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# Big data analysis and its impact on the marketing industry: a systematic review

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**ABSTRACT**

This systematic review focused on understanding the impact of big data on marketing productivity, following the guidelines of systematic literature reviews and using the PICOC (problem/population, intervention, comparison, results, context) method. 50 high-impact articles were selected in Scopus, prioritizing those in the areas of engineering, computer science and business, and published between 2020 and 2023. These articles, selected for their relevance and contribution to the study objectives, showed that the big data offers notable benefits in the marketing industry. The ability to customize marketing strategies to individual customer needs, improved optimization, and a better understanding of customer behaviors and preferences were key aspects. These findings highlight how big data can boost productivity in marketing, strengthening customer relationships and increasing loyalty by improving understanding and adaptation to the specific demands and preferences of each customer. This deeper, more personalized approach to consumers represents a significant shift in the effectiveness and efficiency of marketing strategies in the current era.



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## 1. INTRODUCTION

In today's digital age, the marketing industry is in a state of constant evolution, driven by the proliferation of data on an unprecedented scale. Digital transformation has allowed companies to access a vast amount of information about their customers and their online interactions. This constant and incessant flow of information, called big data, has promised to revolutionize the way companies understand and engage with their audiences. However, despite the promise of big data, in the field of marketing it faces a fundamental problem. Despite the massive accumulation of data across various digital channels, there is a significant disconnect between the amount of data generated and the ability to turn that data into actionable insights that can guide effective strategies [1], [2]. This disconnect poses a number of challenges that require immediate attention and solutions.

Marketing as a discipline has moved beyond traditional tactics toward a more data-driven approach. Companies use data analytics to segment audiences, measure campaign effectiveness, predict trends, and make informed decisions. Gaining detailed insights into consumer behavior and online interactions opens up new opportunities and challenges. Big data is characterized by the large volume, variety and rapid generation of data, which has been an important facilitator of this transformation process. However, using it effectively

in marketing goes beyond collecting large amounts of data. Extracting relevant information and converting it into strategic decisions requires critical analysis and rigorous processing [3], [4].

While the importance of big data in marketing is obvious, there is a growing need to understand how this confluence of technologies and strategies influences the operational efficiency of companies within the sector. A lack of understanding of how to efficiently integrate and analyze this data limits companies' ability to timely identify consumer patterns and preferences. This, in turn, can lead to marketing strategies that are not optimized and do not achieve the desired impact. Additionally, there are technical obstacles that make it even more difficult to effectively implement big data strategies in marketing. Large-scale data management is a challenge in itself as it requires robust infrastructures and significant resources [5]. Additionally, accurately interpreting the results of complex data analysis can be a complicated process that not all organizations are prepared to address. This gap between the accumulation of data and its conversion into effective marketing strategies raises fundamental questions about how to optimally harness the potential of big data in marketing and how to overcome the obstacles surrounding it.

The reason behind this systematic review is its ability to offer a comprehensive perspective on the connection between big data and marketing productivity. The information collected is intended to identify new trends, best practices and opportunities for future research and business strategies. This will benefit marketers and researchers, allowing them to make informed decisions and advance in an ever-changing field. Finally, this systematic review aims to systematize the understanding of how big data is changing productivity in the marketing industry, providing a solid foundation for strategic decision making and future research in this dynamic area.

## 2. METHOD

To carry out this systematic review of the literature, the guidelines established for systematic literature reviews were followed. The PICOC (problem/population, intervention, comparison, results, context) method was used to define the scope of the review and structure the research question [6]. The methodology was carried out focused on the titles of the articles that highlighted the relevant keywords.

First, an exploration of research articles was carried out to identify and select relevant high-impact articles from the Scopus platform that belong to the intersection of “Big Data”. Initially, the results without filters show us 46,709 articles, so these filters were implemented to include only articles classified within the subject areas of engineering, computer science and business, to align them with the technical and interdisciplinary nature of the research. Secondly, the keywords used are “Marketing”, “Marketing Strategy” and “Precision Marketing”. In addition, a filter was applied to include only articles published between 2020 and 2023.

Third, only the “Article” option was selected as the document type to ensure the inclusion of academic works that present in-depth research and analysis. Finally, the results were reduced to include only original articles available in open access. After this search, a result of 50 articles was obtained, which were evaluated based on their relevance to the research topic and their possible impact on the study objectives.

