Artificial Intelligence in Marketing: A Bibliometric Mapping of Central and Eastern European Research

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The increasing adoption of artificial intelligence (AI) in marketing poses significant managerial and governance challenges, particularly for small and medium-sized enterprises (SMEs) operating in dynamic, digitally transforming markets. Although the academic literature on AI in marketing has expanded rapidly since 2020, the thematic structure of this research in the Central and Eastern European (CEE) context remains underexplored. This study aims to map AI-related marketing research in CEE countries. Keyword co-occurrence analysis and network visualisation were conducted using VOSviewer to identify dominant research themes, thematic interconnections, and emerging directions. The findings reveal interconnected thematic clusters addressing AI applications in marketing. The results highlight patterns in how AI-driven marketing and consumer trust are conceptualised in the CEE region. By offering a structured overview of the literature, this study supports a deeper understanding of AI-enabled marketing from a management perspective and provides a foundation for future research on AI adoption among SMEs.

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1 Theoretical background

Artificial intelligence (AI) has rapidly evolved from a technological novelty to a transformative force in marketing strategy and practice. AI-based tools such as machine learning algorithms, natural language processing, and predictive analytics are increasingly shaping customer targeting, personalisation, content generation, and decision support systems. (Davenport et al., 2020; Huang & Rust, 2021) As marketing becomes more data-intensive and automated, companies are increasingly relying on AI to optimise operational efficiency, improve customer engagement, and enhance strategic responsiveness. (Wedel & Kannan, 2016)

The spread of AI in marketing is particularly important for small and medium-sized enterprises (SMEs). SMEs operate within resource constraints, yet face strong pressure to remain competitive. (European Commission, 2023) AI-based marketing tools promise better customer insights, greater cost efficiency, and scalability, reducing the structural disadvantages associated with company size. (Chatterjee et al., 2021) However, the adoption of AI in SMEs is determined by organisational readiness, managerial capabilities, and the institutional environment, which vary significantly across regions. (El-Haddadeh, 2019; Hoffmann & Nurski, 2021)

Beyond the benefits, AI-based marketing also poses challenges for companies. Issues of transparency, explainability, algorithmic bias, and consumer trust have become central problems in the introduction of AI. (Buhmann & Fieseler, 2022; Martin, 2018) As automated decision-making systems increasingly impact consumer behaviour, trust is not only an ethical consideration but also a strategic asset. (Glikson & Woolley, 2020) For small and medium-sized enterprises, which often lack the appropriate infrastructure, the use of AI can be both a competitive advantage and a management burden.

Although research on the use of artificial intelligence in marketing has been growing rapidly since 2020, regional differences remain underexplored. Central and Eastern Europe (CEE) is a particularly interesting region due to its transitional economic structures, high proportion of SMEs, and ongoing digital transformation. (European Investment Bank, 2023) In the CEE region, marketing effectiveness is also shaped by consumer values and trust. Despite growing interest in AI and digital innovation

in Central and Eastern Europe, AI-related marketing research in the region has not yet been systematically mapped.

Through a systematic literature review of AI-related marketing research, this study contributes to our understanding of how AI, marketing, and entrepreneurship are linked in this regional context. It thus provides a basis for identifying thematic gaps and for future research on the effective adoption of AI by SMEs.

2 Methodology

This study uses a systematic literature review (SLR) to examine the use and application of artificial intelligence (AI) in entrepreneurship and SMEs in Central and Eastern Europe (CEE). The review follows the PRISMA 2020 guidelines to ensure transparency, reproducibility, and methodological rigour.

The research aims to identify studies that focus on the use of AI in the marketing activities of businesses operating in Central and Eastern European countries.

