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Review

Information Technology Adoption on Digital Marketing: A Literature Review

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Abstract: Data generation is currently expanding at an astonishing pace, and the function of marketing is becoming increasingly sophisticated and customized. Companies seek to understand their internal corporate environment and externalities and to exponentially enhance their marketing power. This study aims to understand the influence of Big data analysis on digital marketing. The methodologies used to approach this issue were: (a) a systematic literature review based on articles dated between 2014 and 2020; and (b) a bibliometric analysis of articles dated between 2000 and 2020 using the software VOSviewer. The literature review allowed us to conclude that in the next decades, the business world in general, and marketing in particular, will define more oriented strategies based on a more profound knowledge of consumer behavior. Artificial intelligence agents driven by machine learning methods, technology, and Big data will be a conditioning factor in defining these strategies.

Keywords: Big Data; digital marketing; systematic literature review; bibliometric analysis

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1. Introduction

Marketing analytics and, more specifically, the precise assessment of marketing performance, have long been priorities in business [1,2]. Technological innovations, including Big Data and advancements in data analytics are revolutionary opportunities for businesses to establish a more effective communication strategy with their target customers [3–5]. Big Data has thus become important for marketers as they saw in it an opportunity to explore new technologies and to gain strategic insights for their companies. This has hence enabled them to improve consumer experience, via a better combination of marketing offer and customer preferences.

Data-driven analytics, supported by Big Data, technologies and information systems allow for the extraction of significant data and its transformation into business insights [6].

Understanding how Big Data is used by companies and how it contributes to the definition of digital strategies is a matter of the utmost interest, hence the relevance of this study.

In this sense, this research aims at outlining the concept of Big Data and at understanding how its use influences digital marketing strategies, keeping in mind the importance of new technologies for society in general. The methodology that has been chosen to approach the research problem includes a systematic literature review based on articles dated between 2014 and 2020 and a bibliometric analysis of articles dated between 2000 and 2020. The bibliometric analysis has allowed us to understand the evolution of the research carried out in this field. The gathered data and its respective analysis will be made available in an open repository.

This article is structured as follows: Section 1 presents the context, justification, and relevance of the topic, it briefly mentions the main aim of the work, and it highlights the main conclusions. Section 2 is dedicated to the theoretical framework: it presents the fundamental concepts for contextualizing and understanding the study, based on the

bibliographic analysis considered relevant. Section 3 describes the research problem, the guiding question of the research, and the methodologies used for the collection and analysis of the data. This is followed, in Section 4, by a description of the results obtained through the systematic analysis and the analysis performed using a bibliometric tool. Section 5 presents the conclusions.

2. Theoretical Background

The increased accessibility of digital data, and advancement in the technology used to analyze it, has significantly impacted marketing. This section presents the main concepts of the topic based on literature.

2.1. Digital Strategy, Inbound and Outbound Marketing

Digital marketing can be defined as "an adaptive, technology-enabled process by which firms collaborate with customers and partners to jointly create, communicate, deliver, and sustain value for all stakeholders" [7]. Digital marketing uses digital techniques such as network, computer, multimedia, and interactive technologies to develop the market and to tap consumer needs [8]. Moreover, digital marketing is broad and involves several topics such as social media marketing, mobile marketing, analytics, e-commerce, and customer data mining [9].

The vast amount of data allows companies to benefit from Big Data by optimizing digital marketing strategies and predicting customer response to marketing [10]. Furthermore, data gathered from the digital environment can help track a firm's performance [7]. The vast amount of data in a digital format is also beneficial since it is easier to obtain information on a specific touchpoint between customers and companies. The gathered data is deemed to be useful when measuring and optimizing various online marketing actions and measuring the costs of customer acquisition and retention [7]. Gandomi et al. [11] metaphorically define digital strategy by comparing it to a path. The author argues that a strategy is not just a document or a plan but a way to reach a goal or a destination. Planning only organizes the strategy and facilitates its execution. According to the author, a strategy is only helpful if we have a clear destination.

A successful campaign must be designed and thought out holistically, allowing for some strategies to complement each other [11]. When it comes to applying strategies to company goals, there are two main paths to go about it: outbound marketing and inbound marketing. These two marketing styles differ mainly in their approach, costs, the time needed to obtain results, and duration [12]. The progress of technology has also added new pressures for companies who, to stand out from competitors, have been forced to increase their level of creativity in marketing and to reach potential consumers in other ways [13]. Outbound marketing is a strategy in which a company advertises its products and services, presenting information to consumers using advertising [14]. Inbound marketing is a strategy focused on attracting, converting, and pleasing customers. The more organic a company's communication is, the greater the customer's receptivity will be. It is up to companies to know how to offer their customers pleasant and unique experiences through the best channel [15]. Even if the shared content does not produce an immediate purchase action, as long as it is attractive and able to engage the customer, it can build brand awareness [16]. The main goal of this strategy is to create a connection between the brand and the consumer so as to culminate in the desired end—the action in the form of a sale, a donation, or a subscription [17].

Digital transformation and changes in consumer behavior have brought new challenges to companies that need to change their attitudes, creating new ways to win and keep their customers [15]. Traditional forms of advertising are called outbound marketing. This is a strategy in which a company advertises its products and services, presenting information to consumers even if they are not looking to purchase them [18]. Rancati et al. [19] postulate that the trend of this marketing strategy is decreasing due to the inevitable change in consumer behavior, reflecting the idea that consumers prefer to control the promotional

information they receive and do not accept being interrupted by messages they do not consider useful.

The progress of technology has also added new pressures for companies which, in order to stand out from competitors, have been forced to increase their level of creativity in marketing so as to reach potential consumers in a non-invasive way [20].

Adopting a traditional marketing strategy in this digital day and age has proven to be a risky option taken by companies to communicate with their audience. Digital transformation and changes in consumer behavior have brought on new challenges to companies that needed to change their attitudes, creating new ways to win and keep their customers [21,22].

