

# Implementation of Agentic AI, Multi-Agent Systems and Retrieval Augmented Generation in Digital Marketing: A Systematic Literature Review

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## ABSTRACT

The rapid advancement of artificial intelligence has significantly transformed digital marketing practices, particularly through the emergence of Large Language Models (LLMs), Retrieval-Augmented Generation (RAG), and Agentic AI architectures. This study aims to analyze the evolution, implementation, opportunities, and limitations of Agentic AI using a Multi-Agent System approach in supporting digital marketing strategies. The study employs a Systematic Literature Review (SLR) method by synthesizing relevant academic publications published between 2020 and 2025 from indexed databases. The review focuses on the integration of autonomous AI agents, collaborative multi-agent workflows, and retrieval enhanced language models within digital marketing environments. The findings indicate that Agentic AI enables more adaptive and data driven marketing processes through automated decision making, audience segmentation, campaign optimization, and personalized content generation. Furthermore, the integration of RAG enhances contextual accuracy and reduces the limitations of static LLM knowledge. Despite its strategic potential, several challenges remain, including system reliability, hallucination risks, computational complexity, ethical concerns, and organizational readiness. This study contributes to the growing academic discussion on Agentic AI implementation in digital marketing and provides insights for future development of intelligent marketing systems in business environments.

**Keywords:** *Agentic AI, Multi-Agent Systems, Retrieval-Augmented Generation, Digital Marketing.*

## I. INTRODUCTION

The rapid growth of digital technology has significantly transformed how organizations communicate with consumers and develop marketing strategies. Digital marketing increasingly plays an important role in improving customer



engagement, strengthening brand visibility, and supporting business competitiveness through data driven approaches (Chaffey & Chadwick, 2022). Along with this transformation, Artificial Intelligence (AI) has become increasingly integrated into digital marketing activities, particularly in automating processes, analyzing consumer behavior, and generating personalized content (Dwivedi et al., 2021).

Recently, the emergence of generative AI and Large Language Models (LLMs) has expanded the capabilities of AI systems in producing human like and contextual responses. These technologies enable companies to automate communication and support decision making processes more efficiently. However, conventional generative AI systems still rely heavily on static pretrained knowledge and often have limited ability to adapt to real time information and dynamic market conditions (Lewis et al., 2021). In digital marketing environments, where consumer preferences and trends continuously change, these limitations may reduce the relevance and effectiveness of AI generated outputs.

To address these challenges, the concept of Agentic AI has attracted growing attention. Agentic AI refers to autonomous AI systems capable of reasoning, planning, and making decisions independently to achieve specific goals (Russell & Norvig, 2022). The implementation of Agentic AI becomes increasingly effective when combined with Multi-Agent Systems, where multiple autonomous agents collaborate to handle complex tasks collectively (Wu et al., 2023). In addition, the integration of Retrieval-Augmented Generation (RAG) allows AI systems to retrieve external and up to date information before generating outputs, improving contextual relevance and reducing misinformation risks (Lewis et al., 2021).

Several studies have discussed AI adoption in marketing and the development of autonomous AI systems. Mariani et al. (2023) examined the role of AI in marketing and consumer behavior analysis, while Brand et al. (2023) explored the use of LLMs for market research activities. Meanwhile, studies by Wu et al. (2023) and Li et al. (2023) demonstrated the growing capability of collaborative AI Agents in solving technologies separately. highlighted the growing capability of collaborative AI agents in handling complex tasks. Nevertheless, studies that systematically review the integration of Agentic AI, Multi-Agent Systems, and Retrieval-Augmented Generation in digital marketing are still limited.

Therefore, this study aims to conduct a Systematic Literature Review (SLR) on the development and implementation of Agentic AI using Multi-Agent Systems and Retrieval-Augmented Generation in digital marketing. This study focuses on identifying current trends, potential applications, challenges, and future research directions related to autonomous AI systems in supporting adaptive and data driven digital marketing strategies.

