Moreover, the results provided a more specific overview of the subject of sensory marketing, revealing insights not only focusing on brand experiences, which is a relatively new area, but also exposing potential directions for future research.

In a prior bibliometric analysis conducted by Stead et al. (2022), which utilized text-mining and co-citation analysis to explore service and multisensory customer experiences, three distinct research areas emerged: atmospherics and sensory perception; service environments and social interaction; and customer- and firm-related outcomes. The authors extended their investigation into cross-disciplinary domains, revealing three research areas: sensory processing, food perception, and system interaction. However, it appears that these results may overlook the role of senses and stimuli processing. Also, the review focused specifically on sensory research within service and marketing disciplines. In contrast to the previous study, this current research expands into new potential areas of study, primarily focusing

on digital sensory marketing – an emerging subject in the present digital age. In another bibliometric analysis of sensory information processing conducted by Wörfel et al. (2022), the database only included publications from the last 25 years. In contrast, our current research extends the period under consideration, spanning the last 40 years of research. Wörfel et al. (2022) identified sensory marketing as one of five distinct research streams – alongside experiential marketing, embodied cognition, store atmospherics, and cross-modal taste perception – that collectively explain the total variance in co-citation data. These authors revealed that sensory marketing extends beyond its traditional boundaries into other marketing-related disciplines, such as service management and customer relationship management. However, our investigation stands out by its specific focus on sensory marketing, aiming to broaden the scope within this field. For instance, we have identified the emerging digital sensory marketing cluster and the opportunity to go beyond the traditional five senses, marking a novel research area. Notably, the previous three bibliometric studies relied solely on co-citation analysis within a limited time frame, lacking descriptive data such as the evolution of publications over the years and the most cited authors. Our study introduces a novel approach by employing bibliographic coupling, which broadens the scope to almost 40 years of research. Additionally, it visually illustrates the network of the field, employing intense cluster analysis to provide valuable insights for future research avenues.

Largely, regarding theoretical contributions, a performance analysis was conducted to trace the research field's development regarding publications and contributions of different parts, which will help researchers to locate the dominant entities under this subject in the future. Secondly, through keyword analysis and bibliographic coupling, this research defined the thematic and topic structure, which may help future researchers analyze the intellectual structure of the research area of sensory marketing, in which emerging topics could be identified. Thirdly, content analysis based on cluster analysis divided the literature on sensory marketing into five different clusters: (1) human senses in customer experiences, (2) digital sensory marketing, (3) the visual sense, (4) multisensory marketing, and (5) the gustative sense, where a critical review was discussed with future research opportunities.

By combining insight from content analysis, research gaps in sensory marketing were identified, highlighting the role of future multidisciplinary research and suggesting several avenues for future research with the objective to enrich the knowledge of this topic. One of the contributions of this study is to have confirmed the progress of digitalization used in marketing strategies to influence consumer's experiences (Petit et al., 2019), in which certain research questions can be defined for future research, such as *'How do consumers process multisensory information in online vs. offline channels?'* and *'How can the lack of haptic input in online retailing be surpassed over time by the development of new technological tools?'*

In addition, the sense of taste explored in the fifth cluster leads to various promising research avenues, especially with regards online shopping. Krishna (2012) showed that taste is susceptible to external influences, such as brand name, physical attributes, product packaging, advertising, and product information (such as nutritional info). It is thus crucial to investigate how online food and beverage shopping can be explored. Being linked to the visual sense, gustative imagery should be analyzed, specifically how it can be designed in the digital context. In addition, this study highlights that there is an opportunity to go beyond the traditional sensory systems. Indeed, while recent research has almost exclusively focused on the traditional five sensory systems proposed by Aristoteles (Agapito et al., 2013), studies of Biswas et al. (2019) have started to explore the interoceptive senses, specifically the vestibular sense, which drives balance and posture. Accordingly, this study calls for further research on the interoceptive system, that is seemingly unexplored, emphasizing the opportunity for the interdisciplinary exchange with the areas of neuroscience, psychology and biology.

4.2. Practical implications

Sensory marketing is a complex field that involves cross-disciplinary sources, such as psychology and biology. Marketers should accordingly carefully design their marketing strategies to influence consumer behavior, especially with regards online shopping. Indeed, with the increasing reduction of physical interactions, digital media make it harder for brands to interact and emotionally connect with consumers (Petit et al., 2019).

