Journal of Scientometric Research, 2026; 15(3):1080-1092.
https://www.jscires.org

Research Article

An Altmetric Evaluation of Metaverse-Oriented Sensory Marketing Research

Tanmoy Acharjee[1], Deepjyoti Choudhury[1,*], Mukut Sarmah[2]

[1]Department of Business Administration, Assam University, Silchar, Assam, INDIA.
[2]Department of Library and Information Science, Assam University, Silchar, Assam, INDIA.

ABSTRACT

The growth of sensory marketing scholarship into an immersive, technologically mediated setting has changed how brands create customer experiences, raising new concerns about how this knowledge is disseminated outside academic institutions. This work aimed to examine the online resonance of sensory marketing research using altmetric analysis, focusing on differences between traditional sensory branding studies and new research based on Virtual Reality (VR) and metaverse environments. The study examined how digital attention is distributed among social media, news sources, blogs, policy documents, and patents using 3,847 Scopus-indexed publications identified through a layered search technique and monitored using Altmetric Explorer. Descriptive statistics, Spearman's rank-order correlation, and keyword co-occurrence mapping were employed to describe the dataset. Of the 1,628 altmetrically tracked documents, 972 (25.3%) had an Altmetric Attention Score (AAS) ≥1, resulting in 6,485 mentions across multiple platforms. X (formerly Twitter) emerged as the primary attention channel, along with news sources, blogs, and policy citations. Themes of immersive customer experience, haptic perception, and multisensory branding dominated the top-ranked publications. AAS and citation count showed a statistically significant positive connection (ρ=0.487, p<0.001). Despite lower volume, immersive/metaverse-based sensory research showed stronger media uptake and proportionally higher per-paper AAS than standard sensory marketing studies. The results highlight how digital platforms influence the exposure of sensory marketing research and provide useful information for scholars, journals, and organisations seeking to reach a wider audience.

Keywords: Altmetric Attention Score, Altmetrics, Bibliometrics, Brand experience, Immersive marketing, Metaverse, Sensory marketing, Virtual reality.

Correspondence:
Deepjyoti Choudhury
Business Administration, Assam University, Silchar, Assam, INDIA.
Email: choudhurydeepjyoti@gmail.com
ORCID:0000-0002-9614-3916

Received: 04-07-2026;
Revised: 18-08-2026;
Accepted: 23-10-2026.

INTRODUCTION

Over the past 20 years, sensory marketing which is the deliberate use of sight, sound, smell, touch, and taste to influence perception, preference, and purchase decisions, has grown to be one of the most innovative subfields of consumer research (Pandey & Tripathi, 2025; Zha *et al*., 2022). More recent research has expanded sensory theory into settings where the senses themselves are partially or fully simulated, such as Virtual Reality (VR), Augmented Reality (AR), and the larger metaverse, whereas Krishna's (2012) seminal studies solidified the discipline around embodied cognition and brand experience. This shift expands the discipline's relevance for digital commerce, retail, gaming, hospitality, and tourism while challenging conventional measurement and theory (Fici *et al*., 2024; Jeong *et al*., 2022). Simultaneously, digital affordances have changed the organization of scholarly communication. Platforms like X, LinkedIn, Mendeley, Reddit, Wikipedia, blog ecosystems, and news aggregators are the platforms which function independently of traditional journal gatekeeping and are seeing an increase in the convergence of researchers and audiences (Jordan, 2019; Rao *et al*., 2024). By monitoring how research enters public, professional, and policy discourse, altmetrics, which Priem *et al*. (2011) view as a manifesto to capture this online activity and supplement citation counts. While altmetrics travel quickly and garner media attention, social discourse, and application acceptance, citation-based indicators build slowly and indicate peer recognition (Costas *et al*., 2015; Thelwall *et al*., 2013). For a field like sensory marketing, whose insights affect packaging design, retail environments, advertising, and increasingly virtual product showrooms, altmetrics are important both strategically and substantively (Hoffmann *et al*., 2022; Tran, 2025). They also show whether sensory research is shared not only by academics but also by practitioners, journalists, and politicians. From a strategic standpoint, they assist organisations and journals in comprehending the subject drivers of online resonance, such as the relative appeal of immersive, technology-driven work versus heritage sensory paradigms (Shaban, 2025; Casais *et al*., 2025).

OPEN ACCESS

Manuscript TECHNOMEDIA

DOI: 10.5530/jscires.20260384

Copyright Information :
Copyright Author (s) 2026 Distributed under Creative Commons CC-BY 4.0

Publishing Partner : Manuscript Technomedia. [www.mstechnomedia.com]

Despite the quick development of altmetric studies, few studies have used this lens to examine marketing subfields, and even fewer have broken down sensory marketing into its traditional and immersive forms. The majority of altmetric work in marketing is still limited to more general fields like computer science, health communication, and the natural sciences, where it is easier to aggregate the amount of online attention. Because its most recent advancements rely on platforms that themselves produce a great deal of online discussion and cross-disciplinary boundaries like psychology, neurology, retail, information systems, etc., sensory marketing makes a unique case. This disparity is taken into consideration in the current investigation. In addition to comparing the digital footprint of traditional sensory studies with those of immersive or metaverse-based investigations, it employs altmetric tools on a curated corpus of sensory marketing publications to ask how this literature performs digitally overall. In particular, the study maps thematic clusters using keyword co-occurrence, analyses the existence of altmetrics across platforms, finds the publications with the closest attention, and examines the connection between altmetric attention and citation accumulation using Spearman's correlation.

REVIEW OF CONTRIBUTIONS

Altmetric analysis as a research-evaluation technique and sensory marketing as a developing topic with historic branches are the two main questions in the literature pertinent to this study. Since Priem *et al.* (2011) formalised altmetrics, a substantial body of empirical research has been produced. Costas *et al.* (2015) discovered through a multidisciplinary comparison that altmetric indicators had a moderate but variable correlation with citations, with the largest relationships finding in disciplines that participate in active social media networks. In their analysis of Twitter and other social media platforms, Thelwall *et al.* (2013) shown that altmetric counts can capture attention beyond traditional readership signals with proper disciplinary contextualisation. Later investigations by Tahamtan *et al.* (2016) consolidated factors which shape citation accumulation including open access, collaboration, etc. and thus providing the conceptual scaffolding for studies that investigate these factors in altmetric contexts. Shen *et al.* (2021) further advance this line of inquiry through a meta-analysis confirming a strong link between scientific collaboration and citation impact.

Institution-focused altmetric research is continuously growing. Lamba *et al.* (2021) looked at altmetric performance across Indian central universities and found significant diversity between subjects and institutions, with Twitter being the main factor influencing altmetric scores. In their investigation of Finnish universities, Holmberg et al. (2019) demonstrated that altmetric visibility and institutional research output do not move in tandem. This finding confuses simple comparisons between productivity and digital reach. Gnanasekaran and Rajkumar (2022) highlighted the impact of digital platforms in research distribution by analysing NIRF-ranked medical institutes in India using altmetric data from ResearchGate. Dey *et al.* (2022) described significant positive associations between Mendeley readership and citation counts at the Indian Institute of Public Health Gandhinagar. Recently, a cross-sectional altmetric coverage analysis of Irish health research that reaffirmed Twitter/X as the central altmetric source was provided by Sharp *et al.* (2025).