## II. LITERATURE REVIEW

### *Artificial Intelligence in Digital Marketing*

Artificial Intelligence (AI) has increasingly become an important component in modern digital marketing activities. The ability of AI systems to process large scale consumer data enables organizations to identify behavioral patterns, automate repetitive processes, and improve decision making efficiency (Dwivedi et al., 2021). In digital marketing, AI technologies are commonly applied in customer segmentation, recommendation systems, predictive analytics, and personalized content generation. The growing adoption of AI reflects the increasing need for marketing strategies that are more adaptive, data driven, and responsive to dynamic consumer preferences.

Recent developments in generative AI have further expanded the role of AI in business environments. Large Language Models (LLMs) enable systems to generate human like text, perform contextual interactions, and support automated communication processes (Mienye et al., 2025). These capabilities have accelerated the implementation of AI in various marketing activities, including campaign planning, customer engagement, and digital content creation.

### *Agentic AI and Multi-Agent System*

The emergence of Agentic AI represents a significant development in intelligent system technologies. Unlike conventional AI models that mainly operate reactively based on user prompts, Agentic AI focuses on autonomous reasoning, planning, and decision making capabilities (Russell & Norvig, 2022). This approach enables AI systems to perform tasks more dynamically while adapting to changing environmental conditions and organizational goals.

The implementation of Agentic AI is often associated with Multi-Agent Systems, where multiple autonomous agents collaborate to solve complex tasks collectively (Wu et al., 2023). In this architecture, each agent can handle specific responsibilities, such as information retrieval, data analysis, content generation, or strategic evaluation. Through collaborative workflows, Multi-Agent Systems provide more scalable and adaptive solutions compared with traditional single agent approaches.

Several recent studies have demonstrated the increasing capability of autonomous AI agents in handling complex operational processes. Wang et al. (2024) explain that LLM based autonomous agents are increasingly integrating reasoning, memory, planning, and tool utilization within a unified workflow. This development positions Agentic AI as a promising approach for business environments that require continuous optimization and adaptive strategic execution.

## ***Retrieval-Augmented Generation (RAG)***

Retrieval-Augmented Generation (RAG) is an approach that combines information retrieval mechanisms with generative language models to improve the contextual accuracy of AI generated outputs (Lewis et al., 2021). In contrast to conventional generative AI systems that rely only on pretrained knowledge, RAG enables AI models to retrieve relevant external information before generating responses. This mechanism helps reduce hallucination risks and improves the relevance of generated outputs, especially in environments where information changes rapidly.

In digital marketing contexts, the integration of RAG supports more accurate market analysis, trend identification, and personalized communication strategies. By utilizing updated business data and external knowledge sources, RAG allows AI systems to produce outputs that are more aligned with current market conditions and consumer behavior. As a result, RAG is increasingly considered an important component in the development of intelligent marketing systems based on Agentic AI and Large Language Models.

### **III. METHOD**

#### ***PRISMA 2020 Based Research Design***

This study employed the Systematic Literature Review (SLR) method using the PRISMA 2020 framework proposed by Page et al. (2021). The PRISMA framework was selected because it offers a systematic and transparent approach for identifying, evaluating and synthesizing academic literature. In recent years, PRISMA has become one of the most widely adopted standards in review based research, particularly in studies related to technology, artificial intelligence, and digital transformation.

The use of PRISMA 2020 in this study aimed to ensure that the literature review process remained structured and consistent throughout every research stage. In addition, the framework helped reduce potential bias during article selection by establishing clear procedures before the literature search process began. Through this approach, the selected studies were expected to provide relevant and reliable findings regarding the implementation of Agentic AI, Multi Agent Systems, and Retrieval-Augmented Generation (RAG) within digital marketing environments.