In addition, it is crucial for companies to maintain consistency and authenticity in customer experiences, both online and offline, in order to create memorable experiences. This explains the increase in popularity of new technologies such as virtual reality and augmented reality in marketing strategies (Chu et al., 2010), where the digital sensory marketing's cluster presented an in-depth analysis of current trends and prospective usage of those new technologies for improving consumer experiences.

Furthermore, the insights gained from the multisensory marketing cluster will enable practitioners to understand how the different human senses interact and influence consumer behavior, since it is crucial to bear in mind such knowledge when designing a product, a store's atmosphere, or a marketing campaign. In addition, this study provides useful insights for practitioners in sensory marketing regarding engaging sense cues for consumers.

4.3. Future research directions

Senses are the vehicles that enable humans to experience the world, in which the traditional classification of senses proposed by Aristotle – touch, smell, taste, vision and olfactory – has been applied to operationalize methodologies to study sensory marketing. Nevertheless, the extant literature recognizes the existence of more human senses, whereby interoceptive senses are those that include the vestibular sense, the visceral sense, the proprioceptive sense and the sense of internal milieu. This opens a wide range of opportunities for research on how those senses are applied in the sensory marketing field and their consequent influence on consumers' perceptions, attitudes, and behaviors. Also, for future lines of research, Agapito et al. (2013) proposed to investigate how internal factors impact the perception of individuals in tourism sensory experiences, specifically: how different stimuli of human senses are related to each other; the difference between rural and urban sensory experiences; how tourists are segmented according on sensory experiences; and the role of human senses in specific stages of their travel.

In digital, new technologies, such as augmented reality (AR), virtual reality (VR) and specific devices (e.g. touch screens and headphones) open new sensory interface opportunities for online interaction with consumers (Petit et al., 2019; Wu et al., 2023). The most recent studies demonstrated a positive correlation between the use of new technologies in digital channels using AR and VR, as well as consumers' willingness to pay and purchase intentions (Petit et al., 2019). As cited by those authors, recent visual-enabling technologies applied to shopping websites demonstrated that 3D images can stimulate mental imagery and touching, providing an incremental increase in purchasing and repurchasing intentions and a positive attitude towards brands when compared to 2D. For Petit et al. (2019), although new multisensory devices are recently emerging to stimulate various consumers' senses, at this stage, it appears to be unrealistic to apply odor and gustative cues in digital contexts so that future research should focus on this thematic. Furthermore, it should be investigated how demographical factors, such as age, impacts the reaction to innovative technology used in sensory marketing strategies. In addition, various promising research avenues can be derived from the second cluster, such as investigating how consumers process multisensory information in online vs. offline channels, namely regarding visual search, memorization and interactivity. Additionally, future research is required to establish the right balance between all the sensory cues, and thus avoid the danger of 'sensory overload' (Petit et al., 2019) by customizing the correct geometric properties, lighting and sound level, among other factors. Furthermore, Spence and Gallace (2011) suggest investigating how the lack of haptic input in online retailing can be surpassed over time by the development of new technological tools.

Up until now, vision has been considered to be the most studied sense within sensory marketing literature. However, gaps still exist in the literature that should be addressed by future studies. One of the unexplored items of vision is light, particularly the effect of lighting in purchasing utilitarian and hedonic products across different ambient light levels. In addition, to the best of our knowledge, there is a gap related to the impact of lightning when shopping for high-priced products versus low-priced items. When it comes to perceptions, visual sense dominates other senses in some cases, such as the auditory sense. This illusion explains how the spatial discrepancy between visual and auditory components affects consumers' perceptions. In fact, the perceived location of a specific sound is biased toward where the visual cue is presented, whose implications should be further studied in future research. Moreover, ambient light influences consumers' mental alertness, which in turn may impact consumers'

food and beverage preferences. Marketers are thus advised to explore how they can induce consumers to purchase healthy options through visual cues, which is a relatively unexplored territory with potential for interesting additional research in this research area.

The sense of taste has received sparse attention in the sensory marketing literature, which suggests the existence of research opportunities to facilitate progress in this research area. It is recommended that further attention be applied for the online shopping of food and beverage products, where the current literature offers limited directions regarding how consumers respond to sensory cues, namely whether they pay attention with regards food images in an online context, and also how marketers should effectively design visual sensory stimulations. Furthermore, there is a need to research how consumer behavior is affected by sensory cues according to different flavors of foods and beverages, especially with regards differing savories.