2.2. Big Data

Industry, as it is known today, has undergone several changes throughout history. Looking at the past, it is possible to pinpoint three moments when three major technological advances took place. The First Industrial Revolution began in England in the 18th century. It introduced the use of water and steam to power the machines. The Second Industrial Revolution erupted with the discovery of electricity and the emergence of mass production factories. These were equipped with continuous production lines based on the division of labor and the introduction of conveyor belts resulting in an exponential increase in productivity. It led people into an era of affordable mass-produced consumer products. The Third Industrial Revolution, already in the 20th century, presented a wide application of electronic technology and information systems that increased the ability of companies to automate their processes, making them highly flexible and efficient. Today, we are at the height of the Fourth Industrial Revolution, where Internet technology has been introduced in industry, rejecting the dominance of the physical world and focusing on connecting it to the digital world [23,24].

The basic principle of this new industry supports the idea that through the interconnection of machines, production systems, and equipment, companies have the ability to create smart grids along the entire value chain, controlling and commanding the production processes independently [24].

Digital technology is the fundamental driving force of the Fourth Industrial Revolution. Concepts such as the Internet of Things, Artificial Intelligence, Machine Learning, and Big Data are some of the aspects of digital technology that improve the storage capacity and the progress of Machine Learning, contributing to a considerable increase in the volume of data [23].

Reinsel et al. [25] predicted that the amount of data created, captured, or replicated would grow from 33 zettabytes in 2018 to 175 zettabytes in 2025.

It is the agglomeration of data that is called Big Data and which, according to [26], is a commercial imperative that provides solutions to long-standing business challenges. This is just one of several components of innovation applied to industry 4.0.

Although the concept of Big Data has only recently emerged, companies have been collecting data since the middle of the last century, when the first commercial computers appeared. The volume of data was growing at a slow pace due to the high costs of computers and data storage [27]. With the evolution of technology and the emergence of the World Wide Web, there was high growth in data and its analysis [28].

Although it already existed, it is in this context of data, analysis, and information that the concept of Big Data has grown in popularity. Big Data is a generic term that assumes that information systems or databases used as the main storage resource are capable of storing large amounts of data longitudinally, as well as very specific transactions [29].

The tools currently available do not address all the problems inherent to Big Data analytics. However, comparatively, handling diverse datasets in a reduced amount of time has become quite a bit easier.

The importance of this technology relates to the fact that more and more companies produce, move, consume, or work with large amounts of data shared by customers [28]. It

is up to companies to know how to transform the raw data into meaningful and actionable knowledge for the benefit of customers and the company itself [15]. This is possible with the tools used within the Big Data universe, which have become indispensable for deciphering consumer behavior [16].

Big Data refers to a set of data that is excessively large and does not allow for the processing of data in the traditional way, thus requiring new processing technologies, namely advanced and unique technologies for storage, management, analysis, and visualization [15].

According to [17], there are three defining characteristics of Big Data—Volume, Variety, and Velocity.

Data volume refers to the size of data that is being created every second from a wide variety of sources [30]. According to [11], the volume of Big Data varies depending on factors such as time and type of data. What may be considered Big Data today may not reach the limit in the future because storage capacities will increase, allowing for even larger datasets to be captured. In addition, two datasets of the same size may require different data management technologies based on their type, as is the case with text data or video data [11].

Velocity is intrinsically linked to volume: the greater the velocity of data capture, the greater the volume generated. According to [25], this characteristic concerns both the velocity with which information is shared and spread over the Internet and the velocity needed to analyze the data in real time. The velocity with which a company receives, analyzes, and uses consumer data is an opportunity for gaining advantage over competitors. The authors understand that, given the amount and variety of information in the marketplace, competitive advantage is lost in a matter of minutes.

Variety refers to the structural heterogeneity of a dataset [11]. With the explosion of sensors and smart devices, companies' data has become complex as it includes not only traditional data but also raw, semi-structured, and unstructured data [31]. Ducange et al. [12] admit that traditional technologies are not able to efficiently handle unstructured data and thus new solutions are needed to address this gap.

Nonetheless, volume, velocity, and variety are just some of the distinguishing characteristics of Big Data. Turner et al. [27] state that the 3 Vs—volume, variety, and velocity—cover the main attributes of Big Data; however, organizations must consider a fourth dimension: veracity.

With the increase of information sources in the digital environment, it has become essential to analyze the veracity of data and its level of confidence. In the age of Big Data, companies need to recognize, adapt, and determine how they can use data uncertainty to their advantage [13]. According to [25], veracity encompasses the quality and reliability of the acquired data. This aspect is fundamental when thinking about the Big Data universe and security as it is the responsibility of those accessing the data to verify the integrity of what is being consulted. Fake data will lead to analysis errors and, consequently, to invalid decision making that may jeopardize a company's strategies. Big Data requires specific tools and large algorithms to achieve reliable results [30].

The ever-increasing amounts of Big Data lead to the questioning of its intrinsic value and how its analysis can generate value for the company [14]. The task is to eliminate unimportant and irrelevant data so that the remaining data is useful and usable for the company [32].

The most effective Big Data solutions are those that start by identifying the requirements of a business and then adapt the infrastructure, data sources, processes, and capabilities to support that business opportunity [26]. An organization's success will depend on its ability to extract insights from the various types of data available, both traditional and non-traditional [31]. According to [33], Big Data works on the principle that the more information companies possess, the more reliable it becomes and the better able it will be to gain new insights and make predictions about consumer behavior.

Companies must apply the most convenient strategies to their objectives, bearing in mind what they have obtained and the tools they have at their disposal, regardless of the origin, volume, or variety of the data [34].

2.3. Big Data in Digital Marketing Strategies

Big Data is reshaping management and marketing strategies through digitalization [35], representing a new frontier in business competitiveness and often being perceived as the 4.0 Industrial Revolution [36].

The use of data is transforming the way we live, work, relate to each other, and have fun. On a global scale, companies have begun to use data to reinvent themselves, introducing new business models and developing new sources of competitive advantage [25].

If marketing is defined as everything a company does in order to deliver its products and services into the hands of potential customers, then it is necessary that those who do it, do it well and better than their competitors to achieve success. For this purpose, it is essential to know customers from their needs, ways to meet them, and even what needs can be created for them [37]. The new source of competitive advantage is customer centricity: deeply understanding their needs to serve them better than any other company [38].