There are still very few studies that apply altmetrics to the marketing and consumer domains. Zhao *et al.* (2019) investigated altmetric and citation metrics for journal-level assessment. Vadhera *et al.* (2022) found that open-access articles have substantially better AAS and citation counts than subscription-access ones in a similarly related field. According to Ouchi *et al.* (2019) analysis of 1,000 most-cited articles, publications that receive more digital attention typically have better citation performance. However, very few studies explicitly take a subdisciplinary approach to marketing, and even fewer separate sensory marketing into traditional and technology-mediated streams. The literature on sensory marketing has undergone several stages of development. The fundamental analysis highlighted the importance of multisensory perception, sensory congruence, and embodied cognition for consumer behaviour and branding. It was based on Krishna's (2012) integrative review and improved by later multidisciplinary work. Retail atmospherics, packaging design, food and beverage cues, ambient scent, soundtrack design, and tactile-haptic perception have all been the subject of empirical scholarship in this tradition, which has mostly relied on field research in real-world settings and laboratory experiments (Spence, 2020; Velasco & Obrist, 2025). The recent, quickly growing stream of research on the operation of sensory experience in immersive digital environments looks at things like VR-mediated retail (Petit *et al.*, 2019), haptic feedback in AR-enhanced product trials, soundscape design for branded virtual environments, the role of avatars and embodiment in consumer engagement, etc.

Research Questions

Considering the gaps identified above, this study possess six interconnected aims: (a) quantifying the altmetric presence of sensory marketing scholarship indexed in Scopus; (b) characterising the distribution of attention across major platform categories; (c) identifying the publications that have generated the highest Altmetric Attention Scores (AAS); (d) describing the dominant thematic clusters using keyword co-occurrence analysis; (e) testing the strength and direction of the relationship between AAS and citation count; and (f) comparing the altmetric performance of traditional sensory marketing research with that of immersive (VR/metaverse-based) sensory studies.

The investigation is guided by the following research questions:

- **RQ1:** What proportion of sensory marketing publications has registered any altmetric activity, and how is this activity distributed across the corpus?
- **RQ2:** Which altmetric platforms generate the largest share of mentions, and which sources stand out within each platform?
- **RQ3:** Which publications have garnered the highest AAS, and what topical patterns do they share?
- **RQ4:** What conceptual themes emerge from keyword co-occurrence analysis of high-AAS publications?
- **RQ5:** What is the strength of association between AAS and traditional citation counts in this corpus?
- **RQ6:** Do traditional and immersive sensory marketing publications differ systematically in altmetric reception?

Data Sources and Analytical Framework

Construction of Corpus

During the fourth week of June, 2026, researchers used a multilayer search approach from the Scopus database to compile the corpus. Using the search string TITLE-ABS-KEY ("sensory marketing" OR "sensory branding" OR "sensory brand experience" OR "multisensory marketing" OR "multisensory branding"), the initial investigation focused on documents whose titles, abstracts, or author keywords contained sensory-marketing terminology. TITLE-ABS-KEY ("sensory") AND ("virtual reality" OR "augmented reality" OR "metaverse" OR "extended reality" OR "immersive experience") AND ("marketing" OR "consumer" OR "brand") were used in a parallel query to catch immersive sensory work. The two sets of results were combined and eliminated duplicates. 3,612 of the 3,847 documents that remained after non-research items were eliminated had Digital Object Identifiers (DOIs), which allowed altmetric retrieval.

To make the transition from the initial Scopus search to the final analytical sample clear, the corpus was refined through a series of documented steps. The two searches produced 4,120 and 980 records, which yielded 4,560 unique records after removing 540 duplicates. The records were then screened for document type and DOI availability followed by DOI-based retrieval through Altmetric Explorer and application of Altmetric Attention Score (AAS) threshold. These steps produced the datasets used in the subsequent analyses. Figure 1 reports each step of the screening process, how the records were retained and removed, and the basis for every decision. It depicts the steps so that the path from 4,560 unique records to the 3,847 eligible publications, the 3,612 DOI-bearing records, the 1,628 altmetrically tracked documents, the 972 AAS-active publications, and the 311 high-attention publications can be traced without ambiguity.

Following DOI-based retrieval, the 1,628 tracked documents were introduced in the comparative analysis. The AAS thresholds then identified 972 altmetrically active publications and 311 high-attention publications for the keyword co-occurrence analysis. In parallel both the full corpus and the tracked subset were classified into traditional and immersive strands. The coding resulted in 2,902 traditional and 945 immersive publications in the full corpuscompared with 1.153 traditional and 475 immersive publications in the tracked altmetric dataset used for the comparisons reported in section 5.8. The descriptive, correlational and comparative analyses were based on these curated subsets as presented in Figure 1.

Altmetric Retrieval

Through a DOI-based batch lookup, altmetric data were obtained using Altmetric Explorer. 3,612 DOIs were submitted out of which1,628 (45.1%) returned tracked records. 972 documents among the tracked records had registered an AAS of at least 1, producing 6,485 mentions across categories. For downstream classification, each mention was tagged by source type such as X, Facebook, Reddit, news, blogs, policy documents, patents, peer reviews, Wikipedia, YouTube, and so on.

Altmetric explorer was chosen over PlumX, Dimensions, and Crossref Event Data for three main reasons. First, it provides broad coverage of non-academic sources including X, news outlets, blogs, policy documents, patents, Wikipedia and peer-review platforms while bringing these sources together through the Altmetric Attention Score (AAS). This made it suitable for comparing attention across different platform categories. Secondly comparability, as the AAS is the most widely reported altmetric indicator in the marketing and library and information science literature that frames this study (Lamba *et al.*, 2021; Sharp *et al.*, 2025). Therefore, adopting the same source maintains comparability with published standards; Crossref Event Data provides raw event logs that require significant further processing before comparison and PlumX delivers counts by category without a comparable aggregate score. Third reason is retrieval fit standards as Altmetric Explorer supports DOI-based retrieval at the scale required for this study and provides structured source-level information for descriptive, correlational and comparative analysis. Dimensions was used for bibliographic retrieval and corpus construction while its additional altmetric functionality was not required after the sampling frame had been established. Differences in platform coverage are acknowledged as a limitation of the study.

Stream Coding

To answer the main comparative question, each document was placed into one of two strands. Immersion sensory research was identified in documents whose abstracts and keywords specifically mentioned VR, AR, metaverse, extended reality, immersive simulation, or similar digitally mediated environments. Traditional sensory research was used to code the remaining documents. Inter-rater agreement was good (Cohen's

κ = 0.86); these were independently completed by two reviewers and settled where disagreement emerged. During the final split, 2,902 traditional and 945 immersive documents were produced.

Analytical Toolkit

Bibliometric mapping, inferential testing, and descriptive statistics make up the analytical toolset. Microsoft Excel was utilised for data cleaning, source aggregation, and basic descriptive calculations; JAMOVI and the R statistical environment were utilised for correlation analysis and normality testing. CiteSpace was utilised to create density visualisations and keyword co-occurrence networks. Since count-based bibliometric data usually deviate from normality, Spearman's rank-order correlation (ρ) is the proper inferential tool. The Shapiro-Wilk test was used for all primary variables, and all p-values were less than.001. Following Evans (1996), the following criteria were used to evaluate the magnitude of ρ: very weak ($0.00 \leq |\rho| < 0.20$), weak ($0.20 \leq |\rho| < 0.40$), moderate ($0.40 \leq |\rho| < 0.60$), strong ($0.60 \leq |\rho| < 0.80$), and very strong ($0.80 \leq |\rho| \leq 1.00$). At $\alpha = 0.05$, significance was assessed.

Empirical Observations and Findings

Publication Landscape Overview

Out of the 3,847 identified sensory marketing publications, 1,628 (42.3%) returned a record in Altmetric Explorer, and 972 (25.3% of the total corpus, 59.7% of tracked items) carried a non-zero AAS. 6,485 mentions were generated across all altmetric platforms by the corpus which is equivalent to an average of 6.67 mentions per altmetric-active publication. Steady acceleration is showed by the publication trajectory: annual output rose markedly and peaked in 2022 after remaining modest until 2014. Immersive sensory research, while a smaller proportion of the corpus (24.6%), exhibited a steeper growth curve, with year-on-year doubling between 2019 and 2022 (Tables 1 and 2).