This study focused on reviewing recent publications discussing the development of autonomous AI systems, collaborative AI architectures, and retrieval enhanced language models in digital marketing contexts. The review also examined implementation approaches, operational benefits, technological limitations, and future opportunities related to intelligent marketing systems.

PRISMA 2020 emphasizes several important components in systematic review studies, including clear research objectives, predefined eligibility criteria, transparent study selection procedures, and systematic synthesis of findings across selected studies (Page et al., 2021). By following these principles, this study aimed to

produce a more rigorous and objective literature review compared with conventional narrative review approaches.

### ***Eligibility Criteria***

The eligibility criteria were determined before the literature search process was conducted to maintain consistency throughout the review process. These criteria functioned as a filtering mechanism to ensure that only studies relevant to the research objectives were included in the final synthesis. The criteria were divided into inclusion criteria and exclusion criteria.

### ***Inclusion Criteria***

The inclusion criteria consisted of the following aspects:

1. Publications released between 2020 and 2025 to ensure the relevance of recent technological developments related to Agentic AI, Multi-Agent Systems and Retrieval-Augmented Generation.
2. Peer reviewed journal articles, international conference proceedings and academically credible publications discussing artificial intelligence and digital marketing developments.
3. Studied explicitly discussing at least one of the following topics:
  - a. Agentic AI or autonomous AI agents,
  - b. Multi-Agent System,
  - c. Retrieval-Augmented Generation (RAG),
  - d. Large Language Models (LLMs),
  - e. Artificial Intelligence implementation within digital marketing environments
4. Studies containing empirical findings, conceptual discussions, implementation frameworks, system architectures, or analytical evaluations related to intelligence marketing systems.
5. Publications discussing marketing automation, customer engagement, personalization systems, campaign optimization, AI assisted decision making, or data driven marketing strategies.

The inclusion criteria were intentionally designed to accommodate both technical and managerial perspectives because the topic of Agentic AI in digital marketing involves interdisciplinary discussions between artificial intelligence technologies and business applications.

### ***Exclusion Criteria***

The exclusion criteria were applied to eliminate studies that did not sufficiently align with the research objectives. The exclusion criteria included:

1. Publications unrelated to digital marketing or intelligent business systems.

2. Studies focusing exclusively on low level technical optimization without discussing practical implementation or business applications.
3. Opinion articles, commercial white papers, blog publications, reports without methodological explanations and non scientific sources.
4. Studies discussing general artificial intelligence systems without relevance to Agentic AI, Multi-Agent Systems, or Retrieval-Augmented Generation.

The implementation of these criteria helped maintain the relevance and quality of the selected literature throughout the review process.

### ***Information Sources and Search Strategy***

The literature search process was conducted using several academic databases selected based on their relevance to artificial intelligence, computer science, information systems, and business research domains. The databases used in this study included Scopus, IEEE Xplore, ScienceDirect, SpringerLink, and Google Scholar.

These databases were selected because they provide extensive coverage of peer-reviewed publications related to autonomous systems, generative AI, intelligent agents, and digital business research. The use of multiple databases also helped improve literature coverage and reduce the possibility of database specific publication bias.

The search strategy utilized Boolean operators and keyword combinations developed through preliminary scoping searches. The keywords were adjusted iteratively to improve search sensitivity and relevance. The primary search query used in this study was:

("Agentic AI" OR "Autonomous AI Agents" OR "Multi-Agent Systems")  
AND

("Retrieval-Augmented Generation" OR "RAG" OR "Large Language Models" OR "LLMs")  
AND

("Digital Marketing" OR "Marketing Automation" OR "AI Marketing" OR "Personalized Marketing")

In addition to the primary query, supplementary searches were conducted using more specific keywords to identify potentially relevant studies that may not have appeared through the primary search process. These keywords included:

1. "AI Agents in Marketing"
2. "Autonomous Agents for Business"
3. "LLM-based Marketing Systems"

4. "Generative AI in Digital Marketing"
5. "Multi-Agent Collaboration in Marketing"

The literature search process was conducted during May 2026, and all identified studies were collected and organized for further screening and eligibility assessment.