The obstacle here lies in the fact that consumers are increasingly demanding. As companies increase the digitization of their business and provide consistent and better customer experiences, consumers are embracing these customized, real-time engagements redefining their expectations of services [25]. To do this, businesses need data. However, having countless data is of little value on its own. What separates companies from success is their ability to turn data into insights about consumers and to turn those insights into strategies [39].

A few years ago, most companies collected data manually, and the findings were primarily for tracking operations or predicting needs. However, technological innovations have changed the rules. Advanced software systems have emerged which have led to a large reduction in analysis time, thus increasing the ability for companies to make quick decisions that help increase revenue, reduce costs, and stimulate growth [38].

Such software allows for large amounts of data to be collected, stored, and analyzed, resulting in valuable information about millions of consumers by looking at digital records that are passively collected as consumers go about their lives online [40].

Big Data technology can support more accurate, targeted, and creative digital marketing strategies [7]. Companies must focus on their own resources to create a single system of essential capabilities. These capabilities provide a strong foundation from which the business will draw value to pass on to customers and stakeholders, seize new opportunities, and grow. They also set the company apart from its peers and help create a sustained competitive advantage in the industry or sector [41].

If companies only pursue a technological adoption without considering a strategic framework, they may undermine their effort to generate value. To this end, they need to equip themselves with the best available technology on the market and to develop strategies and practices that foster competitive advantages. Companies also need to mitigate potential issues related to data security and privacy, balancing their desire for innovation and advantage with consumers' expectations and ethical norms [42].

3. Materials and Methods

The review of the theoretical framework has naturally led to the exploration of new knowledge. The learning and reflection processes resulted in the awareness of the importance that extraordinary tools have in assisting organizations in the process of delivering their services to their audience effectively and efficiently. However, during the research of the academic literature on the topic, the negligence of some companies regarding the application of emerging Industry 4.0 technologies in their digital marketing strategies was noticeable. This may reveal the lack of awareness that certain organizations have regarding the potential of these technologies in the development of digital strategies.

Thus, this study aims to enlighten readers of the growing technologies at a time when companies can benefit from their use to strengthen or even boost their market position.

The purpose of this review is to research the extent to which companies' use of Big Data influences their digital strategies. To guide the review, the following question was posed: What is the influence of Big Data on digital marketing strategies?

Seeking to solidify the current understanding of Big Data applied to digital marketing strategies and, consequently, to provide answers to the questions posed, we chose to firstly conduct a systematic literature review, and then to perform a bibliometric review, which will be presented below.

3.1. Systematic Literature Review

Systematic reviews, like traditional reviews, can help identify gaps in knowledge. However, the interest in a systematic literature review lies in the fact that it is a more neutral, rational, and standardized technological process, demonstrating objectivity and transparency in the process [43]. For this reason, it is possible to replicate the research process of a systematic review, ensuring its scientific rigor and minimizing the presence of bias [43].

Although the systematic literature review process has its roots in the field of medical science, over the years there has been investment in knowledge creation in other disciplines [44], notably in social science research, where this technique is increasingly important for clustering the studies conducted [41]. Denyer et al. [44] recognize the importance of reviewing articles in scientific progress in marketing.

An effective review creates a solid foundation for the advancement of knowledge, facilitates the development of theory, closes areas where a plethora of research exists, and uncovers areas where research is needed [45].

There are several authors who point out different steps for conducting research. According to [45], a systematic literature review is divided into five steps (see the Figure 1):

1. Formulation of the research question. The author recognizes the importance of finding a specific focus for the research. Therefore, the first stage is devoted to formulating the research questions. The question will guide the review by advocating which studies to include, which search strategy should be used to identify the relevant primary studies, and what data needs to be extracted for each study.
2. Locating studies. Literature reviews seek to locate, select, and evaluate, as much as possible, the research deemed relevant for the specific review questions. The exhaustive search for studies allows for assurance that the review findings have considered all available evidence and are based on best quality contributions.
3. Study selection and evaluation. To ensure that the studies to be reviewed are only those that are actually relevant to answering the review question, selection criteria are used. Decisions are recorded, specifying precisely why sources of information were included and excluded.
4. Analysis and synthesis. After obtaining the compilation of relevant sources, it is time to analyze and synthesize the information. The goal of this step is to analyze the different studies and to describe how they are related. At the end of the systematic review a complete tabulation of all included studies is displayed, providing a comprehensive summary representation of the field of study.
5. Publication of results. In the final stage, the results found are presented and discussed. A summary of the review, the limitations of the study, recommendations, practices, and future research needs are provided.

During the research of academic literature on the subject, the growing interest of researchers in the area of Big Data was noticeable, thus intensifying the number of studies and articles that provide concepts about Big Data and its applicability in companies.

In this sense, the present study aimed at conducting a general literature review by identifying, analyzing, and critically discussing how Big Data is used in companies' digital strategies.

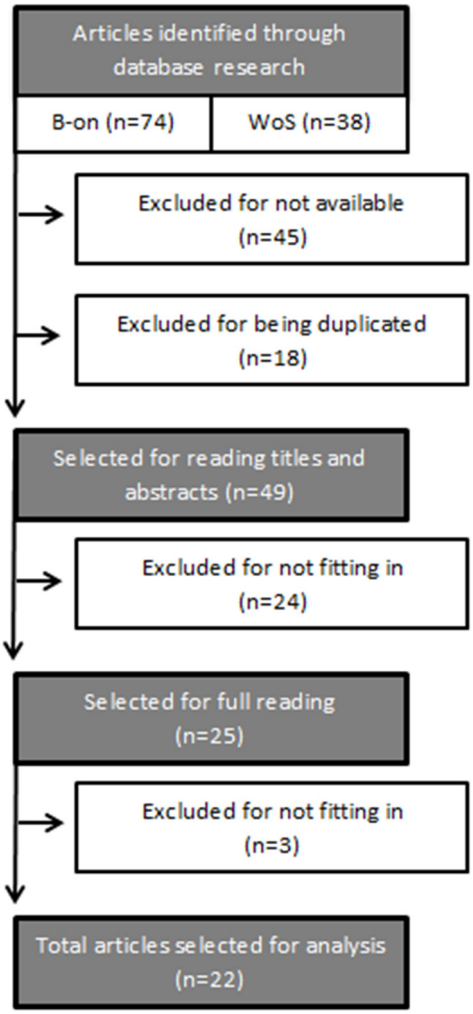

Figure 1. Flowchart of the study selection process.