In this study, the definition of Central and Eastern European Countries (CEECs) follows the OECD statistical terminology, which identifies CEECs as a group of post-transition European economies, including Albania, Bulgaria, Croatia, the Czech Republic, Hungary, Poland, Romania, the Slovak Republic, Slovenia, Estonia, Latvia, and Lithuania. (OECD Glossary; UNESCWA)

2.1 Data source and filtering strategy

The literature review was conducted in the Web of Science database. We used the following search string:

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("artificial intelligence" OR AI)
AND marketing
AND (use OR application*)
AND (entrepreneur* OR startup* OR "new venture*"
    OR "small business*" OR SME* OR "new firm*"
    OR "entrepreneurial activity"
    OR "family business*" OR "family firm*" OR "family enterprise*"))
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The search was conducted without geographical restrictions in the initial phase to cover the entire global research area. The initial query yielded 488 records. To ensure transparency and repeatability, only open-access articles were retained. As a result of this narrowing, 241 records remained. To focus on the latest developments in AI applications, we considered only publications from 2020 to 2025. After applying this criterion, 221 records remained. The analysis was limited to the following Web of Science categories:

- Economics
- Business
- Management
- Social Sciences Interdisciplinary

After filtering, 101 studies remained. Finally, a regional filter was applied to select CEE countries. After this filtering stage, 21 articles were identified as potentially relevant. The full texts of the 21 articles were examined to check the following:

1. Location of the empirical sample
2. Expressed relevance to CEE countries
3. AI-related application in a marketing, SME, or entrepreneurial context

At this stage, three articles had to be excluded because their empirical samples were not or only partially conducted in CEE countries: The final sample consisted of 18 empirical studies.

2.2 Characteristics of the final sample

The empirical analysis in this study examines companies operating in the following CEE countries:

- Poland
- Czech Republic
- Hungary
- Slovakia
- Romania

Most of the studies focused on the Visegrad countries (Poland, the Czech Republic, Hungary, and Slovakia). We did not find any empirical studies for Croatia, Bulgaria, Lithuania, Latvia, Estonia, Slovenia, or Albania. This points to a regional imbalance in the Central and Eastern European research environment.

The analysis was followed by a thematic clustering approach, which enabled us to identify the region's main research directions and gaps.

The systematic screening process is summarised in Table 1.

Table 1: Systematic screening process

	Number of studies
Identified records	488
Open access filter	241
Time restriction (2020–2025)	221
Subject category filter	101
Geographical filter	21
Full text exclusions	3
Final studies included	18

Source: www.um.si

Several limitations had to be taken into account during our analysis. The search was limited to the Web of Science database, so relevant studies, indexed elsewhere, may have been omitted. Restrictions on open access may have reduced the total sample size. Geographic filtering was based on country references that appeared in the title, abstract, or full text. As a result, European datasets covering multiple countries without clear regional references may have been omitted.

Despite these limitations, the applied procedure ensures methodological transparency and provides a high-quality collection for the analysis of AI literature used in the marketing of SMEs in Central and Eastern Europe.

3 Results

Before presenting the co-occurrence network of keywords, a descriptive overview of the studies provides insight into the structural characteristics of AI-related marketing research conducted in the CEE context.

The topics that emerge mainly focus on business (n = 12) and management (n = 9), followed by economics (n = 6). Only a few publications represent interdisciplinary social sciences (n = 2), while educational research, engineering sciences, and interdisciplinary applications of computer science each have a single publication. This may be due to the selected VoS categories (Figure 1).

This distribution suggests that in the CEE region, artificial intelligence applied in marketing is framed within the selected scientific field category as a management and strategic phenomenon rather than as a technological or IT research area. Discussions related to artificial intelligence are closely linked to corporate performance, innovation, and strategic management frameworks.

Figure 1: WoS categories TreeMap Chart
Source: own.

Based on geographical distribution, Poland (n = 5) and Slovakia (n = 5) are the most represented countries, followed by the Czech Republic (n = 3) and Romania (n = 3). Hungary is represented by only 2 articles (n = 2).

It is worth noting that several non-Central and Eastern European countries are also represented (e.g., Spain, England, France, and Malaysia), which reflects patterns of international cooperation in the hit list rather than an empirical focus outside the region (Figure 2).

Figure 2: Countries/Region TreeMap Chart
Source: own.

The results show a concentration in Visegrad countries. This suggests that AI marketing research in Central and Eastern Europe is unevenly distributed, with most work conducted by a limited group of countries. This is more of a regional concentration than widespread research at the Central and Eastern European level.