### ***Study Selection Process***

The study selection process followed the four stage PRISMA 2020 flow consisting of identification, screening, eligibility assessment, and inclusion. Each stage was conducted systematically to ensure transparency and methodological consistency throughout the literature review process.

#### ***Identification Stage***

The identification stage involved systematic searches across the selected databases using predefined search queries. The initial search identified 198 records from database searching consisting of publications from Scopus, IEEE Xplore, ScienceDirect, SpringerLink, and Google Scholar. In addition, 16 supplementary records were identified through reference screening and related article searches. Therefore, a total of 214 records were collected during the identification stage.

#### ***Screening Stage***

During the screening stage, duplicate publications identified across multiple databases were removed, reducing the dataset by 34 records. The remaining studies were then screened based on titles and abstracts to evaluate their relevance to the research objectives.

At this stage, studies were excluded if they did not discuss Agentic AI, Multi-Agent Systems, Retrieval-Augmented Generation, or digital marketing contexts. Several studies were also excluded because they focused solely on technical AI development without discussing implementation or business applications. As a result, 116 studies were excluded during the initial screening process.

#### ***Eligibility Assessment***

A total of 48 full text articles that passed the screening stage were further evaluated using structured eligibility criteria. The evaluation focused on topical relevance, conceptual contribution, methodological clarity, and alignment with the research objectives.

During this stage, 27 studies were excluded for several reasons:

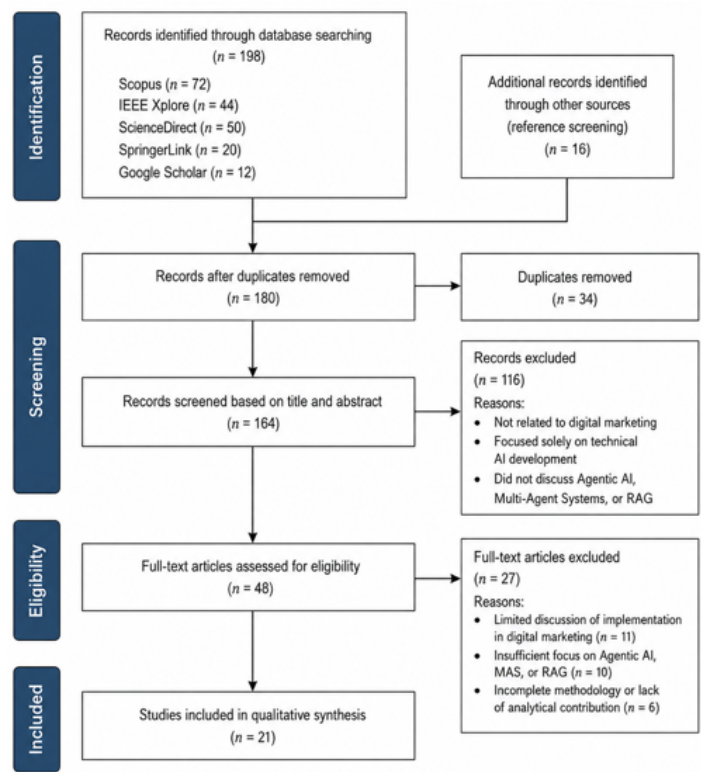
1. Limited discussion regarding AI implementation within digital marketing environments (n = 11)
2. Insufficient focus on Agentic AI, Multi-Agent System, or Retrieval-Augmented Generation (n = 10)
3. Incomplete methodological explanations or limited analytical contribution (n = 6)

The eligibility assessment process ensured that only studies with sufficient academic relevance and methodological quality were included in the final synthesis stage.