To guide the research, the question "What is the influence of Big Data on digital marketing strategies?" was divided into the following specific questions:

- Question 1: What is the influence of Big Data analysis on the study of consumer behavior?
- Question 2: How can Big Data influence digital marketing strategies?
- Question 3: What kind of systems seek to adapt to technological changes?

Two platforms were used to select the studies: the online Knowledge Library (b-on) and the Web of Science (WoS).

In order for the search to be effective and result in as many relevant studies as possible, "big data" and "digital marketing" were defined as search terms. These criteria were defined considering the objective of the study and the research questions.

The selection process of the studies took place in June 2020, and a literature search was carried out in the two mentioned databases whose process listed 112 documents.

In the Web of Science database, after applying TOPIC: ("big data") and TOPIC: ("digital marketing"), 38 articles were extracted, dated between 2014 and 2020.

In the b-on database, the search was limited to the terms "big data" and "digital marketing" and these should appear as keywords. The search result listed 74 articles.

The total articles were then subjected to an evaluation and were screened according to the selection criteria. The inclusion criteria were: articles dated between 2014 and 2020, available for full reading in the referenced databases, and with a focus on Big Data in digital strategies.

The exclusion criteria are: duplicate articles, studies unrelated to digital marketing, systematic reviews and dissertations, and documents without conclusions.

From the initial 112 articles, 45 articles were excluded as they did not provide access to the full text or were not available in the library, and 18 articles were excluded as they were duplicates. Forty-nine articles were selected for the next step.

The first selection was based on the titles and abstracts of the articles, excluding all those that showed they did not fit the intended purpose, which resulted in 24 articles being excluded.

Often reading the title and the abstract is not enough to recognize the true relevance of an article, so it is essential to analyze the introduction and conclusion as well. These steps are intended to ensure the selection of the most relevant and of high-quality articles for the study that follows. Twenty-five documents were selected for a full reading. After this analysis, 3 articles were removed for not containing either conclusions or appropriate methodology for analysis. The total number of articles selected for the study was 22.

3.2. Bibliometric Review

This research is exploratory in nature, based on scientific articles available online. However, to add knowledge and relevance to the documentary analysis, it was complemented with bibliometric analysis with papers dated from 2000 to the present day. Bibliometrics is a type of research method where quantitative and statistical analyses are used to describe the patterns of publications in a particular field [36]. This method introduces quantitative rigor into the subjective evaluation of literature and is able to provide evidence of theory-derived categories of a review article [46].

The bibliometric analysis of the documents was performed with the help of two software programs—R Bibliometrix and VOSviewer. The choice of these two tools to perform the bibliometric analysis was based on their free use, allowing for their use without necessarily incurring costs, both for enjoyment in this report and for possible replication by interested parties; another factor that weighted on the decision was the possibility of submitting a large volume of data for analysis.

The data inserted in the software resulted from the search conducted in the Web of Science database, whose topics focused on "marketing" and "big data". As a result, 5508 articles were listed, and it was based on this result that it was possible to extract the information that is presented in Chapter 4.

4. Discussion

4.1. Systematic Literature Review

After applying the criteria that resulted in relevant sources, the next step is to analyze and synthesize the information. The objective of this phase is to analyze the different studies and describe how they are related.

The following studies were organized in chronological order to understand the evolution of the themes and approaches in digital marketing and Big Data. In this way, it is possible to understand some ideas formed over the years in which digital marketing and Big Data have grown in popularity (see Table 1).

Table 1. Relevant Studies list resulted from step 3 analysis.

Authors	Article Title	Objective(s)	Study Type	Conclusions
[47]	Viral Geofencing: An Exploration of Emerging Big-Data Driven Direct Digital Marketing Services	Explore the logic, evolution, business potential, and barriers that underlie the performance of location-based mobile marketing services.	Bibliographic analysis	Viralizing location-based marketing campaigns using geofencing requires the integration and complete real-time processing of user flows. Selecting the perfect combination to ensure effectiveness and maximum viralization of the offered message is only possible thanks to Big Data detection and response features.

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[48]	Inter-category Map: Building Cognition Network of General Customers through Big Data Mining	Analyze the messages and opinions that consumers post on social media and thus create a network of consumer preferences and perceptions of products in different categories.	Content analysis	By analyzing users' messages, the brand understands their preferences, allowing for the extraction of associations between product categories. The ultimate aim of data analysis is to introduce positive consumer responses to companies' new product or service launches. By observing consumers' attitudes and opinions on social networks, the company can try to mold public opinion, making the acceptability of new products and services easier.
[49]	Analyzing social networks from the perspective of marketing decisions	Present the benefits to marketing of exploiting social networks using two information technologies: Big Data and Social Network Analysis software.	Content analysis	Using software designed for this purpose, the authors recognize the advantages of exploiting customer practices in social media for marketing effects. Independently of activity or dimension, any company has the ability to promote its products or services and get immediate feedback by analyzing blog comments and social media conversations.
[50]	Qué entendemos por usuario como centro delservicio. Estrategia y táctica en marketing	Understand the challenges raised by the digital environment for companies; Learn how libraries can use their visitor data to reinvent themselves and attract more audiences.	Bibliographic analysis	As with any service, the focus should be on the users, getting to know their needs and desires. The marketing process is not about selling a product, but identifying the users' needs and how these can be fulfilled by the brand. To know their audience and offer what they expect, libraries must adapt to trends. Integrating different channels in their strategies, segmenting the audience, personalizing content, and providing quick answers to customers are some of the trends that can facilitate the communication between the brand and the user allowing for a win-win situation. To add value to the company, it must promote user involvement in its offers.
[51]	A cloud-based Big Data sentiment analysis application for enterprises' brand monitoring in social media streams	Present a cloud-based application for analyzing and monitoring brands through publications on the social network Twitter in order to identify implicit sentiments that facilitate the knowledge of users' opinions.	Content analysis	Through the suggested app, users are able to understand how other people feel about a searched brand, who the influential users are, and what the brand's reach is in a worldwide context. With this app, companies have access to new and innovative information that can help them efficiently recognize the needs and expectations of their audience.