Recognizing the significance of multisensory experiences, marketers have become more focused on the interplay between different senses. Nevertheless, given the complexity of multisensory consumers' processing of information, more systematic studies are needed to develop knowledge in this field. Cross-modal cues may help or interfere with one another, which in turn can affect consumers' perceptions and behaviors. It is thus crucial to investigate how multiple-sensory cues interact with each other and how consumers process the information, be it in a holistic way, or hierarchically, or sequentially. When studying the interaction of different sensory cues, attention should be directed towards the optimum level of sensory stimulation, with the ultimate objective being to avoid overloading consumers, which is capable of destroying the desirable usage of sensory marketing. Furthermore, Hultén (2011) stated that the multisensory brand-experience concept is still in its infancy, proposing future studies to develop specific measures and frameworks for managing those experiences related with performance and outcome. In addition, this author suggests studying the multisensory interplay in value creation processes between all the human senses.

4.4. Limitations

Several limitations can be identified in this study. To begin with, the data used were retrieved only from the Scopus database, so it is not possible to guarantee that the data is error-free. Accordingly, the use of another database is recommended, such as Web of Science or EBSCO, in order to safeguard that important journal indexes are included in the data. Secondly, the data used in this research are monolingual, as only English-language publications were selected, which may cause excluding important documents, which in turn could lead to crucial failures in this review. Future works should consider a broader scope than the current scope of this research to overcome this limitation. Thirdly, the defined criteria of only searching by the 'sensor* marketing' keyword, as well as screening the sample only by analyzing extracts and titles and the carrying out of content analysis based on the top-cited articles of each cluster may ignore important documents and distort the results. Consequently, it is suggested that big data analytic tools be used to add robustness and provide more bias-free research in this field.

4.5. Conclusions

This article offers three main contributions to the furthering of knowledge: (1) it summarizes previous research regarding sensory marketing through descriptive analysis; (2) by adopting a bibliometric approach with content analysis, it provides a systematization of the content research in sensory marketing, mainly the main theories and frameworks followed, and (3) it proposes new research opportunities for future studies. Given the theoretical and practical contributions of this study, it is hoped that scholars will be inspired to explore the field of sensory marketing research and thus enhance the literature with interdisciplinary exchange.

Authors' contribution

Inês Antunes participated in the conceptualization and design of the study, analysis and interpretation of data. José Veríssimo participated in the coordination and drafting of the manuscript. Each author contributed to critical revision of the content for intellectual content. All authors read and approved the final manuscript.

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Data availability statement

The data that support the findings of this study are openly available in Scopus at scopus.com.