Research questions were formulated based on the PICOC method, which are crucial elements to focus the identification of studies and data extraction. Each research question is composed of the following PICOC components, shown in Table 1. RQ: how can the use of big data in the field of marketing compared to traditional approaches improve marketing productivity in the current context?

Table 1. Research questions and objectives

| Research question | Objective |
|---|---|
| RQ1: what are the key challenges the marketing industry is currently facing? | Determine the most used keywords in the papers on mobile applications and cybercrime prevention. |
| RQ2: what are the specific benefits of using Big Data in marketing? | Identify the most cited papers by country, number of citations and sources in research on mobile applications and cybercrime prevention. |
| RQ3: what are the technologies applied in Big Data most used in marketing? | To know the classification of computer crimes in the investigations reviewed. |
| RQ5: in which specific sectors is Big Data most frequently used in marketing? | Determine the authors who frequently co-occur in research on mobile applications and cybercrime prevention. |

In Table 2, the PICO elements are shown with their associated keywords. The search equations were used according to the selected sources, as shown in Table 3. During the process of identifying articles in the Scopus database, specific inclusion and exclusion criteria were applied to select documents that would be considered eligible for a review. This selection process ensured that only the most relevant and research-

appropriate articles were included in the research, following a comprehensive approach and based on specific criteria. These criteria are detailed in Table 4.

Table 2. Pico elements

| PICO | Keywords | Associated keywords |
|---|---|---|
| Problem | Marketing industry | Marketing companies, marketing professionals, marketing firms, marketing agencies, marketing experts, marketing industry |
| Intervention | Use of big data in marketing | Big data in marketing, data analytics in marketing, data-driven marketing, marketing with big data, utilizing data in marketing, personalization in marketing |
| Comparison | Traditional methods without big data | Traditional marketing methods, conventional marketing strategies, non-data-driven approaches, old-school marketing, marketing without data, traditional vs. data-driven marketing |
| Results | Improve productivity | Enhancing productivity, productivity optimization, work efficiency, process improvement, increasing effectiveness, time management |
| Context | In today's marketing industry | Marketing industry, marketing sector, current marketing trends, contemporary marketing challenges, innovation in marketing, changes in marketing |

Table 3. Sources and search equations

| Source | Search equations |
|---|---|
| Scopus | TITLE ("Big data") AND PUBYEAR > 2019 AND PUBYEAR < 2024 AND (LIMIT-TO (OA, "all")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "ENGI") OR LIMIT-TO (SUBJAREA, "COMP") OR LIMIT-TO (SUBJAREA, "BUSI")) AND (LIMIT-TO (EXACTKEYWORD, "Marketing Strategy") OR LIMIT-TO (EXACTKEYWORD, "Marketing") OR LIMIT-TO (EXACTKEYWORD, "Precision Marketings") |

Table 4. Inclusion and exclusion criteria

| Inclusion criteria | Exclusion criteria |
|---|---|
| **CI1:** focuses on subject areas related to engineering, computer science or business. | **CE1:** does not belong to the subject areas of engineering, computer science or business. |
| **CI2:** the keywords used are marketing, marketing strategy and precision marketing. | **CE2:** they do not contain the keywords marketing, marketing strategy and precision marketing. |
| **CI3:** the publication period covers from 2020 to 2023. | **CE3:** outside the publication period of 2020 until 2023. |
| **CI4: i**t is of the "Original Article" document type. | **CE4:** it is not the "Original Article" document type. |

In the context of this systematic review, a conventional approach was used for the selection of articles to be used as sources in the research. The PRISMA standard was followed to identify the sources and documents that will be incorporated into the set of articles intended to delve deeper into the topic of discussion [6]. As a first step, we began searching for articles in the Scopus database using the search equation. At this stage, a bibliographic scope of 46,709 sources was obtained.

As a second step, criteria were used to select and discard information to screen the results. No duplicate articles or others were found that should be eliminated for other similar reasons. However, 28,590 non-article sources were excluded, leaving a total of 18,119 articles for review. The available articles were filtered to identify those with open access in the Scopus database. Of the 18,119 articles, 9,532 did not have open access and, therefore, could not be used.

As a third step, the exclusion criteria detailed in Table 2 were applied to the remaining 8,587 articles after the exclusion of documents without a digital version. As a result, 2,823 articles are excluded that do not belong to the subject areas of engineering, computer science or business, 5,680 articles that do not contain the keywords "Marketing", "Marketing Strategy" and "Precision Marketing", 10 articles outside the publication period between 2020 and 2023, and 24 articles that are not of the "Original article" document type. Finally, after rigorously applying the inclusion and exclusion criteria, it was concluded that only 50 articles met all the established requirements and, therefore, would be used as sources in the review project as shown in Figure 1.