A higher altmetric tracking ratio is revealed by the data for immersive sensory research (50.3% vs. 39.7%) and a higher per-paper mention average. Despite traditional sensory research dominating publication volume, immersive work disproportionately attracts digital attention, which is a finding that anchors the comparative argument developed in Section 5.6.

Attention Distribution Across Altmetric Platforms

Out of all mentions, 77.3% accounts for social media, with X dominating individual contributions. 10.5% comes from news and blog coverage, policy and patent activity accounts for 4.5%, and 3.8% from academic platforms. The remainder originates from miscellaneous sources such as YouTube and Q&A sites.

A temporal mapping of mention activity (Figure 2) reveals that altmetric activity remained modest until 2014. Thereafter, X-driven attention rose steadily. In 2021-2022, a pronounced

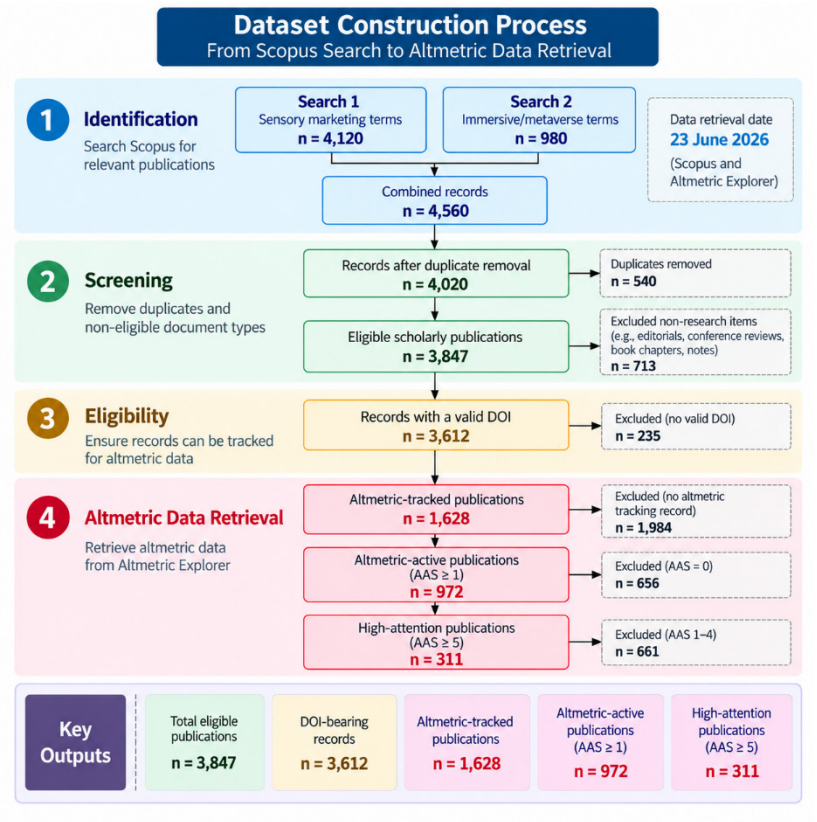


Figure 1: Dataset Construction Process.

Table 1: Aggregate altmetric profile of the sensory marketing corpus.

Indicator	Total corpus	Traditional	Immersive
Publications	3,847	2,902	945
Tracked by Altmetric Explorer	1,628	1,153	475
Tracking ratio	42.3%	39.7%	50.3%
Publications with AAS ≥ 1	972	651	321
Total mentions	6,485	4,028	2,457
Mean mentions per altmetric paper	6.67	6.19	7.65

Source: Compiled by authors.

Table 2: Distribution of mentions across altmetric data sources.

Source category	Source name	Total mentions	Subtotal	Share of total
Social media	X (Twitter)	4,612		
	Facebook	287		
	Reddit	76		
	LinkedIn	37	5,012	77.3%
News & blogs	News outlets	458		
	Blogs	225	683	10.5%
Policy & patents	Policy documents	91		
	Patents	198	289	4.5%
Academic sources	Peer reviews (Faculty Opinions)	153		
	Wikipedia	92	245	3.8%
Other sources	YouTube	142		
	Q&A platforms	68		
	Video repositories	46	256	3.9%
Total			6,485	100.0%

Source: Compiled by authors.

infexion is appeared, which coincided with the public unveiling of Meta's metaverse strategy and a wave of related popular coverage.

According to the geographic segmentation of X activity (Figure 3), the nation distribution is dominated by the United States (1,162 posts), the United Kingdom (489 posts), India (361 posts), Spain (227 posts), and Germany (198 posts). India's ranking is consistent with the country's growing interest in immersive consumer technology, while Spain's higher ranking demonstrates the productivity of European sensory marketing firms. The X debate on sensory marketing research received contributions from 1,983 distinct individuals across 71 countries.

Top Social Media Handles and Mentioning Sources

The most active sources that referenced sensory marketing publications across major altmetric channels are listed in Table 3. Marketing Week (12 mentions), The Drum (9 mentions), and Forbes (8 mentions) emerged as the principal channels among the news outlets. Marketing-oriented blogs such as the Neuromarketing Science & Business Association (11 mentions) and Convince & Convert (7 mentions) contributed substantially to blog discourse. The OECD (8 mentions) and the European Commission (6 mentions) stood out among the policy sources, showing the broader policy relevance of immersive consumer technology. Automated and curatorial accounts predominated on X, with significant social media traction coming from marketingscibot (164 mentions), AcademicMarketing (92 mentions), and metaverse_news (78 mentions).

Top Ten Sensory Marketing Articles by Altmetric Attention

The ten highest-AAS publications in the corpus, arranged in descending order, are highlighted in Table 4. The leading article, themed "Multisensory experience in metaverse retail" by Sørensen and colleagues at the University of Copenhagen, registers an AAS of 187, with 412 X mentions, 23 news mentions, 318 Mendeley readers, and 78 citations. The list is dominated by immersive sensory studies (seven of ten), but Velasco and colleagues' work on cross-modal congruence in food packaging (117 citations) still produces the most-cited paper of the table. Throughout the investigation, there's an asymmetry that immersive papers lead

to altmetric attention, but traditional papers lead to cumulative citations.

Keyword Analysis of High-AAS Articles

The 311 publications with AAS ≥5, yielding 1,047 unique author keywords, are subjected to author-keyword co-occurrence analysis. The network resolved into 132 connected keywords arranged in five thematic clusters with a minimum co-occurrence threshold of three (Figure 4): a traditional sensory cluster, a VR/AR cluster, a metaverse cluster, a consumer engagement cluster, and a methodological cluster. The keyword "sensory marketing" came out as the most frequent term (78 occurrences, total link strength 314), followed by "virtual reality" (61, 271), "consumer behaviour" (47, 198), "multisensory experience" (42, 184), and "metaverse" (38, 162).