References

- Achrol, R. S., & Kotler, P. (2012). Frontiers of the marketing paradigm in the third millennium. *Journal of the Academy of Marketing Science*, 40(1), 1–22. <https://doi.org/10.1007/s11747-011-0255-4>
- Agapito, D., Mendes, J., & Valle, P. (2013). Exploring the conceptualization of the sensory dimension of tourist experiences. *Journal of Destination Marketing & Management*, 2(2), 62–73. <https://doi.org/10.1016/j.jdmm.2013.03.001>
- Ardelet, C., Peyrelongue, B., & Mérigot, P. (2022). Within sniffing distance: Impact of ambient scent and physical distancing on consumer comfort with frontline employees. *Journal of Personal Selling & Sales Management*, 42(3), 265–278. <https://doi.org/10.1080/08853134.2022.2049602>
- Biswas, D., Lund, K., & Szocs, C. (2019). Sounds like a healthy retail atmospheric strategy: Effects of ambient music and background noise on food sales. *Journal of the Academy of Marketing Science*, 47(1), 37–55. <https://doi.org/10.1007/s11747-018-0583-8>
- Biswas, D., Szocs, C., & Abell, A. (2019). Extending the boundaries of sensory marketing and examining the sixth sensory system: effects of vestibular sensations for sitting versus standing postures on food taste perception. *Journal of Consumer Research*, 46(4), 708–724. <https://doi.org/10.1093/jcr/ucz018>
- Biswas, D., Szocs, C., Chacko, R., & Wansink, B. (2017). Shining light on atmospherics: How ambient light influences food choices. *Journal of Marketing Research*, 54(1), 111–123. <https://doi.org/10.1509/jmr.14.0115>
- Bogue, J. C., Delahunty, C. M., Henry, M. K., & Murray, J. M. (1999). Market-oriented methodologies to optimise consumer acceptability of Cheddar-type cheeses. *British Food Journal*, 101(4), 301–317. <https://doi.org/10.1108/EUM00000000004561>
- Bolton, R., Gustafsson, A., McColl-Kennedy, J., Sirianni, N., & Tse, D. (2014). Small details that make big differences: A radical approach to consumption experience as a firm's differentiating strategy. *Journal of Service Management*, 25(2), 253–274. <https://doi.org/10.1108/JOSM-01-2014-0034>
- Brakus, J., Schmitt, B., & Zarantonello, L. (2009). Brand experience: What is it? How is it measured? Does it affect loyalty? *Journal of Marketing*, 73(3), 52–68. <https://doi.org/10.1509/jmkg.73.3.52>
- Bredie, W., & Møller, P. (2012). Overview of sensory perception. *Alcoholic Beverages: sensory Evaluation and Consumer Research*, Woodhead Publishing Series in Food Science, Technology and Nutrition, 3–23.
- Chu, J., Arce-Urriza, M., Cebollada-Calvo, J.-J., & Chintagunta, P. K. (2010). An empirical analysis of shopping behavior across online and offline channels for grocery products: The moderating effects of household and product characteristics. *Journal of Interactive Marketing*, 24(4), 251–268. <https://doi.org/10.1016/j.intmar.2010.07.004>
- Crisinel, A.-S., & Spence, C. (2010). As bitter as a trombone: synesthetic correspondences in nonsynesthetes between tastes/flavors and musical notes. *Attention, Perception & Psychophysics*, 72(7), 1994–2002. <https://doi.org/10.3758/APP.72.7.1994>