Communication is the basis of business. Private cloud platforms are the starting point of the real-time data transfer process; data must be loaded every minute or even every 30 seconds or less. This type of equipment has high requirements for real-time information and commands provided by the cloud platform, as shown in Figure 2. For the different information requirements of different companies, a scalable platform must be built to meet with the requirements of industrial marketing, it promotes the integration of internet of things (IoT) technology and real business. A big data-based private cloud platform must support different devices with different real-time requirements [7].

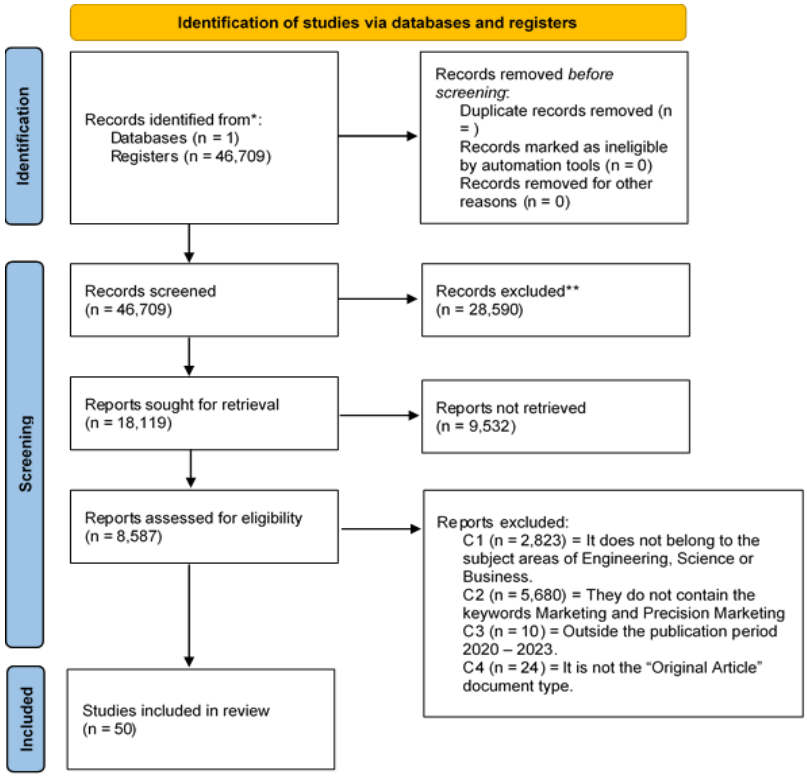


Figure 1. Flowchart of inclusion and exclusion of articles

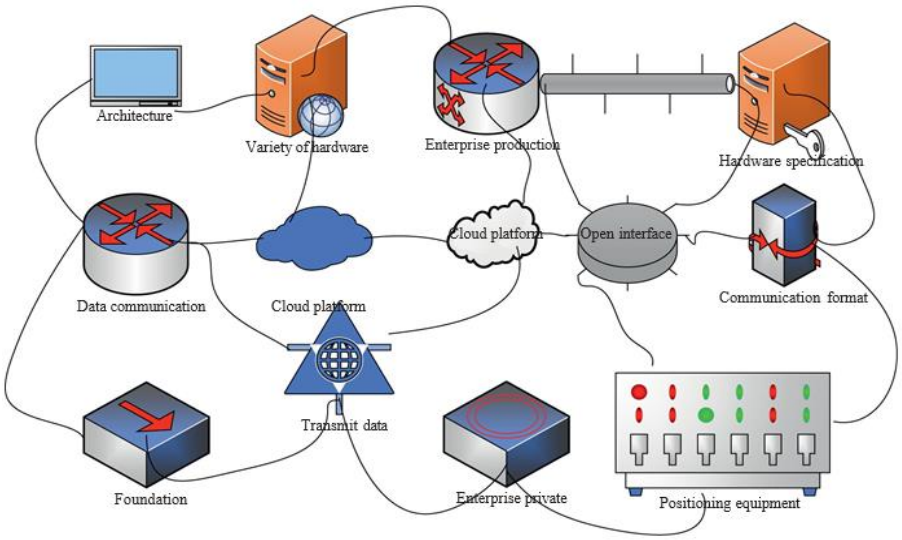


Figure 2. Infrastructure services for the marketing industry

## 3. RESULTS AND DISCUSSION

In this section, the reports generated from the analysis of all the articles reviewed in the research will be detailed, presented in the form of tables and graphs that will facilitate the understanding of the data collected. This will allow us to corroborate the effectiveness of the use of big data in increasing effectiveness in marketing, through a systematic review, considering aspects related to productivity [7]. In this review study, the challenges inherent in the effective application of big data in marketing, such as accuracy issues and a potential lack of innovation, are recognized. These challenges highlight the complexity of the marketing field and the need to address multiple aspects to optimize its use [8].