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[52]	Organizational capabilities in the digital era: Reframing strategic orientation	Develop a theoretical framework that explains how the digitization of marketing channels and the resulting massive expansion of real-time data can impact organizational performance.	Bibliographic analysis	Due to the emergence of new technologies and consequent growth, companies must be able to develop organizational capabilities that enable them to respond to rapid market changes. The traditional perspective of dynamic capabilities and the more recent framework of dynamic marketing capabilities have in common the concern with the importance of developing market knowledge to understand and respond to new opportunities.
[53]	Use of data in advertising creativity: The case of Google's Art, Copy & Code	Demonstrate the resources offered by Google for creating new digital brands.	Literature review and Case studies	The use of data is recognized as an asset for advertising creativity. The ability of companies to capture user data in real time is an asset that allows them to create more effective and creative campaign proposals that meet customer satisfaction.
[54]	Tendencias tecnológicas en internet: hacia un cambio de paradigma	Presenting the technological trends and innovations for 2016	Bibliographic analysis	Every year technology conquers more power in the daily life of companies and in the definition of their activities. The exploration of data through artificial intelligence, the personalization of the offer, the interaction between user and machine, the elimination of barriers between channels, or the automation of marketing are only a few trends that transform society. The Internet is an inexhaustible source of opportunities that needs more than ever to be transparent in order to be accepted by the people.
[55]	Classification and Prediction Based Data Mining algorithms to Predict Email Marketing Campaigns	Through a learning model, predict open, click-through, or conversion rates of targeted email marketing campaigns.	Bibliographic analysis	Data mining techniques have been used to predict future trends and behaviors. Using these tools in the context of email marketing it is possible to explore open, click, and conversion rates to evaluate the effectiveness of campaigns. The system present in the article seeks to predict these rates before the email is sent to consumers, resulting in a company's ability to personalize emails taking into consideration the audience's needs and preferences. By sending more personalized and relevant messages, these will be much better received by the audience, allowing for an improvement in the performance of the email channel.

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[56]	Big Data and Data-Driven Marketing in Brazil	Know the marketing strategies related to Big Data that are being implemented by Brazilian companies.	Interviews and Case study	Theoretical knowledge is not always put into practice. This article shows that the companies under study recognize the importance of data management and the capability to analyze it. However, the attitude taken by them is not yet the desired one, neglecting the ability that data has to anticipate actions and predict trends. Thus, it is possible to recognize the presence of strategies aimed at Big Data in Brazilian companies, but these cannot be classified as users of Big Data because they do not benefit from all the potential of this tool.
[57]	Data driven marketing for growth and profitability.	Explore the adoption practices of data-driven marketing and how companies can increase customer centricity through better use of data.	Questionnaire	Big Data, combined with data-driven marketing, enables customer centricity. Using this system allows companies to recognize the "right" customers, work with them, and encourage them to develop a longer-lasting relationship with the brand. However, the success of this strategy is contingent on the company's ability to invest its resources in data-driven marketing. Investing in the right people, infrastructure, and processes can result in a better marketing audit and contribute to a higher return on the marketing investment needed to sustain an organization's growth and profitability.
[58]	New ways of interacting with culture consumers through cultural services marketing using Big Data and IoT	To make known the strategies that the performing arts and cultural events industry can adopt to cope with the reality experienced.	Bibliographic analysis and Content analysis	The authors highlight the term "convergence" to explain the need to bring together two concepts that were previously separate. This idea allows interdisciplinary exploration in order to create an original user experience. The Internet has impacted the way the marketing mix was developed, offering the possibility to explore new product distributions, price testing, create new consumer segments, and have a better awareness of consumer needs and motivations. In addition, consumers are digital and express their desires in the online environment, allowing companies to get to know them. In the case of performing arts and cultural services companies, they should offer a unique selling proposition, different from pricing models. The authors propose creating campaigns that appeal to the consumer's emotion, a story that makes them feel like they own them and convinces them that they not only want but need the company's service.

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[59]	Uso y valor de la información personal: un escenario en evolución	Recognize the interest of the disclosure of personal data and its analysis for three specific entities: companies, consumers, and the public administration sector.	Bibliographic analysis	For companies, knowing their customers' information allows them to create campaigns that are more interesting and appropriate to their audience and the conditions that this imposes, improving their receptivity. For consumers, the data is needed to create personalized content that offers undeniable added value to those who enjoy it. Meanwhile, the government, the entity that stores the largest amount of personal data, must be aware, protecting the rights of its citizens and, in this way, must repress practices that put their privacy at risk. However, the circumstances experienced in the digital environment require other efforts by the public administration, and the law that regulates privacy must adapt to the situation in which it applies, at the risk of losing its effectiveness.
[60]	An impulse to exploit: the behavioral turn in data-driven marketing.	Know the implications on user behavior when confronted with data-driven marketing strategies.	Bibliographic analysis	The data required from consumers should be only those essential to the implementation of the company's proposed actions, and its purpose should be explicit. However, not all marketers do this correctly, with some using data-driven marketing to manipulate consumer's wants and needs. These practices, when not properly regulated and shared, increase the distrust of consumers who are unaware of the treatment of the data they share.
[61]	Establishing high value markets for data-driven customer relationship management systems An empirical case study	Define valuable and more competitive markets by applying data-driven CRM systems.	Bibliographic analysis and Content analysis	From data-driven CRM (custom relationship management) systems it is possible to know the customer and establish valuable markets. These systems allow the company to know its customers and the buying behavior of each one individually. By knowing the characteristics of the market, it can be divided into clusters, allowing marketing managers to implement plans and campaigns targeted to different types of customers considering their value. In this way it is possible to recognize the specificities of each group and assign specialized services or offers for each one.