- Degeratu, A., Rangaswamy, A., & Wu, J. (2000). Consumer choice behavior in online and traditional supermarkets: The effects of brand name, price, and other search attributes. *International Journal of Research in Marketing*, 17(1), 55–78. [https://doi.org/10.1016/S0167-8116\(00\)00005-7](https://doi.org/10.1016/S0167-8116(00)00005-7)
- Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285–296. <https://doi.org/10.1016/j.jbusres.2021.04.070>
- Egghe, L., & Rousseau, R. (2002). Co-citation, bibliographic coupling and a characterization of lattice citation networks. *Scientometrics*, 55(3), 349–361. <https://doi.org/10.1023/A:1020458612014>
- Fiore, A. M., Yah, X., & Yoh, E. (2000). Effects of a product display and environmental fragrancing on approach responses and pleasurable experiences. *Psychology and Marketing*, 17(1), 27–54. [https://doi.org/10.1002/\(SICI\)1520-6793\(200001\)17:1<27::AID-MAR3>3.0.CO;2-C](https://doi.org/10.1002/(SICI)1520-6793(200001)17:1<27::AID-MAR3>3.0.CO;2-C)
- Fürst, A., Pečornik, N., & Binder, C. (2021). All or nothing in sensory marketing: Must all or only some sensory attributes be congruent with a product's primary function? *Journal of Retailing*, 97(3), 439–458. <https://doi.org/10.1016/j.jretai.2020.09.006>
- Garg, R., Bhatia, R., Chhikara, R., & Kataria, A. (2021). Sensory marketing – a review and research agenda. *Academy of Marketing Studies Journal*, 25(4), 1–30.
- Goldkuhl, L., & Styvén, M. (2007). Sensing the scent of service success. *European Journal of Marketing*, 41(11/12), 1297–1305. <https://doi.org/10.1108/03090560710821189>
- Guo, Y., Huang, Z., Guo, J., Li, H., Guo, X., & Nkeli, M. (2019). Bibliometric analysis on smart cities research. *Sustainability*, 11(13), 3606. <https://doi.org/10.3390/su11133606>
- Hawkins, D. T. (1977). Unconventional uses of on-line information retrieval systems: On-line bibliometric studies. *Journal of the American Society for Information Science*, 28(1), 13–18. <https://doi.org/10.1002/asi.4630280103>
- Holbrook, M. B., & Hirschman, E. C. (1982). The experiential aspects of consumption: Consumer fantasies, feelings and fun. *Journal of Consumer Research*, 9(2), 132–140. <https://doi.org/10.1086/208906>
- Hultén, B. (2011). Sensory marketing: The multi-sensory brand-experience concept. *European Business Review*, 23(3), 256–273. <https://doi.org/10.1108/09555341111130245>
- Jia, C., & Mustafa, H. (2022). A bibliometric analysis and review of nudge research using VOSviewer. *Behavioral Sciences*, 13(1), 19. <https://doi.org/10.3390/bs13010019>
- Kessler, M. M. (1963). Bibliographic coupling between scientific papers. *American Documentation*, 14(1), 10–25. <https://doi.org/10.1002/asi.5090140103>
- Khan, M. A., Ali, I., & Ashraf, R. (2020). A bibliometric review of the special issues of psychology and marketing: 1984–2020. *Psychology & Marketing*, 37(9), 1144–1170. <https://doi.org/10.1002/mar.21393>
- Kim, M., Kim, J.-H., Park, M., & Yoo, J. (2021). The roles of sensory perceptions and mental imagery in consumer decision-making. *Journal of Retailing and Consumer Services*, 61(5986), 102517. <https://doi.org/10.1016/j.jretconser.2021.102517>
- Kim, D., & Perdue, R. (2013). The effects of cognitive, affective, and sensory attributes on hotel choice. *International Journal of Hospitality Management*, 35, 246–257. <https://doi.org/10.1016/j.ijhm.2013.05.012>
- Kleminski, R., Kazienko, P., & Kajdanowicz, T. (2022). Analysis of direct citation, co-citation and bibliographic coupling in scientific topic identification. *Journal of Information Science*, 48(3), 349–373. <https://doi.org/10.1177/0165551520962775>
- Kotler, P. (1974). Atmospherics as a marketing tool. *Journal of Retailing*, 49(4), 48–64.
- Krishna, A. (2012). An integrative review of sensory marketing: Engaging the senses to affect perception, judgment and behavior. *Journal of Consumer Psychology*, 22(3), 332–351. <https://doi.org/10.1016/j.jcps.2011.08.003>
- Krishna, A., Cian, L., & Aydinoglu, N. (2017). Sensory Aspects of Package Design. *Journal of Retailing*, 93(1), 43–54. <https://doi.org/10.1016/j.jretai.2016.12.002>
- Krishna, A., & Schwarz, N. (2014). Sensory marketing, embodiment, and grounded cognition: A review and introduction. *Journal of Consumer Psychology*, 24(2), 159–168. <https://doi.org/10.1016/j.jcps.2013.12.006>
- Laukkanen, T., Xi, N., Hallikainen, H., Ruusunen, N., & Hamari, J. (2021). Virtual technologies in supporting sustainable consumption: From a single-sensory stimulus to a multi-sensory experience. *International Journal of Information Management*, 63, 102455. <https://doi.org/10.1016/j.ijinfomgt.2021.102455>
- Lick, E., König, B., Kpossa, M., & Buller, V. (2017). Sensory expectations generated by colours of red wine labels. *Journal of Retailing and Consumer Services*, 37, 146–158. <https://doi.org/10.1016/j.jretconser.2016.07.005>
- Malhotra, N. K. (1984). Information and sensory overload. Information and sensory overload in psychology and marketing. *Psychology & Marketing*, 1(3–4), 9–21. <https://doi.org/10.1002/mar.4220010304>
- Mody, M., Hanks, L., & Cheng, M. (2021). Sharing economy research in hospitality and tourism: A critical review using bibliometric analysis, content analysis and a quantitative systematic literature review. *International Journal of Contemporary Hospitality Management*, 33(5), 1711–1745. <https://doi.org/10.1108/IJCHM-12-2020-1457>
- Paul, J., & Bhukya, R. (2021). Forty-five years of international journal of consumer studies: A bibliometric review and directions for future research. *International Journal of Consumer Studies*, 45(5), 937–963. <https://doi.org/10.1111/ijcs.12727>
- Pauwels, K., Leeflang, P., Teerling, M., & Huizingh, K. (2011). Does online information drive offline revenues?: Only for specific products and consumer segments!. *Journal of Retailing*, 87(1), 1–17. <https://doi.org/10.1016/j.jretai.2010.10.001>
- Petit, O., Velasco, C., & Spence, C. (2019). Digital sensory marketing: Integrating new technologies into multisensory online experience. *Journal of Interactive Marketing*, 45(1), 42–61. <https://doi.org/10.1016/j.intmar.2018.07.004>