The publication trend is clearly on the rise. After minimal activity in 2020–2021, the number of studies has been growing steadily since 2022, yet only nine studies on this topic were published last year (Figure 3).

The rapid growth can be explained, on the one hand, by the acceleration of digital development after COVID. Other reasons may include the growing political emphasis on AI adoption in Europe, increased scientific interest in AI-based marketing, and the competitiveness of SMEs. The increase over time suggests that AI in marketing is an emerging trend in the Central and Eastern European scientific environment.

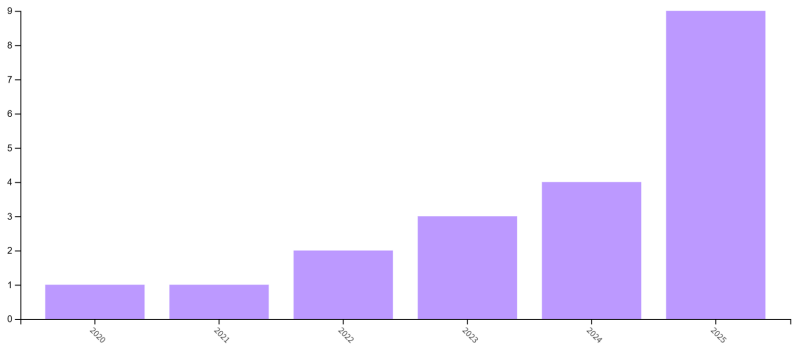

Figure 3: Final publication year Bar Chart
Source: own.

his sample characterisation provides a basis for interpreting the thematic clusters identified in the subsequent keyword co-occurrence analysis.

3.1 Keyword co-occurrence network

A co-occurrence analysis of keywords from the 18 selected studies reveals a thematically differentiated research environment in Central and Eastern Europe. The network visualisation identifies four dominant thematic clusters organised around artificial intelligence as a central node.

Artificial intelligence appears in the network as a central connecting concept, closely linked to management, innovation, SMEs, machine learning, and entrepreneurship. This central role suggests that, in the CEE context, artificial intelligence is not treated merely as a technical construct, but also as a management and strategic phenomenon embedded in the discourse on SME competitiveness and innovation.

The strong correlation between AI and management-related terms suggests that research in the region primarily frames AI from the perspective of governance and decision-making.

The VOSviewer clustering algorithm automatically generated four colour-coded clusters. However, the interpretative analysis showed that one cluster functions primarily as a structural hub focused on artificial intelligence, while the other three

represent thematically coherent research areas. Accordingly, we will focus on presenting the three main clusters. (Figure 4)

Cluster 1: Innovation, performance, and strategic management (red/green zone)

One of the dominant cluster groups includes concepts such as innovation, management, model, corporate performance, business model, risk, impact, and challenges. This cluster reflects a strong orientation towards the following:

- AI-driven organisational transformation
- Impacts on performance
- Strategic adaptation
- Risks and implementation challenges

Rather than measuring specific marketing ROI, many studies frame the introduction of AI as part of broader innovation capabilities and strategic renewal. Company-level performance is often analysed in the context of digital transformation and globalisation dynamics.

Cluster 2: Digital marketing and analytics applications (green zone)

This cluster focuses on digital marketing, analytics, machine learning, natural language processing, and big data. Here, AI appears more in operational marketing contexts:

- Customer data analysis
- Content and communication optimisation
- Social media and digital engagement
- Marketing analytics

However, compared to Western European literature, these topics remain more closely related to SMEs and applications rather than to a purely marketing-technology group. This suggests that in Central and Eastern European research, AI-driven marketing is generally embedded in broader digitalisation narratives and is not treated as a separate specialised field.