**Inclusion Stage**

Following the eligibility assessment process, 21 studies were included in the final qualitative synthesis. These studies became the primary sources used to identify technological developments, implementation approaches, operational challenges, research trends, and future opportunities related to Agentic AI within digital marketing environments.

Figure 1 PRISMA 2020 Flow Diagram of Literature Selection Process



Source: Adapted from Page et al. (2021)

**Data Collection and Synthesis Methods**

The selected studies were analyzed using thematic synthesis to identify recurring patterns and major themes across the reviewed literature. This approach was selected because it enables findings from different studies to be organized into coherent analytical categories.

The synthesis process focused on several analytical dimensions, including the evolution of Agentic AI architectures, the implementation of Multi-Agent Systems in digital marketing activities, the integration of Retrieval-Augmented Generation for improving contextual accuracy, operational challenges and technological limitations, as well as future opportunities for intelligent marketing systems.

The analysis process consisted of several stages. First, the selected studies were reviewed comprehensively to identify important concepts, implementation approaches, and emerging discussions. Second, initial thematic coding was conducted to group similar findings across different studies. Third, the identified themes were categorized into broader analytical dimensions relevant to the research objectives.

After the categorization stage, the findings were synthesized descriptively and interpretively. Rather than merely summarizing previous studies, this research emphasized analytical interpretation to identify similarities, differences, research gaps, and emerging technological trends across the reviewed literature.

The synthesized findings are presented in the Results and Discussion section through analytical narratives, thematic discussions, and comparative literature analysis regarding the implementation of Agentic AI, Multi-Agent Systems, and Retrieval-Augmented Generation within digital marketing environments.

## **IV. RESULTS AND DISCUSSION**

### ***Overview of Selected Studies***

The systematic literature review examined studies related to Agentic AI, Multi-Agent Systems, Retrieval-Augmented Generation (RAG), and their applications in digital marketing. Following the PRISMA 2020 framework, studies were identified, screened, and evaluated according to predefined inclusion and exclusion criteria. The final review included 21 publications published between 2020 and 2025.

Selected studies reflect the rapid evolution of artificial intelligence technologies over the past five years. Earlier research primarily focused on developing large language models capable of understanding and generating natural language. As the capabilities of these models improved, researchers began exploring advanced prompting techniques, retrieval mechanisms, and autonomous agent architectures that could support more complex tasks and decision making processes.

A notable trend identified in the reviewed literature is the transition from conventional generative AI systems toward more autonomous and collaborative AI architectures. Rather than functioning solely as text generation tools, modern AI systems increasingly integrate reasoning, memory, planning, and retrieval capabilities. This shift has contributed to the emergence of Agentic AI, which represents a new paradigm in artificial intelligence where systems can independently perform multi step tasks with minimal human intervention.

Table 1. Characteristics of Selected Studies

| No. | Year | Authors          | Study Title                                                       | Approach                  | Key Findings                                                                                                                                                    |
|-----|------|------------------|-------------------------------------------------------------------|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.  | 2020 | Brown et al.     | Language Models are Few-Shot Learners                             | Large Language Models     | Demonstrated the effectiveness of large-scale language models in performing multiple tasks through few-shot learning.                                           |
| 2.  | 2020 | Davenport et al. | How Artificial Intelligence Will Change the Future of Marketing   | Marketing Analysis        | Identified AI as a driver of automation, personalization, and marketing efficiency.                                                                             |
| 3.  | 2020 | Karpukhin et al. | <b>Dense Passage Retrieval for Open-Domain Question Answering</b> | Information Retrieval     | Introduced Dense Passage Retrieval (DPR), significantly improving retrieval performance for knowledge-intensive tasks and forming a foundation for RAG systems. |
| 4.  | 2021 | Lewis et al.     | Retrieval-Augmented Generation for Knowledge-Intensive NLP Tasks  | RAG Framework             | Improved response accuracy through external knowledge retrieval.                                                                                                |
| 5.  | 2021 | Liu et al.       | Pre-train, Prompt and Predict                                     | Prompt Engineering Survey | Classified and analyzed prompting                                                                                                                               |