- Raghubir, P., & Krishna, A. (1999). Vital dimensions in volume perception: Can the eye fool the stomach? *Journal of Marketing Research*, 36(3), 313–326. <https://doi.org/10.2307/3152079>
- Rahman, I., Stumpf, T., & Reynolds, D. (2014). A comparison of the influence of purchaser attitudes and product attributes on organic wine preferences. *Cornell Hospitality Quarterly*, 55(1), 127–134. <https://doi.org/10.1177/1938965513496314>
- Rimkute, J., Moraes, C., & Ferreira, C. (2016). The effects of scent on consumer behaviour. *International Journal of Consumer Studies*, 40(1), 24–34. <https://doi.org/10.1111/ijcs.12206>
- Satti, Z., Babar, S., & Parveen, S. (2022). Role of customer satisfaction as a mediator between sensory marketing and customer loyalty: A case of pakistani restaurant industry. *Journal of International Food & Agribusiness Marketing*, 35(5), 559–581. <https://doi.org/10.1080/08974438.2022.2049415>
- Small, H. (1973). Co-citation in the scientific literature: A new measurement of the relationship between two documents. *Journal of the American Society for Information Science*, 24(4), 265–269. <https://doi.org/10.1002/asi.4630240406>
- Small, H. (1999). Visualizing science by citation mapping. *Journal of the American Society for Information Science*, 50(9), 799–813. [https://doi.org/10.1002/\(SICI\)1097-4571\(1999\)50:9<799::AID-ASIS9>3.0.CO;2-G](https://doi.org/10.1002/(SICI)1097-4571(1999)50:9<799::AID-ASIS9>3.0.CO;2-G)
- Spence, C., & Gallace, A. (2011). Multisensory design: Reaching out to touch the consumer. *Psychology & Marketing*, 28(3), 267–308. <https://doi.org/10.1002/mar.20392>
- Spence, C., Puccinelli, N. M., Grewal, D., & Roggeveen, A. L. (2014). Store atmospherics: A multisensory perspective. *Psychology & Marketing*, 31(7), 472–488. <https://doi.org/10.1002/mar.20709>
- Stead, S., Wetzels, R., Wetzels, M., Odekerken-Schröder, G., & Mahr, D. (2022). Toward multisensory customer experiences: A cross-disciplinary bibliometric review and future research directions. *Journal of Service Research*, 25(3), 440–459. <https://doi.org/10.1177/10946705221079941>
- Svensson, G. (2010). SSCI and its impact factors: a “prisoner’s dilemma”? *European Journal of Marketing*, 44(1/2), 23–33. <https://doi.org/10.1108/03090561011008583>
- Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence-informed management knowledge by means of systematic review. *British Journal of Management*, 14(3), 207–222. <https://doi.org/10.1111/1467-8551.00375>
- Troye, S. V., & Supphellen, M. (2012). Consumer participation in coproduction: “I made it myself” effects on consumers’ sensory perceptions and evaluations of outcome and input product. *Journal of Marketing*, 76(2), 33–46. <https://doi.org/10.1509/jm.10.0205>
- van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. *Scientometrics*, 84(2), 523–538. <https://doi.org/10.1007/s11192-009-0146-3>
- Wörfel, P., Frentz, F., & Tautu, C. (2022). Marketing comes to its senses: A bibliometric review and integrated framework of sensory experience in marketing. *European Journal of Marketing*, 56(3), 704–737. <https://doi.org/10.1108/EJM-07-2020-0510>
- Wu, J., Zhu, Y., Fang, X., & Banerjee, P. (2023). Touch or click? The effect of direct and indirect human-computer interaction on consumer responses. *Journal of Marketing Theory and Practice*, 32(2), 158–173. <https://doi.org/10.1080/10696679.2022.2158872>
- Zha, D., Foroudi, P., Jin, Z., & Melewar, T. C. (2022). Making sense of sensory brand experience: Constructing an integrative framework for future research. *International Journal of Management Reviews*, 24(1), 130–167. <https://doi.org/10.1111/ijmr.12270>
- Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods*, 18(3), 429–472. <https://doi.org/10.1177/1094428114562629>