Cluster 3: Introduction, acceptance, and technological readiness (blue/yellow zone)

This cluster links adoption, technology, user acceptance, and education with entrepreneurial spirit. The following areas are highlighted:

- Technology acceptance models
- Organisational readiness
- Human capital and digital skills
- Capacity constraints of SMEs

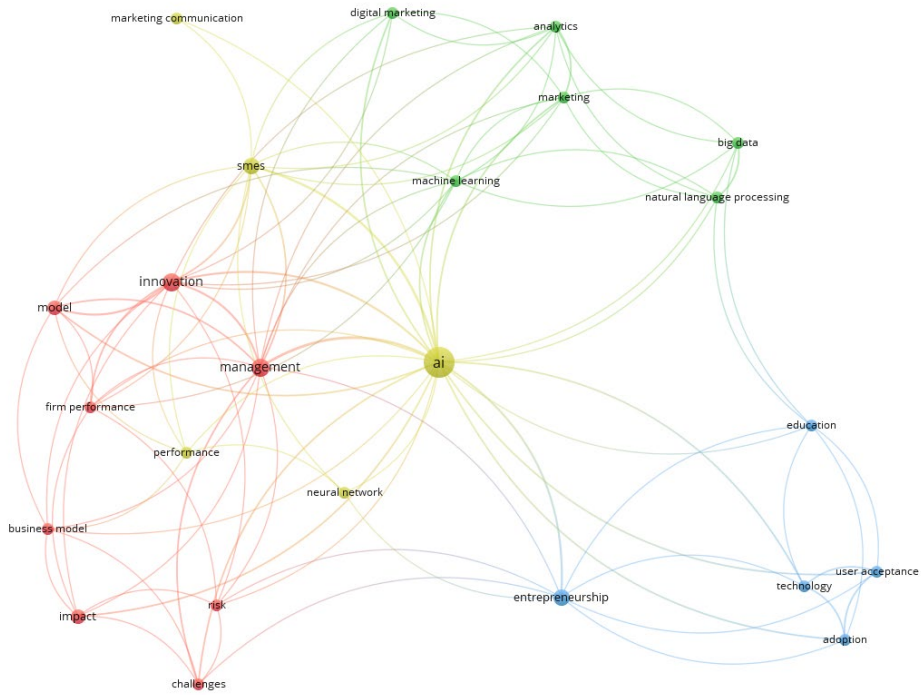

Figure 4: Network visualisation
Source: own.

The overlay visualisation (Figure 5) shows that these application-related topics are gaining prominence in recent publications (2024–2025). Attention is focused on barriers to AI adoption, trust and behavioural factors, risks, challenges, impacts, and user acceptance.

This is particularly relevant for resource-constrained SMEs, where management awareness and user acceptance significantly influence AI adoption. Previous publications (2023) focused on big data, natural language processing, and technical analysis.

This evolution over time indicates the maturity of the research processes:

1. Initially, the focus was on technological capabilities,
2. Then issues of organisational adoption came to the fore,
3. And now the focus is shifting towards governance, accountability, and performance impacts.

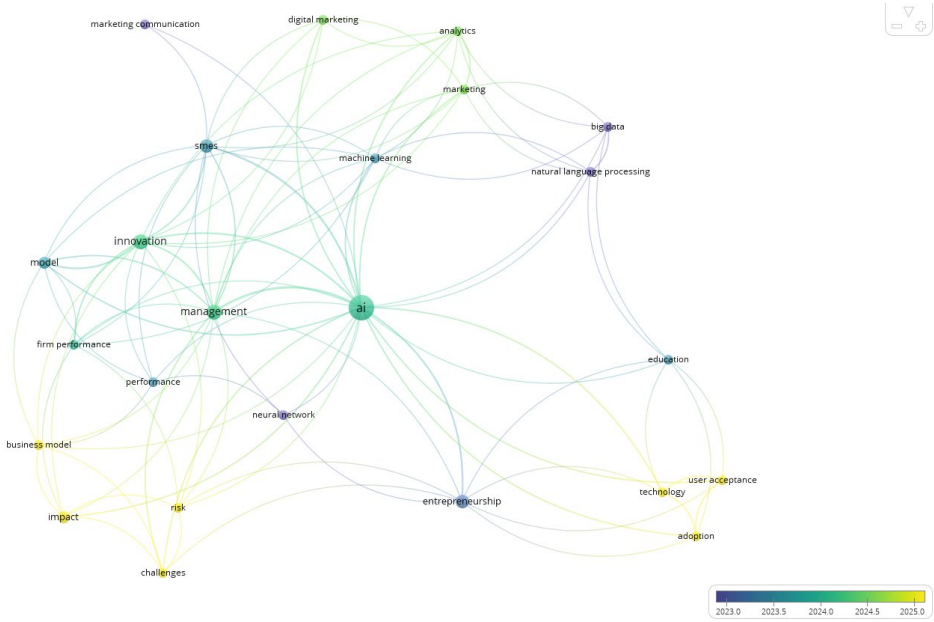

Figure 5: Overlay visualisation
Source: own.