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[62]	Towards the Adoption of Machine Learning-Based Analytical Tools in Digital Marketing	Explore the potential of machine learning in marketing analytics; To know the degree of implementation of the technology in Slovak companies; Understand the attitude of agencies and marketing managers towards the active use of machine learning tools.	Interviews and Questionnaire	Through the research conducted, it was possible to confirm the significant impact that marketing analytics tools have on the process of preparation and implementation of strategies. The data collected allows us to acquire know-how from previous campaigns, analysis of available studies and data, and opinions and experiences already observed. Working with analytical tools allows acquiring an overview of competitors' activities and market mapping, speeding up the decision-making process since data is instantly available, the possibility of segmentation by target groups considering behavioral profiles, real-time data tracking for campaigns or even the accuracy of observed parameters. Although the survey reveals insecurity on the part of some managers regarding the definition of basic concepts in the area, they recognize its importance and believe that machine learning and artificial intelligence will be pillar concepts in the future of digital marketing.
[63]	The Digital Sales Transformation Featured by Precise Retail Marketing Strategy	Understand the situation of retail companies in China and how they can remain effective by using precision marketing.	Bibliographic analysis	In order to improve the situation for retail companies in China, they must rely on technology to drive precision marketing. The steps to be taken should include establishing an information base of target groups, understanding market positioning, providing customized products to meet increasingly stringent market conditions, and encouraging cross-selling. This whole system should be supported by Big Data technologies.
[64]	Manipulate to empower: Hyper-relevance and the contradictions of marketing in the age of surveillance capitalism	Analyze hyper-relevance in light of the paradox between consumer empowerment and autonomy on the one hand and control and manipulation of decision making on the other.	Bibliographic analysis	Application optimization, consumer monitoring, response accuracy, design, or consumer experience are a step towards a service specifically designed for each consumer. Consumers thus believe that their decisions are autonomous, but in fact they are often decisions designed by computational marketing analytics systems, generated from the data itself. The marketing vision is to create an environment where marketing is everywhere and is no longer noticed by people

Table 1. *Cont.*

Authors	Article Title	Objective(s)	Study Type	Conclusions
[65]	Digital analytics: Modeling for insights and new methods	Understand companies' efforts to generate strategic insights given the context experienced in the fundamentally technological society	Bibliographic analysis	The evolution of technology exerts an inevitable force on consumers, changing their needs and demands, and on companies, forcing them to develop internal capabilities if they are to keep up with the competition.
[66]	Social media marketing: Who is watching the watchers?	Identify consumer perceptions of the use of social media data for marketing purposes.	Interview	For consumers to have confidence in social media and consequently grow their comfort with digital marketing practices, platforms should limit access to users' personal data, improve transparency about data collection and use, implement acceptance procedures, and offer benefits to consumers. Marketers must recognize and consider the impact of their actions on all stakeholders since trust is a key factor to keep positive long-term relationships.
[67]	Digital advertising: present and future prospects	Understand the changes of data-driven marketing communications, the impact of artificial intelligence on content production, and Big Data on campaign execution.	Bibliographic analysis	Creating marketing campaigns based on advertiser intuition is an outdated process. Instead, marketers should explore the value of social media, which provides more reliable information about the audience's preferences. In this way it is possible to adapt the message and personalize experiences, adding value to the campaign and therefore increasing consumer acceptance of the message received.
[68]	Machine learning and AI in marketing—Connecting computing power to human insights	Briefly discuss common machine learning methods and processes and their implication for business.	Bibliographic analysis	The authors discuss the notion of machine learning and how the methods used are capable of processing unstructured, large-scale data generating strong predictive performance. However, these methods may lack transparency and interpretability. Machine learning methods are core components in marketing research, used to extract insights from unstructured, tracking, and large-scale network data and should be used transparently for descriptive, causal, and prescriptive analyses, to map consumer purchase journeys and develop decision support features.

After analyzing the articles, the authors find that in the coming decades, the business world in general, and digital marketing in particular, will witness the proliferation of automated artificial intelligence agents driven by machine learning methods in all aspects, driven by Industry 4.0 technology, in particular Big Data and associated technologies.

The next section will present the bibliometric analysis.

4.2. Bibliometrics Analysis

We used R Bibliometrix [69] software to perform bibliometric analysis and build data matrixes for co-citation, coupling, scientific collaboration analysis and co-word analysis, and VOSviewer [70] to create data clusters from analyzed articles. The use of Bibliometrix is gradually extending to all disciplines and is suitable for science mapping at a time when the emphasis on empirical contributions is producing large, fragmented, and controversial research streams [69]. For network matrix creation, we used R Bibliometrix (http://www.bibliometrix.org, accessed on 28 September 2020). The next step was categorical content analysis. However, before performing this analysis, the data had to be homogenized.

During the research of the academic literature on the topic, researchers' growing interest in the field of Big Data was noticeable, as the number of studies and articles that provide concepts on Big Data and its applicability in marketing multiplied (see Figure 2).

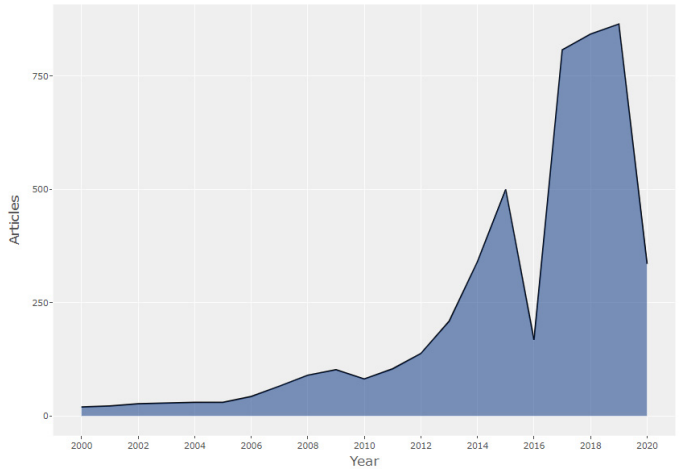

Figure 2. Evolution of production in the field.

According to [71], co-authorship networks mostly give emphasis to understand patterns of scientific collaborations, to capture collaborative statistics, and to propose valid and reliable measures for identifying prominent author(s). Figures 3 and 4 present the co-authorship network by authors.