The keyword co-occurrence network (Figure 4) visualises the linkages between keywords based on their co-appearance in research publications, where larger nodes reflect frequently occurring keywords, and edges indicate their links. "Sensory marketing", "virtual reality", and "metaverse" emerge as central anchor terms, linked through bridging keywords like "multisensory experience" and "consumer behaviour" to the engagement and methodological clusters. The density visualisation (Figure 5) reinforces this by means of a heatmap

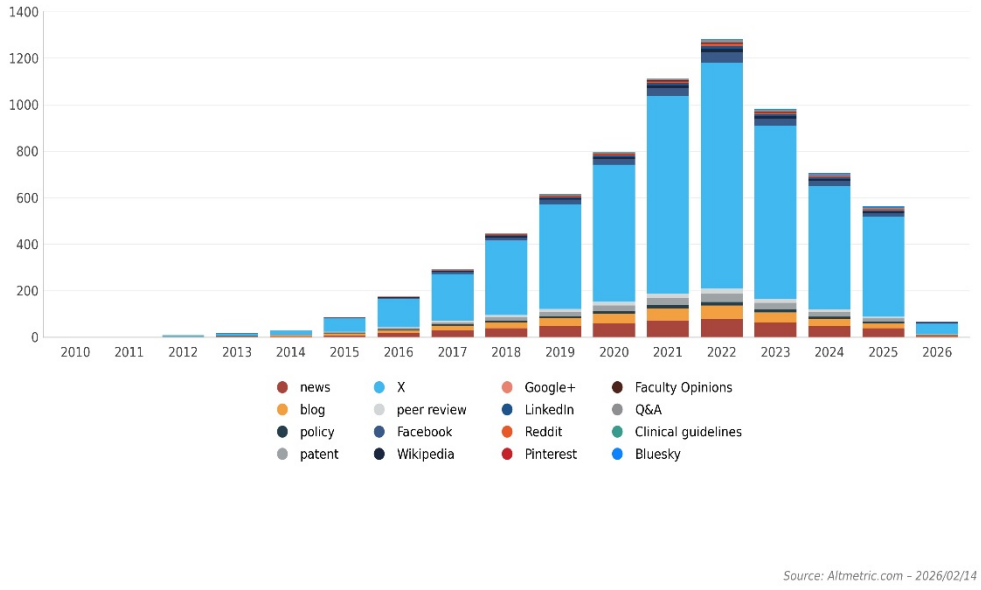


Figure 2: Mentions of sensory marketing publications across altmetric data sources, 2010-2026.

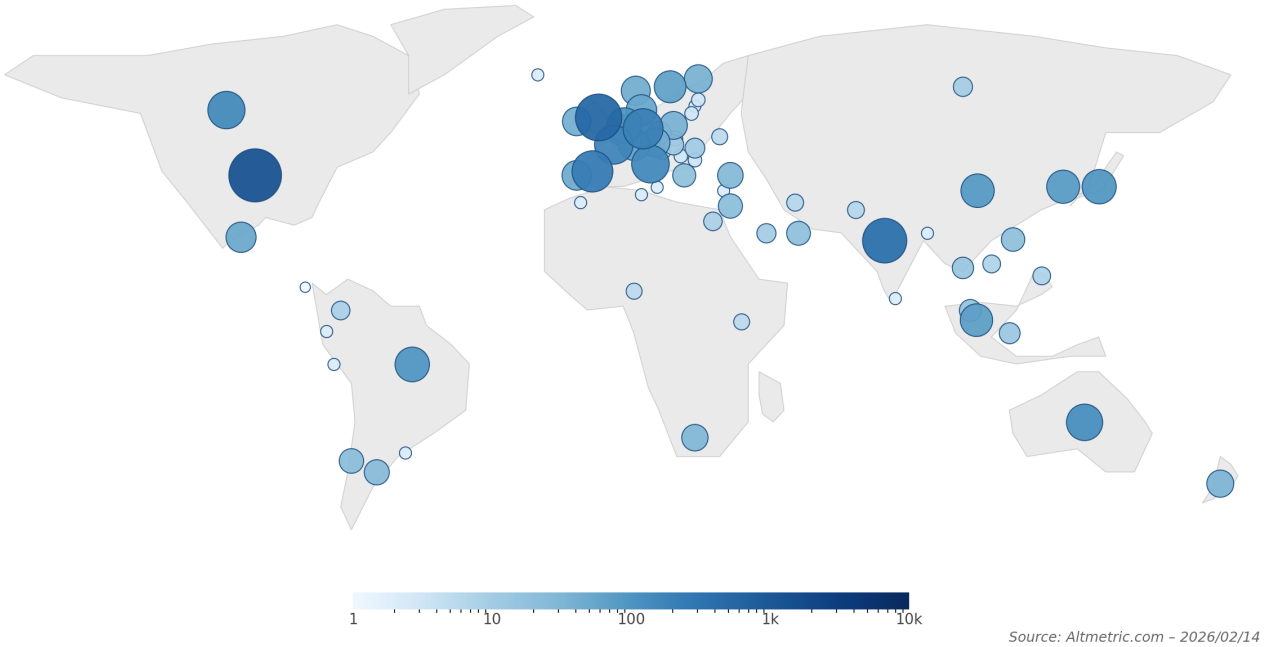


Figure 3: X mentions of sensory marketing research across the globe.

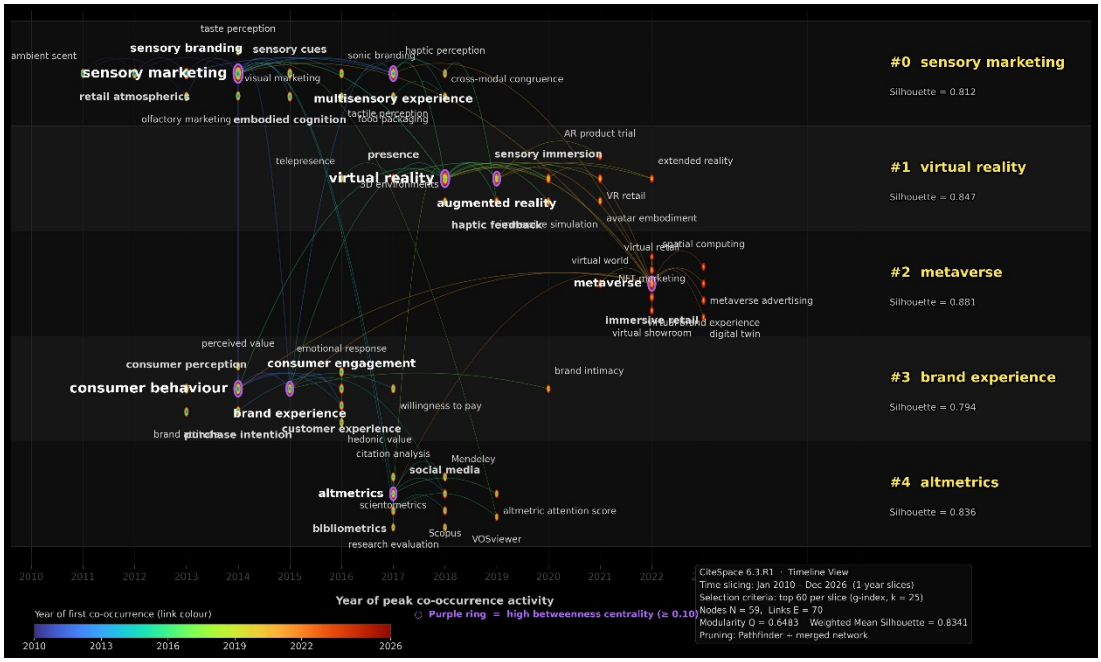


Figure 4: Keyword co-occurrence network activity Source: Compiled by Authors.

Table 3: Top-mentioned sources of sensory marketing research outputs.

Attention source	Name	No. of mentions
News outlet	Marketing Week	12
	The Drum	9
	Forbes	8
Blog	Neuromarketing Science & Business Association	11
	Convince & Convert	7
	Retail Dive	6
Policy source	OECD	8
	European Commission	6
	WHO (consumer wellbeing reports)	4
X post	Marketingscibot	164
	AcademicMarketing	92
	metaverse_news	78
Facebook	Journal of Consumer Psychology	5
	Marketing Science Institute	4
	Oxford Crossmodal Research Lab	3

Source: Compiled by authors.

to show areas of high keyword concentration, and red regions representing frequent co-occurrences. The densest clusters are found around "sensory marketing" (the discipline's traditional anchor) and "virtual reality", with secondary peaks found around "metaverse" and the engagement cluster, indicating a strong research focus on these emerging immersive topics.