However, despite these challenges, the notable benefits that big data brings to marketing stand out. The ability to precisely personalize strategies, improve audience segmentation, and retain customers by better understanding their behaviors and preferences are key elements here. These benefits are crucial for rural tourism, where a deep understanding of travelers and their preferences can drive effective promotion and customer retention [9]. In this case, the recognition of the importance of integrating artificial intelligence and big data in the field of rural tourism and marketing is shared. As a first instance, this review study highlights the challenges inherent in the application of big data in marketing, but also emphasizes notable benefits, such as the ability to personalize strategies and improve customer retention, where the need is highlighted. of deeper integration to improve the tourist experience and marketing strategy.

Furthermore, the crucial role of data mining in identifying customer groups is mentioned, which is crucial in tourism marketing, as it allows offers to be adapted to specific segments of travelers with particular interests in rural tourism [10]. The emphasis on the prevalent use of big data in technological sectors, followed by administrative and financial sectors, highlights how this tool can be used to improve the effectiveness of marketing in rural tourism.

The findings suggest that the effective implementation of marketing strategies based on big data and artificial intelligence can have a positive impact on the sustainable development of rural tourism. The ability to accurately and deeply analyze tourism data can help rural scenic spots adapt to tourists' changing preferences, promoting environmental conservation, cultural heritage and local economic development. The research indicates that the strategic use of big data can lead to a significant improvement in the efficiency of tourism marketing and, therefore, in the income generated [11].

### 3.1. Key challenges the marketing industry is currently facing

A set of 26 articles was analyzed in order to address the questions raised in this review. As reflected in Table 5, the problems linked to the optimization of productivity in the marketing industry are presented, along with the number of articles reviewed that address them. Following the systematic review that examined the challenges facing the marketing industry, several problems were observed. Precision was identified as a problem in 11 of the articles reviewed, followed by innovation mentioned in 3 articles. Efficiency stood out in 9 articles. In addition, you will find 3 articles that were not specified, as shown in Figure 3.

### 3.2. Specific benefits of using big data in marketing

A set of 26 articles was analyzed to address the issues raised in this review. As reflected in Table 6, the specific benefits of using big data to optimize productivity in the marketing industry are presented, along with the number of articles reviewed that address them. Benefits were identified such as personalization in 6 articles, optimization in 4 articles, behavior prediction in 5 articles and in addition 9 articles were found that were not specified, as shown in Figure 4.

Table 5. Challenges facing companies and marketing professionals

| Challenges | Articles |
|---|---|
| Precision | 11 |
| Innovation | 3 |
| Efficiency | 9 |
| Not specified | 3 |

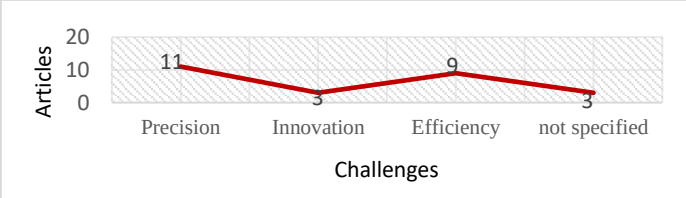


Figure 3. Challenges facing companies and marketing professionals

Table 6. Benefits of using big data in marketing

| Challenges | Articles |
|---|---|
| Personalization | 6 |
| Optimization | 4 |
| Behavior prediction | 5 |
| Not specified | 9 |