Only authors with at least five documents in the database and at least three citations of their articles were considered. This restriction produced a network with 31 items (authors), grouped into 17 clusters, denoting a certain degree of dispersion as far as research in the field is concerned. The circles in Figures 3 and 4 regard the sampled authors' articles, and the variation in size is proportional to the number of articles by each of them. The clusters with more items, representing a higher number of co-authorships, are Clusters 1 (red) and 2 (green). All authors in Cluster 1 have the same number of articles (7) and the same number of links (35). In Cluster 2, Yong Yuan is the author with the most articles in the sample (17) and the author with the most co-authorship links (42). One can find, in the same cluster, other authors with a high number of documents such as Fei-yue Wang, Rui Quin, and Juanjuan Li. The remaining clusters are categorized as follows: one cluster with three items, three clusters with two items, and twelve clusters have only one item, which denotes a certain degree of dispersion as far as the production of literature in the field of marketing and Big Data is concerned.

Figure 4 shows the geographic distribution of the co-authorship network concerning the respective main articles in the database by country. As can be confirmed, by the extent of the elements, the most represented countries are the United States of America and China, with a far higher number of articles than any others. A word cloud is a form of visual representation of word frequency and value that can be used to provide instant insight into the most important terms in data—in this case, the keywords of the articles. The size of the font varies proportionally to the number of terms (keywords) within the articles,

making it easier to perceive the most prominent ones. Figure 5 shows the result of an analysis based on the co-occurrence of keywords. From the options "Author's keywords", "Keywords Plus", and "All keywords", the latter was chosen as it encompassed the first two modalities. The aim of this option was to include the widest range of words and to use the complete counting method that attributes the same weight to each co-occurring link. It is possible to distinguish the most used keywords as being "big data", followed by "model", "management", "impact", "performance", and "market".

"A keyword co-occurrence network (KCN) focuses on understanding the knowledge components and knowledge structure of a scientific/technical field by examining the links between keywords in the literature" [72]. Figure 6 presents the KCN of our study. The analysis of the articles resulted in three clusters, namely: Cluster 1 (red) contains eight terms, Cluster 2 (green) contains seven terms and Cluster 3 (blue) contains five terms (cf. Figure 6).

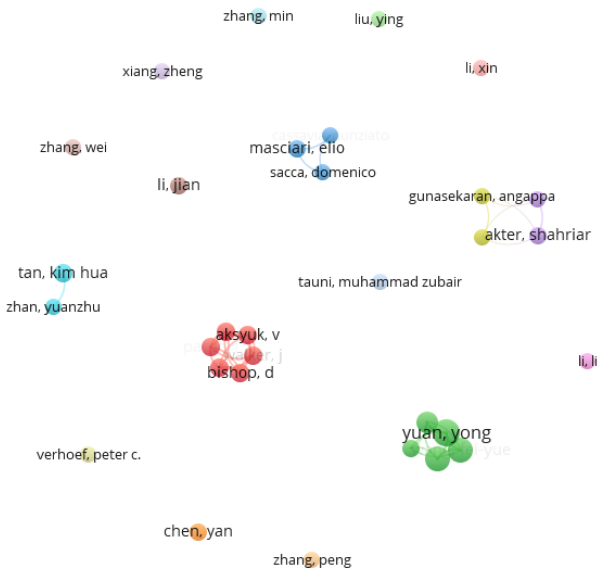

Figure 3. Co-authorship network by authors.

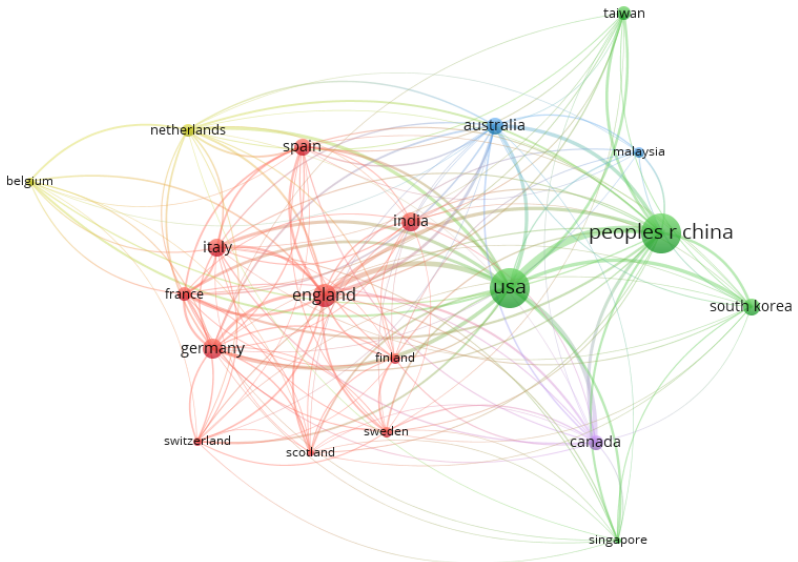

Figure 4. Co-authorship network by country.

Figure 5. Word cloud.