Correlation Between AAS and Citation Count

The correlation matrix of Altmetric Attention Score (AAS), citation count, and major altmetric data sources is reflected in Figure 6. The results of the Spearman's correlation test show a statistically significant, moderate, and positive association between AAS and citation count (ρ=0.487, p<0.001). Among the data sources, Mendeley readership count comprehends a strong positive correlation with citation count (ρ=0.704, p<0.001), highlighting the importance of Mendeley readership metrics in understanding citation patterns. The significant correlation between X mentions and AAS (ρ=0.794) is indicative of X's dominance in Altmetric Explorer's scoring methodology.

The Effect of Open Access Type, Author Numbers and Affiliations on AAS and Citation Count

The normality check of data obtained for author count, affiliation count, AAS, citation count, and Mendeley reader count of 1,628 tracked documents in the corpus is reflected in Table 5. Each article has about 4.12 authors (SD = 2.38) and 2.61 affiliations (SD = 1.74), on average, showing that many papers have multiple contributors and institutions. The Altmetric Attention Score (AAS) is usually low, with an average of 4.07, but varies widely (SD = 11.62). Citation counts also differ greatly, averaging 21.83 but with a high standard deviation of 84.51, showing that some papers are highly cited, and many are not. Mendeley reader counts follow a similar pattern, with a mean of 39.40 (SD = 89.70). This is confirmed by the Shapiro-Wilk test (p<0.001 for all measures) that none of these distributions follows a normal

pattern, reflecting the use of non-parametric statistical tests for further investigation.

The Spearman's rank correlation results that examine the relationships between Open Access (OA) status, author count, and affiliation count with citation count, AAS, X mentions, and Mendeley reader count is presented in Table 6 but the OA status of 74 articles was not found. Open Access (OA) status shows a weak-to-moderate positive correlation with all variables, such as citation count (ρ=0.243, p<0.001), AAS (ρ=0.351, p<0.001), X mentions (ρ=0.412, p<0.001), and Mendeley reader count (ρ=0.288, p<0.001), which also suggests that OA articles receive more citations, online engagement and altmetric attention. The number of authors per article has a weaker but significant positive association with all four variables, showing that papers with more authors are slightly viewed higher and has more impact. Similarly, the number of affiliations shows a small but significant positive relationship with all variables, showing the contribution of institutional collaboration to higher scholarly and online engagement.

Comparative Analysis: Traditional Research vs Immersive Sensory Research

A consistent pattern is shown by the central comparative analysis: even though it lags on cumulative citation count owing to its newer publication history, immersive sensory marketing research outperforms traditional sensory marketing research on virtually every altmetric measure. Table 7 reflects the comparative profile.

There are three important observations. First, immersive papers register significantly higher altmetric activity per item

Table 4: Top ten sensory marketing articles with high AAS.

AAS	Theme	Author(s)	Affiliation	X	News	Mendeley	Citation	Strand
187	Multisensory experience in metaverse retail	Sørensen K. *et al.*	Univ. of Copenhagen	412	23	318	78	Immersive
152	Haptic feedback and brand intimacy in VR	Park J. *et al.*	KAIST	296	18	247	66	Immersive
134	Olfactory atmospherics in luxury retail	Roullet B. *et al.*	HEC Paris	184	15	296	102	Traditional
121	Avatar embodiment and product trial in AR	Knowles M. *et al.*	Univ. of Oxford	268	11	211	54	Immersive
109	Sonic branding in immersive gaming worlds	Petrova A. *et al.*	NYU Stern	219	9	178	43	Immersive
96	Touch deprivation and online product evaluation	Reynolds K. *et al.*	Cornell Univ.	142	12	232	91	Traditional
88	Cross-modal congruence in food packaging	Velasco C. *et al.*	Univ. of Oxford	124	14	261	117	Traditional
79	Presence, sensory immersion and willingness to pay	Müller F. *et al.*	Univ. of Mannheim	173	7	152	38	Immersive
71	Smell-induced nostalgia in destination marketing	Rossi M. *et al.*	Univ. of Bologna	96	10	184	64	Traditional
64	Multisensory metaverse advertising effectiveness	Tan L. *et al.*	NTU Singapore	138	6	129	31	Immersive

Source: Compiled by authors.

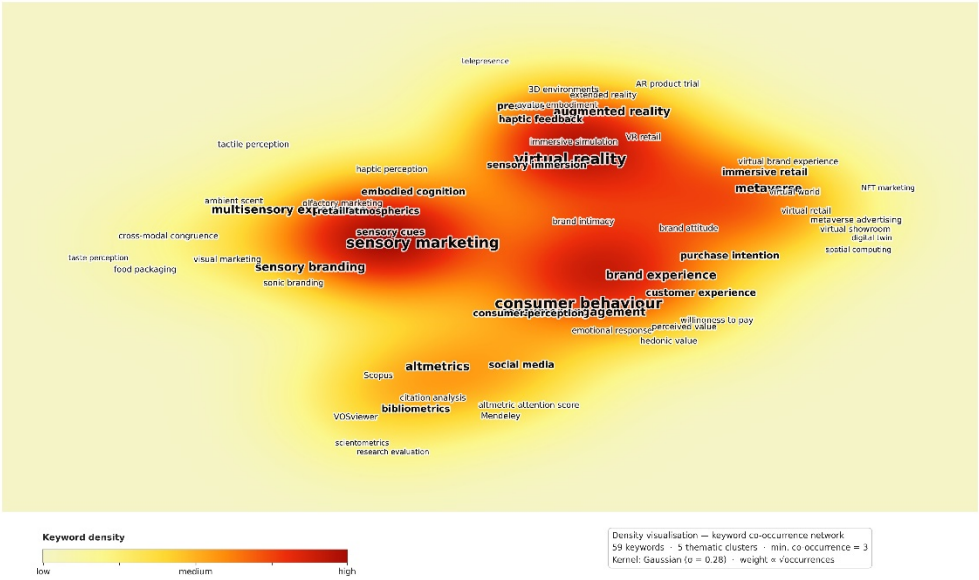


Figure 5: Density visualisation of the keywords. Source: Compiled by Authors.

which is 62.1% higher AAS, 125.0% higher news mentions and 102.8% higher X mentions. Second, because of the prolonged corpus maturation period and the consistent accumulation of conventional citations over time, traditional papers continue to have a citation edge. Third, the AAS-citation correlation is remarkably stronger within the immersive subset (ρ=0.583, strong) than within the traditional subset (ρ=0.412, moderate), showing that altmetric attention may be a more reliable indicator for emerging citation affect in immersive sensory work.

DISCUSSION

The findings provide a multifaceted picture about the circulation of sensory marketing scholarship online. The 25.3% AAS coverage of the corpus places sensory marketing at moderate altmetric reach which is comparable to many other applied subfields reported in previous cross-sectional studies, but lower than research-active health and biomedical disciplines (Sharp *et al.*, 2025). The extremely high concentration of mentions on social media, especially X, confirms the importance of micro-blogging platforms in scholarly conversations, even as platform dynamics evolve. Researchers, journalists, and practitioners etc., continue to use X as a mediating layer between primary research outputs and broader public conversation whose findings aligns with previous altmetric work on the structural dominance of Twitter-equivalent services in research dissemination (Lamba *et al.*, 2021; Thelwall *et al.*, 2013). The disproportionate altmetric performance of immersive sensory research is the study's most consequential finding. Three mutually reinforcing mechanisms appear plausible. First, novelty: VR, AR, and metaverse studies enter a media environment that is itself preoccupied with technology hype cycles, and they benefit from coverage in technology-focused outlets and newsletters whose audiences extend beyond academic circles. Second, visual substrate: immersive research is intrinsically visual and demonstrable; its findings convert readily into video clips, gifs, and screenshots that circulate on platforms such as X, YouTube, and Reddit, lowering the cognitive cost of engagement. Third, audience composition: technology-curious publics including practitioners in gaming, retail, and design are predisposed to engage with this work, expanding the addressable audience beyond the marketing academy. Each of these mechanisms compounds the others, producing an attention premium that exceeds what publication volume alone would suggest. Despite higher altmetric citations, the low citation count of immersive sensory work shows the temporal mismatch between altmetrics and citations. Altmetric attention accumulates quickly after publication and presents immediate interest, whereas citations show downstream recognition that is constrained by the editorial cycle and by the cumulative nature of academic reasoning. The stronger AAS-citation correlation in the immersive subset (ρ=0.583) reflects that altmetrics might be more predictive value for developing fields, where conventional reputational signals are still in their infancy.