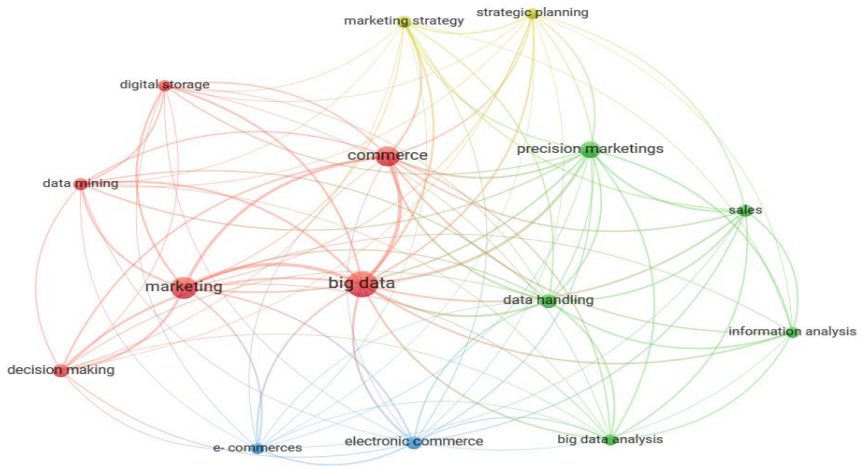


Figure 4. Keywords on the use of big data in marketing

### 3.3. Specific technologies applied in big data most used in marketing

To answer this question, it was necessary to carry out an analysis of the technologies applied to various aspects or characteristics related to the optimization of productivity in the marketing industry. According to Table 7, it is confirmed that the aspect most frequently addressed in the studies is related to data mining and marketing precision. These two aspects are recurring in the majority of the articles reviewed, which has allowed us to identify the groups of clients or communities involved in these investigations [5]-[50].

Table 7. Applied technologies in big data

| Applied technologies | References | Amount |
|---|---|---|
| Data warehouse | [5] | 2% |
| Machine learning | [8], [24], [27], [33], [44] | 10% |
| extract, transform, and load (ETL) | [19], [24], [26], [36], [37], [39], [45], [47] | 16% |
| Cloud | [3], [10] | 4% |
| IoT | [16], [20], [32] | 6% |
| Data mining | [5], [23] | 4% |
| Precision marketing | [13], [17], [19], [22], [28], [30], [31], [34], [38], [41], [42] | 22% |
| Management innovation | [2], [13], [20] | 6% |
| SGBD | [6], [14], [18], [19], [24] | 10% |
| Big data | [1]-[18], [21], [25], [26], [29], [31], [38], [40], [43], [46], [48], [49], [50] | 60% |

### 3.4. External factor with greatest influence on the integration of big data in the field of marketing

Among the articles collected we identified: 22 that highlight the influence of technological innovations in the advancement of big data in marketing, 11 that highlight the importance of integration and 4 that highlight the impact of the economic context on the implementation of strategies. of big data in companies. These articles provide a diverse and detailed view of how these external variables have shaped and directed the evolution of marketing as shown in Table 8.

Table 8. Factors that influence the adoption of big data

| Factors | Articles |
|---|---|
| Technological | 22 |
| Social | 9 |
| Economical | 4 |

## 4. CONCLUSION

The research, focused on systematizing the understanding of how big data improves productivity in the marketing industry, revealed a diversity of challenges, from accuracy and innovation issues to a lack of clarity in the literature on specific challenges. These findings reflect the complexity inherent to the marketing field, highlighting the need to address precision, innovation, efficiency and optimization, as well as the lack

of clarity in the identified challenges. Despite these challenges, the results revealed that big data presents significant opportunities to improve the personalization of strategies, optimize processes, and deepen the understanding of customer behavior and preferences. This ability to strengthen customer relationships highlights the relevance of big data in the evolution of modern marketing. The detailed analysis of the applied technologies highlights the crucial importance of data mining and precision in the identification of customer groups, underlining the need for precise and effective implementation of these tools in marketing strategies. Furthermore, the distribution of big data use in various sectors reveals a prevalence in technological industries, closely followed by administrative and financial sectors, suggesting widespread potential for its application in various business contexts. The research also provides the influences behind the adoption of big data in marketing, highlighting technology as the main catalyst, although the significant influence of social factors is recognized. This contrast with a more limited economic presence underscores the importance of considering multiple factors when implementing big data strategies in the marketing space. Despite the advances, it is essential to recognize the limitations of this study, such as the complexity in integrating data from various sources and the variability in data quality. The speed of technological change can also cause some findings to become obsolete over time. Ultimately, the results highlight the imperative to address a wide range of challenges, ranging from precision and innovation to clear understanding of specific obstacles. Only through a holistic and multidimensional approach, which takes into account both technological and social aspects, will it be possible to fully harness the potential of big data in the marketing industry, opening new opportunities and ensuring a sustainable competitive advantage in the changing business landscape.

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