| No. | Year | Authors        | Study Title                                                                                                                                      | Approach                     | Key Findings                                                                                                                               |
|-----|------|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|     |      |                |                                                                                                                                                  |                              | approaches in NLP.                                                                                                                         |
| 6.  | 2021 | Dwivedi et al. | Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy | Literature Review            | Discussed opportunities and challenges associated with AI adoption.                                                                        |
| 7.  | 2022 | Mariani et al. | AI in Marketing, Consumer Research and Psychology                                                                                                | Systematic Literature Review | Identified major research streams in AI-enabled marketing.                                                                                 |
| 8.  | 2023 | Li et al.      | CAMEL: Communicative Agents for "Mind" Exploration of Large Language Model Society                                                               | Multi Agent System           | Demonstrated collaborative communication among autonomous AI agents.                                                                       |
| 9.  | 2023 | Raffel et al.  | Exploring the Limits of Transfer Learning with a Unified Text-to-Text Transformer                                                                | Transformer Architecture     | Demonstrated the effectiveness of unified text-to-text frameworks in improving language understanding and generation across diverse tasks. |
| 10. | 2023 | Vaswani et al. | Attention Is All You Need                                                                                                                        | Transformer Model            | Introduced the Transformer architecture, providing the                                                                                     |

| No. | Year | Authors        | Study Title                                                              | Approach                   | Key Findings                                                    |
|-----|------|----------------|--------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------|
|     |      |                |                                                                          |                            | foundational mechanism for modern LLMs and Agentic AI systems.  |
| 11. | 2023 | Wu et al.      | AutoGen: Enabling Next-Gen LLM Applications via Multi-Agent Conversation | Multi Agents Collaboration | Improved task execution through coordinated agent interactions. |
| 12. | 2023 | Wei et al.     | Chain-of-Thought Prompting Elicits Reasoning in Large Language Models    | Prompt Engineering         | Enhanced reasoning performance of large language models.        |
| 13. | 2023 | Pryzant et al. | Automatic Prompt Optimization with "Gradient Descent" and Beam Search    | Prompt Optimazation        | Improved output quality through automated prompt refinement.    |
| 14. | 2023 | Zhou et al.    | Large Language Models are Human-Level Prompt Engineers                   | Prompt Engineering         | Demonstrated autonomous prompt generation capabilities.         |
| 15. | 2023 | Brand et al.   | Using LLMs for Market Research                                           | Market Intelligence        | Supported customer insight generation and market analysis.      |
| 16  | 2023 | Shinn et al.   | Reflexion: Language Agents with Verbal Reinforcement Learning            | Agentic AI                 | Introduced self reflective mechanisms for autonomous agents.    |

| No. | Year | Authors           | Study Title                                                                                                              | Approach              | Key Findings                                                               |
|-----|------|-------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------------------------------------------------------------|
| 17. | 2024 | Achiam et al.     | GPT-4 Technical Report                                                                                                   | Advanced LLM          | Demonstrated improvements in reasoning and multimodal capabilities.        |
| 18. | 2024 | Dong et al.       | A Survey on In-Context Learning                                                                                          | Literature Review     | Reviewed contextual learning techniques in LLMs.                           |
| 19. | 2024 | Sabbatella et al. | Prompt Optimization in Large Language Models                                                                             | Prompt Optimization   | Evaluated strategies for enhancing model performance.                      |
| 20. | 2024 | Arslan & Cruz     | Business-RAG: Information Extraction for Business Insights                                                               | Business Intelligence | Applied retrieval-enhanced generation for business information extraction. |
| 21. | 2025 | Chen et al.       | Application of retrieval-augmented generation for interactive industrial knowledge management via a large language model | RAG Application       | Improved knowledge retrieval and information accessibility.                |

Based on Table 1, four dominant research themes can be identified. The first theme focuses on the development of Large Language Models and advanced prompting techniques. The second theme examines Agentic AI and autonomous decision making capabilities. The third theme explores Multi-Agent Systems as a collaborative architecture for intelligent task execution. The fourth theme investigates Retrieval-Augmented Generation as a mechanism for improving contextual accuracy and reducing hallucinations in AI generated outputs.