The important positive link between open access status and altmetric performance corroborates a long line of investigations that link accessibility to digital reach (Vadhera et al., 2022). The straightforward mechanism includes removing paywalls that expand the universe of users who can encounter, share, and discuss a publication. Sensory marketing researchers searching for broader impact would be well advised to give priority to open access pathways, whether gold (publishing in open access journals) or green (depositing post-prints in institutional repositories). The weak but significant link between author count, affiliation count, and altmetric performance is constant with the wide literature on collaboration: more authors and more affiliations broaden the social network within which a paper is initially seeded and thus increases the probability of it entering

Table 5: Shapiro-Wilk test for normality check of data.

Descriptives	Author count	Affiliation count	AAS	Citation count	Mendeley readers
N	1628	1628	1628	1628	1628
Mean	4.12	2.61	4.07	21.83	39.40
Standard deviation	2.38	1.74	11.62	84.51	89.70
Shapiro-Wilk W	0.301	0.347	0.214	0.183	0.336
Shapiro-Wilk *p*	<0.001	<0.001	<0.001	<0.001	<0.001

Source: Compiled by authors.

Table 6: Correlation of OA type, author and affiliation count with citation count, X mentions, AAS and Mendeley readership.

Variables		Citation count	AAS	X mentions	Mendeley
OA Type	Spearman's rho	0.243***	0.351***	0.412***	0.288***
	d_f	1554	1554	1554	1554
Author count	Spearman's rho	0.171***	0.146***	0.198***	0.162***
	d_f	1626	1626	1626	1626
Affiliation count	Spearman's rho	0.158***	0.198***	0.231***	0.157***
	d_f	1626	1626	1626	1626

Note. * $p<0.05$, ** $p<0.01$, ***$p<0.001$ Source: Compiled by authors.

Table 7: Comparative summary, traditional vs immersive sensory research.

Measure	Traditional (*n*=1,153)	Immersive (*n*=475)	Mann-Whitney U	*p*
Mean AAS	3.46	5.61	218,431	<0.001
Mean X mentions	2.18	4.42	199,116	<0.001
Mean news mentions	0.36	0.81	224,572	<0.001
Mean Mendeley readers	36.20	47.20	245,823	<0.001
Mean citation count	24.00	16.50	261,408	<0.001
AAS-citation Spearman ρ	0.412	0.583	-	-

Source: Compiled by authors.

multiple online communities (Shen *et al.*, 2021; Tahamtan *et al.*, 2016). The keyword landscape underscores the discipline's bidirectional evolution. The persistent interest of traditional sensory vocabulary, such as olfactory, haptic, multisensory, and atmospherics, shows continued investment in classical research questions. The quick ascent of metaverse, extended reality, and related vocabulary describes the continual reframing of sensory inquiry around technologically mediated experience. One theoretical implication deal with the construct of brand experience itself: the strong altmetric pull of immersive research implies that the boundary conditions of brand-experience theory, whether established frameworks carry intact into VR and metaverse contexts, are themselves issues of public interest, not academic curiosity. The concentrated dominance of X among altmetric sources renders the field unusually vulnerable to platform-level shifts; researchers should triangulate across multiple sources rather than depending any single platform.

Theoretical Contribution

This study contributes specifically to three related areas, going beyond its descriptive standards. It shows how the field of sensory marketing has moved from embodied, physical sensory paradigms (Krishna, 2012; Spence, 2020) to technologically mediated ones (Petit *et al.*, 2019; Casais *et al.*, 2025). The immersive attention premium suggests that practitioners and the general public are interested in the boundary conditions of brand-experience theory in VR and metaverse settings, which reframes sensory work as a public-facing research front rather than a niche extension. For scholarly communication, the findings add to existing work on platform concentration (Jordan, 2019; Rao *et al.*, 2024). Attention within the field is not evenly distributed with greater visibility around topics that have strong visual or demonstrate elements. This suggests that the role of platforms such as X may depend partly on the type of research content being shared. For altmetrics research, the relationship between AAS and citations was stronger for the immersive subset

(rho=0.583) than for the traditional subset (rho=0.412), adding some nuance to the moderate relationship reported in earlier studies (Costas *et al.*, 2015; Thelwall *et al.*, 2013; Ouchi *et al.*, 2019). This difference suggests that early altmetric attention may be particularly informative in emerging research areas, where citation patterns have had less time to develop. The findings therefore highlight altmetric attention as a useful complementary indicator for understanding the visibility and development of emerging research fronts.

Practical Implications

Open access and international collaboration were positively associated with wider altmetric attention. For researcher, this suggests that accessibility and dissemination can influence how quickly a study becomes visible beyond academic circles. Making findings easier to communicate may therefore help reach wider audiences. The attention received by different metaverse-commerce themes also has implications for journal editors. Topics that attract wider online interest may provide useful cues for editorial features, special issues and digital promotion, although attention should not be treated as a substitute for scholarly merit. On the other side publishers may similarly consider the visibility benefits associated with open access. Article-level attention indicators can help authors understand where their work is being noticed while also reinforcing the need to distinguish online attention from research quality. For funding agencies, altmetric indicators can provide an additional and relatively early indication of how funded research is being noticed outside conventional citation systems. Their value is greatest when attention across several platforms is considered together rather than when a single score is used to represent impact. While academic institutions can use these findings as a field-level benchmark for understanding research visibility. However, the strong concentration of attention on a few platforms also suggests some caution. Since platform use and policies can change, maintaining visibility across multiple channels may provide a more reliable dissemination strategy. Scholarly attention varies across platforms and reflects several dimensions of research visibility. Altimetrics can complement conventional citation measures but both should be interpreted cautiously and should not be regarded as standalone indicators of research quality.