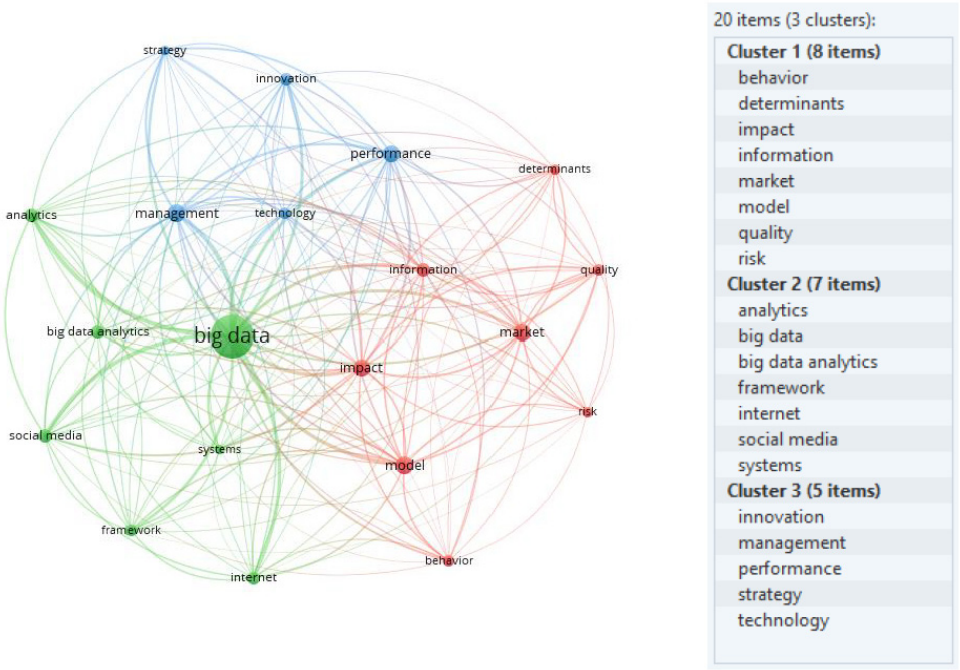

Figure 6. Keyword co-occurrence network.

When comparing this cluster with the previously performed analysis of the articles, it is possible to see a match in the terms used.

Cluster 1: The influence of Big Data analysis on the study of consumer behavior: from the companies' point of view, data allows them to know their audience and, thus, to deliver offers that meet their expectations. From the consumers' point of view, they get what they want without having to look for it. It is a win-win situation for both sides. However, in an environment where the volume of data is colossal and it is within easy reach of any entity, there is a growing concern from consumers about the misuse of their personal data for unauthorized purposes [60]. Many people are not comfortable with some practices, resulting in a negative impact for campaigns [66]. Consumer welfare should be the primary factor when defining marketing practices and it is therefore imperative that organizations adopt transparent practices and data privacy policies so as to promote security and trust to consumers as far as the nature and purpose of their information is concerned. Basic accountability, openness, and transparency are essential when influencing consumers' daily lives, interactions, and decision making [64].

Cluster 2: The influence of Big Data on digital marketing strategies.

Business strategies must increasingly contemplate new resources to keep the business competitive and relevant. In the current scenario, data extraction and analysis promote the efficiency and effectiveness of management processes. Companies have access to an

extraordinary amount of data, which is available for analysis in real time and will enrich future strategies. Having access to this data and using it in favor of more attractive and engaging campaigns is everything a company wants and needs to stand out from the competition. Analytical tools allow for more conscious and assertive decision making which results in increased productivity and financial return [62]. We thus enter a market environment in which professionals are increasingly basing their decisions and business plans on information generated by the customers themselves, making sounder and more effective choices both in the short and long term.

Cluster 3: Type of systems that a company must adopt to adapt to technological changes.

Due to the inevitable technological changes, companies are forced to develop organizational capabilities that are fundamental to their survival in the market and, preferably, to increase their notoriety and relevance in relation to their competitors. This requires specific knowledge, creative activity, practical thinking, and the ability to understand user decision making [73]. The ability to analyze data in real time is another asset for any company, especially in a high-speed market, where companies should become faster at identifying challenges and opportunities [74]. This will be enable them to create more effective, creative campaign proposals that meet customer satisfaction [53]. Companies will adopt Big Data storage systems equipped with automated artificial intelligence agents [63,68] driven by machine learning methods across all aspects, driven by Industry 4.0 technology, particularly Big Data and associated technologies.

5. Conclusions

The role of Big Data in digital marketing has expanded in the past several years. The main contribution of this review and mapping of literature is now a clear chart detailing what has already been published in this field of knowledge. We identified the most important and relevant publications on the subject, detailing the topics that have triggered the greatest level of academic interest and provided details about the use of technologies in a digital context.

The methodology chosen to answer the research questions was a systematic literature review and a bibliometric analysis, using VOSviewer. Concerning Question 1, i.e., "What is the influence of Big Data analysis on the study of consumer behavior?", one of the most relevant advances for the use of data in marketing is the analysis of data to predict future consumer needs and behaviors. With market trends constantly changing, predicting new developments before they happen is an essential part of an organization's success in modern marketing. If marketing managers can understand the key motivations that form the basis of consumer decision making, they will be able to predict future consumer behaviors with a certain degree of certainty. By predicting customer practices and customs, companies will be able to identify and segment high-value customers, encourage loyalty, reduce spending on marketing campaigns, and customize the consumer's experience. In fact, understanding the target audience and the messages that will have the most impact on each segment allows for marketing actions to be more precise and, thus, significantly improve customer experiences. Ensuring a good experience not only promotes customer satisfaction but it also helps improve customer loyalty to the brand.

Concerning Question 2, i.e., "How can Big Data influence digital marketing strategies?", the role of data in companies is becoming increasingly strategic. Whatever their activity, data is a true ally in the improvement of management processes, as it contributes to the achievement of business efficiency and quality. However, the mere availability of information does not guarantee its security, nor does it clearly reveal solutions for the companies' business problems. Data analysis solutions are not only tools but also a way to generate insights and a way to make decisions based on the valuable information generated by the market and by the company itself.

Concerning Question 3, i.e., "What kind of systems seeks to adapt to technological changes?", in a scenario of business competitiveness, an organization's strategies must

increasingly contemplate new resources and practices that keep the business competitive and relevant. For this, it is necessary that the decisions made are based on real and reliable information and not only on managers' intuition. This envisages a completely different approach to solving business problems. The analytical power of Big Data provides companies with critical insight into the behavior of their target audience, thus helping them to position themselves more insightfully and efficiently in the marketplace.

As far as the limitations of this study are concerned, some biases are deemed to occur. Namely: (i) whilst selecting the sources of the content (databases, etc.); (ii) whilst selecting and assessing the articles, or (iii) during the data synthesis and analysis. There is, therefore, the risk of subjectivity upon the studies' interpretation, which may compromise the final result.

The next intended step envisages an exploratory study of a qualitative (interviews) and quantitative (questionnaires) nature with companies and consumers so as to identify the influence of Big Data and similar technologies in Portugal.

In addition, other studies can be further explored, such as: the importance of data security to raise online trust, the processes to extract insights from Big Data for use in digital marketing, and the efforts required from companies to transform their traditional business model into a digital model.

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