AI-based marketing tools are rarely analysed in isolation. Instead, they are embedded in innovation strategy, application readiness, and executive management context.
It is important to note that trust and transparency appear indirectly through concepts such as risk, user acceptance, and challenges, suggesting that governance issues are emerging but have not yet matured enough to form a separate cluster.

Overall, the results show a research environment where AI in marketing is primarily framed as a mechanism for strategic and organisational transformation in SMEs, rather than merely as a technical marketing optimisation tool.

4 Discussion

The bibliometric map provides important insights into how Central and Eastern European (CEE) research defines artificial intelligence (AI) in marketing. The results show that AI-related marketing research in the region is structurally interdisciplinary and closely embedded in the discourse of SMEs and the entrepreneurial sphere.

One of the most striking findings of our study is that AI is not primarily presented as a specific marketing optimisation technology but rather positioned as a broader strategic and innovation-enabling capability. The frequent co-occurrence of AI and terms such as innovation, management, corporate performance, and business model suggests that CEE scholars view the field as part of corporate transformation. In Central and Eastern Europe, AI is part of digitalisation and competitiveness strategies, especially among SMEs, operating under structural constraints. This indicates a management framework in which the introduction of AI is closely linked to long-term survival. This contrasts with some Western literature, where AI is often examined in detail in marketing (e.g., algorithmic targeting, personalised metrics).

In Central and Eastern European marketing, in a small and medium-sized enterprise environment, the examination of AI is characterised by:

- Resource constraints
- Skill gaps
- Institutional transition dynamics
- Pressure for rapid digital transformation

The close relationship between AI, entrepreneurship, and performance reflects the focus of regional research. This is consistent with the general direction of post-socialist economic development in the region, where innovation and internationalisation remain critically important strategies.

Another important contribution of the mapping is the introduction of concepts such as user acceptance, along with the visibility of technology and education. These topics are receiving increasing emphasis in recent publications, suggesting a shift from technological enthusiasm to the realities of implementation.

This evolution reflects the maturity of the research program. Early studies emphasised analytical and technical capabilities (e.g., big data, machine learning), while recent research increasingly examines topics such as organisational readiness, leadership capabilities, and risk perception. This suggests that research in Central and Eastern Europe increasingly recognises the introduction of AI as a socio-technical process rather than merely a technological development. For companies, the introduction of AI is not only a technological innovation but a complex organisational and strategic transformation process that requires the development of new competencies, adaptive operating structures, and management approaches (Koteczki et al, 2025).

Although they do not yet form a separate cluster, governance-related topics appear with keywords such as risk, challenges, and impact. This aligns with growing global concerns about transparency, explainability, and the ethical use of artificial intelligence.

The results suggest that future theoretical developments in the CEE context should integrate a resource-based view (RBV) of AI capability development.

5 Conclusion

Overall, regional research indicates that numerous SMEs face significant challenges in implementing digital transformation initiatives due to insufficient resources.

By identifying thematic clusters and their relationships, this study provides a structured picture of how AI-based marketing is conceptualised in CEE and highlights the need for more performance-oriented, trust-sensitive empirical research.

This study contributes to the literature in three important ways. First, it is the first structured bibliometric map of marketing research on artificial intelligence conducted in the Central and Eastern European (CEE) context, offering a region-specific perspective that has been largely missing from the global discourse. Second, it shows that in CEE marketing research, AI is primarily understood as a strategic and innovation-driven capability in the SME environment, rather than merely as a technical optimisation tool. Third, it identifies a structural gap between application-oriented studies and measurable marketing performance outcomes, underscoring an underexplored area for future empirical research.

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