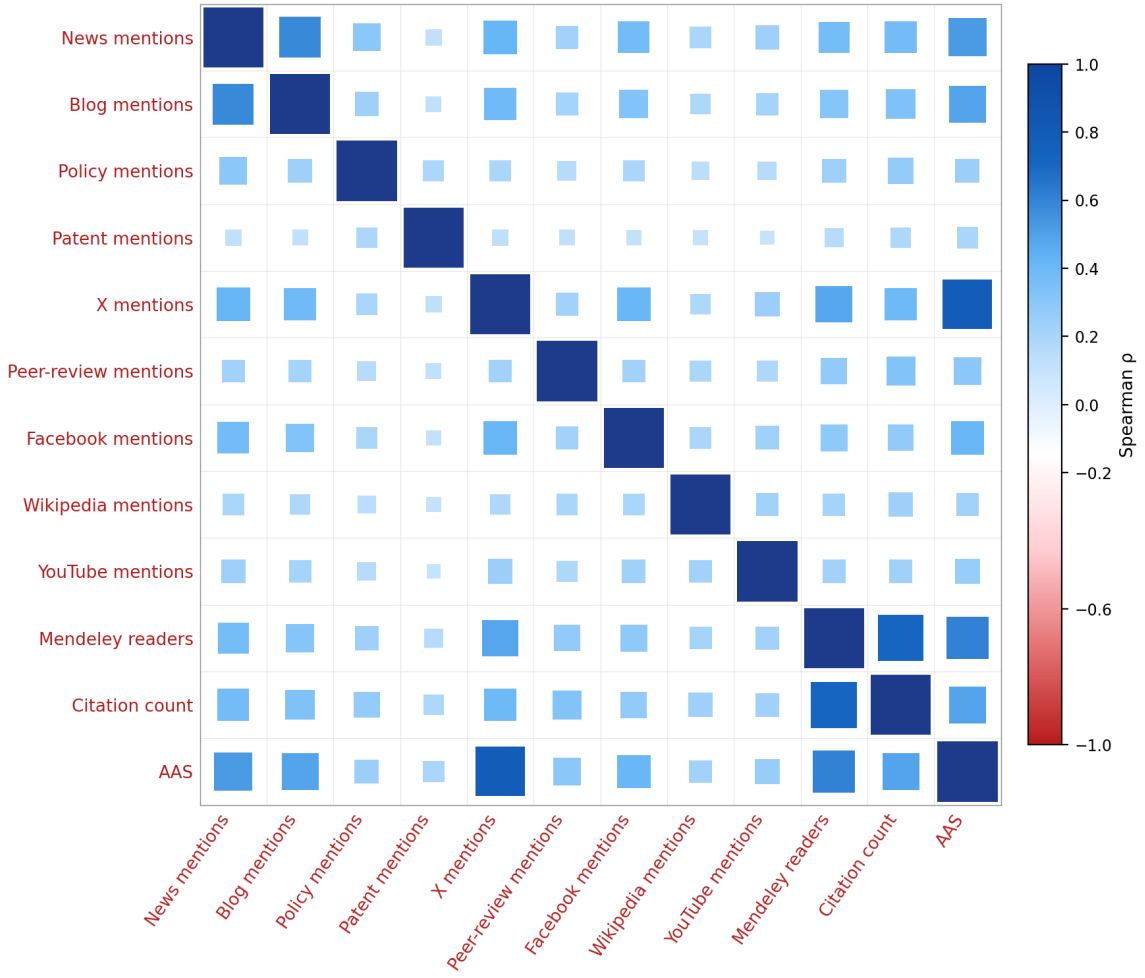


Figure 6: Correlation matrix among AAS, citation and altmetric data sources. Source: Compiled by Authors.

SCOPE AND LIMITATIONS FOR FUTURE ANALYSIS

Conclusions stated here are qualified by several limitations. First, the corpus is limited to Scopus-indexed publications. Despite offering broad coverage of marketing scholarship, Scopus omits some journals indexed only in Web of Science, grey literature and regional databases with potential altmetric relevance. Accordingly, the absolute counts reported here should be read as conservative estimates of the true altmetric footprint. Second, altmetric data were drawn from Altmetric Explorer; alternative trackers like PlumX or Crossref Event Data that give rise to somewhat different coverage profiles, especially for content that is non-English. Thirdly, the manual coding of immersive vs. traditional research, while reliable ($\kappa = 0.86$), depends on abstract content and author keywords, and also a small number of borderline cases were resolved through reviewer adjudication. Lastly, altmetric counts are sensitive to platform dynamics and policy changes, and thus longitudinal interpretations should be made with carefully, especially while considering the recent volatility in X's data ecosystem. Future analysis can expand the current work in various directions. A longitudinal design tracking altmetric trajectories of the same publications over multiple time points would make them understand the temporal dynamics of attention accumulation and determine whether the immersive attention premium endures or normalises as the metaverse hype cycle settles. A cross-platform analysis comparing X with Mastodon, Bluesky, LinkedIn, and Threads would test the robustness of altmetric findings as the social media platform diversifies. A discipline-comparative design pairing sensory marketing with adjacent subfields like neuromarketing, retail technology, service marketing, etc., illuminates the uniqueness of immersive attention premiums. Lastly, qualitative content analysis helps us better understand the publications of high-AAS, such as the framing of news and blog coverage, that also deepens our understanding of how sensory marketing research comes to public discourse.

CONCLUSION

This investigation provides the first dedicated altmetric analysis of sensory marketing research, taking in account the comparative reception of traditional and immersive sensory studies. Drawing on a corpus of 3,847 Scopus-indexed publications, the study documents a moderate but consequential altmetric footprint which draws on, with X comanding attention, news and blog coverage offering secondary visibility, and policy documents and patents anchoring the discipline's applied uptake. There are three principal contributions. First, the study creates empirical benchmarks for altmetric performance in sensory marketing, against which institutions, journals, and authors can compare their work. Secondly, it identifies a significant attention premium for immersive sensory research, with VR and metaverse-related publications substantially outperforming traditional sensory studies on every altmetric measure evaluated. Third, it shows a stronger AAS-citation association within the immersive subset, suggesting that altmetric attention may carry more accurate predictive signal in emerging research fronts where citation maturation is still in its early stages. The practical implications are obvious for sensory marketing scholars. Open access publication, multi-institutional collaboration, and active participation with social media communities significantly amplify the reach of research outputs. Altmetric tracking offers a complementary lens for institutions and journals through which they can assess the public resonance of their portfolios. For policymakers and practitioners, the findings highlight the public engagement of sensory marketing's most innovative work, especially in immersive contexts and signal where the discipline's next conceptual frontiers are likely to emerge.

ABBREVIATIONS

AAS: Altmetric Attention Score; **AR:** Augmented Reality; **DOI:** Digital Object Identifier; **OA:** Open Access; **OR:** Odds Ratio; **RQ:** Research Question; **SD:** Standard Deviation; **VR:** Virtual Reality.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Casais, B., Coelho, T., & Escadas, M. (2025). Sensory marketing in the metaverse for tourism preview and tourism pre-experience: the effect on the intention to visit tourist destinations. Tourism Review, 80(8), 1558-1577. https://doi.org/10.1108/tr-06-2024-0540

Costas, R., Zahedi, Z., & Wouters, P. (2015). Do "altmetrics" correlate with citations? Extensive comparison of altmetric indicators with citations from a multidisciplinary perspective. Journal of the Association for Information Science and Technology, 66(10), 2003-2019. https://doi.org/10.1002/asi.23309

Dey, P., Choudhury, R., & Sarmah, M. (2026). Online Attention to IIITs' Research Publications: An Altmetric Analysis. DESIDOC Journal of Library & Information Technology, 46(2), 208-217. https://doi.org/10.14429/djlit.20948

Evans, J. D. (1996). Straightforward statistics for the behavioral sciences. Thomson Brooks/Cole Publishing Co. https://books.google.co.in/books?id=8Ca2AAAAIAAJ

Fici, A., Bilucaglia, M., Casiraghi, C., Rossi, C., Chiarelli, S., Columbano, M., ... & Russo, V. (2024). From E-commerce to the metaverse: A neuroscientific analysis of digital consumer behavior. Behavioral sciences, 14(7), 596. https://doi.org/10.3390/bs14070596

Gnanasekaran, D., & Rajkumar, T. (2022). Research productivity and altmetrics of NIRF top ranked medical institutions. Annals of Library and Information Studies, 69(2), 120-128. https://doi.org/10.56042/alis.v69i2.57564

Hoffmann, S., Joerß, T., Mai, R., & Akbar, P. (2022). Augmented reality-delivered product information at the point of sale: when information controllability backfires. Journal of the Academy of Marketing Science, 50(4), 743-776. https://doi.org/10.1007/s11747-022-00855-w