## ***Evolution and Implementation of Agentic AI in Digital Marketing***

The reviewed studies demonstrate that Agentic AI has evolved from traditional generative AI systems toward more autonomous architectures capable of planning, reasoning, memory management, and task execution. Early developments focused on improving language generation through large language models such as GPT-3 and GPT-4 (Brown et al., 2020; Achiam et al., 2024). Subsequent studies introduced advanced prompting techniques that enhanced reasoning performance and contextual understanding (Liu et al., 2021; Wei et al., 2023)

The emergence of Multi-Agent Systems marked another important stage in this evolution. Studies such as CAMEL and AutoGen demonstrated that multiple autonomous agents can collaborate to solve complex tasks more efficiently than a single AI system (Li et al., 2023; Wei et al., 2023)

Within digital marketing, Agentic AI has been applied to content generation, customer engagement, market research, campaign optimization, and personalized marketing. Brand et al. (2023) highlighted the ability of LLMs to support market intelligence and consumer insight generation, while Davenport et al. (2020) emphasized the role of AI in enhancing marketing automation and personalization. The integration of Agentic AI with Multi-Agent Systems and RAG allows organizations to automate complex workflows while maintaining contextual relevance and decision quality.

The findings suggest that Agentic AI can support both operational and strategic marketing activities by improving efficiency, scalability, and responsiveness in increasingly dynamic digital environments.

## ***Challenges and Future Opportunities***

Despite its potential benefits, several challenges remain. One of the most frequently discussed issues involves hallucination and information reliability. Although RAG improves factual grounding, the quality of generated outputs still depends on the accuracy and relevance of retrieved information sources. In addition, autonomous decision making may introduce concerns related to transparency, accountability, and ethical governance (Dwivedi et al., 2021).

The reviewed literature also identifies challenges associated with Multi-Agent Systems, particularly regarding coordination complexity and resource requirements. As the number of interacting agents increases, communication management and system scalability become more difficult to maintain (Li et al., 2023; Wu et al., 2023)

Nevertheless, future opportunities remain substantial. The combination of Agentic AI, Multi-Agent Systems, and RAG offers new possibilities for intelligent marketing automation, real time decision support, and adaptive customer engagement. Future research should focus on empirical evaluations in real business

environments, the development of trustworthy AI governance frameworks, and the measurement of long term impacts on marketing performance.

The findings of this review indicate that Agentic AI is evolving into a key technological foundation for next generation digital marketing. Its ability to combine reasoning, collaboration, and knowledge retrieval positions it as a promising solution for addressing the growing complexity of contemporary marketing activities.

## V. CONCLUSION AND RECOMMENDATION

This study employed a Systematic Literature Review (SLR) approach based on the PRISMA 2020 framework to examine the implementation of Agentic AI in digital marketing. The review of 21 selected studies indicates that the development of Agentic AI has been driven by advances in Large Language Models (LLMs), Multi-Agent Systems, and Retrieval-Augmented Generation (RAG). These technologies enable AI systems to perform more autonomous tasks, including content generation, information retrieval, reasoning, and decision making processes.

The findings suggest that Agentic AI has considerable potential to improve efficiency and effectiveness in digital marketing through content creation, customer engagement, market analysis, and campaign optimization. However, challenges related to information reliability, transparency, and system coordination remain significant concerns. Future studies are encouraged to conduct empirical investigations in real world marketing environments to evaluate the practical impact of Agentic AI on organizational performance and customer experience.

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