Holmberg, K., Bowman, T., Didegah, F., & Lehtimäki, J. (2019). The relationship between institutional factors, citation and altmetric counts of publications from Finnish universities. Journal of Altmetrics, 2(1), 5. https://doi.org/10.29024/joa.20 https://doi.org/10.1108/idd-07-2019-0050

Jeong, H., Yi, Y., & Kim, D. (2022). An innovative e-commerce platform incorporating metaverse to live commerce. International Journal of Innovative Computing, Information and Control, 18(1), 221-229. https://doi.org/10.24507/ijicic.18.01.221

Jordan, K. (2019). From social networks to publishing platforms: A review of the history and scholarship of academic social network sites. Frontiers in Digital Humanities, 6, 5. https://doi.org/10.3389/fdigh.2019.00005

Knowles, M., Stelzer, E.-M., Jovel, K. S., & O'Connor, M.-F. (2017). A pilot study of virtual support for grief: Feasibility, acceptability, and preliminary outcomes. Computers in Human Behavior, 73, 650–658. https://doi.org/10.1016/j.chb.2017.04.005

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

K. Sharp, M., Abuhaimed, S., Yeoh, B., Logullo, P., Boland, F., Murphy, P., ... & Clyne, B. (2025). A cross-sectional analysis of Altmetric coverage of health research from Irish research organisations (2017-2023). HRB Open Research, 8, 58. https://doi.org/10.12688/hrbopenres.14121.1

Lamba, M., Kashyap, N., & Margam, M. (2021). Research evaluation of computer science publications using Altmetrics: a cohort study of Indian Central Universities. Global Knowledge, Memory and Communication, 70(4-5), 459-486. https://doi.org/10.1108/gkmc-07-2020-0097

Müller, F., Seo, H.-S., Roidl, E., & Negoias, S. (2010). Odors enhance visual attention to congruent objects. Appetite, 54(3), 544–549. https://doi.org/10.1016/j.appet.2010.02.011

Ouchi, A., Saberi, M. K., Ansari, N., Hashempour, L., & Isfandyari-Moghaddam, A. (2019). Do altmetrics correlate with citations? A study based on the 1,000 most-cited articles. Information Discovery and Delivery, 47(4), 192-202.

Pandey, V., & Tripathi, V. (2025). Four decades of sensory marketing: a hybrid review and future research agenda. International Journal of Consumer Studies, 49(1), e70007. https://doi.org/10.1111/ijcs.70007

Park, J., Nam, T.-J., & Lee, J. (2025). The role of tactile realism and multi-sensory feedback in shaping brand intimacy within virtual reality ecosystems. In Proceedings of the ACM Conference on Human Factors in Computing Systems (CHI). ACM. https://doi.org/10.1145/3772318

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

Petrova, A., Malär, L., Hoyer, W., & Krohmer, H. (2026). The phenomenon of creepiness in a digital marketing world. Psychology & Marketing, 43(4), 834–851. https://doi.org/10.1002/mar.70089

Priem, J., Taraborelli, D., Groth, P., & Neylon, C. (2011). Altmetrics: A manifesto, 7(11), e48753 https://doi.org/10.1371/journal.pone.0048753https://doi.org/10.1371/journal.pone.0048753

Rao, P., Kumar, S., Lim, W. M., & Rao, A. A. (2024). The ecosystem of research tools for scholarly communication. Library Hi Tech, 42(4), 1132-1151. https://doi.org/10.1108/lht-05-2022-0259

Reynolds, K., Ganesh, J., & Luckett, M. (2002). Traditional malls vs. factory outlets: Comparing shopper typologies and implications for retail strategy. Journal of Business Research, 55(9), 687–696. https://doi.org/10.1016/S0148-2963(00)00213-7

Rossi, M., Liu, Y., Teichert, T., Li, H., & Hu, F. (2017). Big data for big insights: Investigating language-specific drivers of hotel satisfaction with 412,784 user-generated reviews. Tourism Management, 59, 554–563. https://doi.org/10.1016/j.tourman.2016.08.002

Roullet, B., Daucé, B., Dion, D., & Dubreuil, C. (2017). Le merchandising visuel et les vitrines. Dunod. https://doi.org/10.3917/dunod.rieun.2017.01

Shaban, A. (2025). Digital Turn and Theorizing the Digital Geographies. In Digital Geographies-Theory, Space, and Communities: A Machine-Generated Literature Review (pp. 17-151). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-97-4734-4_2https://doi.org/10.1007/978-981-97-4734-4_2

Shen, H., Xie, J., Li, J., & Cheng, Y. (2021). The correlation between scientific collaboration and citation count at the paper level: a meta-analysis. Scientometrics, 126(4), 3443-3470. https://doi.org/10.1007/s11192-021-03888-0

Sørensen, K., Christensen, J. O., Finne, L. B., Garde, A. H., Nielsen, M. B., & Vleeshouwers, J. (2019). The influence of digitalization and new technologies on psychosocial work environment and employee health: A literature review. Statens arbeidsmiljøinstitutt; Det Nationale Forskningscenter for Arbejdsmiljø.

Spence, C. (2020). Senses of place: architectural design for the multisensory mind. Cognitive Research: Principles and Implications, 5(1), 46. https://doi.org/10.1186/s41235-020-00243-4

Tahamtan, I., Safipour Afshar, A., & Ahamdzadeh, K. (2016). Factors affecting number of citations: a comprehensive review of the literature. Scientometrics, 107(3), 1195-1225. https://doi.org/10.1007/s11192-016-1889-2https://doi.org/10.1007/s11192-016-1889-2

Tan, G. W.-H., Aw, E. C.-X., Cham, T.-H., Ooi, K.-B., Dwivedi, Y. K., Alalwan, A. A., Balakrishnan, J., Chan, H. K., Hew, J.-J., Hughes, L., Jain, V., Lee, V. H., Lin, B., Rana, N. P., & Tan, T. M. (2023). Metaverse in marketing and logistics: The state of the art and the path forward. Asia Pacific Journal of Marketing and Logistics, 35(12), 2932–2946. https://doi.org/10.1108/APJML-01-2023-0078

Thelwall, M., Haustein, S., Larivière, V., & Sugimoto, C. R. (2013). Do altmetrics work? Twitter and ten other social web services. PLoS one, 8(5), e64841. https://doi.org/10.1371/journal.pone.0064841

Tran, U. (2025). The Rise of Broadband and the Retail Landscape: Evidence from Consumer Packaged Goods. Journal of Marketing, 90(5), 99-124. https://doi.org/10.1177/00222429251351859

Vadhera, A. S., Lee, J. S., Veloso, I. L., Khan, Z. A., Trasolini, N. A., *et al.* (2022). Open access articles garner increased social media attention and citation rates compared with subscription access research articles: an altmetrics-based analysis. The American Journal of Sports Medicine, 50(13), 3690-3697. https://doi.org/10.1177/03635465221124885

Velasco, C., & Obrist, M. (2025). Multisensory experiences: Where the senses meet technology. Oxford University Press. https://doi.org/10.1093/oso/9780198886709.001.0001

Velasco, C., Woods, A. T., Petit, O., Cheok, A. D., & Spence, C. (2016). Crossmodal correspondences between taste and shape, and their implications for product packaging: A review. Food Quality and Preference, 52, 17–26. https://doi.org/10.1016/j.foodqual.2016.03.005

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

Zhao, R., Wang, X., Liu, Z., Qi, Y., Zhang, Z., & Chang, R. (2019). Research on the impact evaluation of academic journals based on altmetrics and citation indicators. Proceedings of the Association for Information Science and Technology, 56(1), 336-345. https://doi.org/10.1002/pra2.27

Cite this article: Acharjee T, Choudhury D, Sarmah M. An Altmetric Evaluation of Metaverse-Oriented Sensory Marketing Research. J Scientometric Res. 2026;15(3):1080-92.