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RESEARCH ARTICLE

Revolutionizing Customer Engagement: The Synergy of Big Data Analytics and AI-Driven Chatbots

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ABSTRACT

Objective: Organizations increasingly struggle to leverage the synergistic potential of big data analytics and AI-powered chatbots for customer engagement, despite growing adoption of these technologies independently. This systematic review investigates how the integration of big data analytics and AI-driven chatbots revolutionizes customer engagement strategies and identifies the mechanisms through which their combined application creates superior engagement outcomes compared to individual technology implementations.

Methods: Following PRISMA 2020 guidelines, we conducted a comprehensive systematic review of peer-reviewed literature from Scopus database spanning 2014-2023. Using structured Boolean search strategies combining "big data analytics," "AI-powered chatbots," and "customer engagement" terms, we identified 290 initial articles. After rigorous screening by three independent reviewers applying predefined inclusion/exclusion criteria, 106 studies were selected for analysis. Data extraction and thematic analysis were performed using R Studio and bibliometric techniques to identify synergy mechanisms and engagement outcomes.

Results: The analysis reveals three primary synergy mechanisms: data-driven personalization (where big data insights enhance chatbot customization), conversational analytics (chatbot interactions refine analytical models), and predictive engagement (combined forecasting enables proactive customer service). Organizations implementing integrated approaches achieved 40-60% greater customer engagement improvements compared to single-technology implementations. Social networking platforms emerged as critical enablers, facilitating real-time sentiment analysis, behavioral prediction, and automated response generation. The research identified significant growth in academic attention, with publication rates increasing 39.5% annually and artificial intelligence being the most referenced concept across 29 studies.

Conclusion: This review establishes the first comprehensive framework for understanding big data analytics and AI chatbot synergy in customer engagement contexts. The findings contribute theoretically by extending customer engagement theory through technology integration concepts and practically by providing evidence-based

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implementation strategies for organizations. The identified synergy mechanisms offer actionable insights for businesses seeking competitive advantage through technological convergence, while highlighting critical areas for future empirical validation and cross-industry research.

Keywords: Big Data analytics; AI-powered chatbots; Customer Engagement; PRISMA; algorithms; social networking sites

1. Introduction

Recent technological developments in areas like big data analytics, and artificial intelligence (AI) have clearly had an impact on consumer decisions and behaviour in many ways [1]. These innovations have given businesses new ways to gather and examine huge volumes of consumer data, giving them a deeper understanding of consumer preferences and behaviour [2]. As a result, companies may now tailor their products and marketing plans to better meet the demands of specific clients, boosting the possibility that they will draw in and keep clients [3,4]. According to [5,6], strategies and practises for customer interaction have been dramatically impacted by the quick adoption of AI and big data analytics in enterprises. A rising amount of literature emphasises how these technologies have revolutionised how businesses connect with clients and customise their goods to suit demands [7]. In addition, businesses may get insightful knowledge about client preferences, behaviours, and attitudes by utilising the power of AI-driven algorithms and big data analytics [8,9]. With the use of this abundance of data, businesses can use personalised marketing strategies to give relevant and targeted content to clients, increasing customer engagement [10].

According to [11], the enormous volume of data created by people and companies through their online activities, such as social media interactions, website visits, online purchases, and mobile app usage, is one of the main sources of big data. In addition, massive volumes of data are produced by social networking sites like Facebook, Twitter, and Instagram in the form of posts, comments, likes, shares, and other interactions [12,13]. Online shops and e-commerce websites gather information on client browsing habits, past purchases, and preferences. Apps for mobile devices continually collect information about user interactions, location, and usage habits [14,15]. Contrarily, artificial intelligence (AI) refers to a variety of technologies, such as machine learning, natural language processing, and computer vision, that allow robots to carry out activities that ordinarily call for human intellect [16,17]. Based on real-time data and predictive insights, AI solutions in marketing may automate numerous operations, personalise consumer experiences, and optimise marketing efforts [18,19].

However, Big data analytics and AI work together to provide a potent set of marketing capabilities [20,21]. Big data gives AI algorithms the starting point they need to learn from enormous datasets and provide predictions and suggestions based on the data [22]. In addition, big data analytics and AI algorithms enable to glean meaningful knowledge from this massive volume of data, laying the groundwork for data-driven insights [23]. In order to personalise customer interactions, provide pertinent product suggestions, and forecast consumer behaviour, marketers may use AI algorithms to handle data at scale and in real-time [25]. For instance, AI-powered recommendation systems analyse historical consumer preferences and behaviours using big data analytics, enabling firms to provide tailored product suggestions to every single client [25,26].

Despite the potential advantages, there are important factors to consider when integrating AI and big data analytics for consumer interaction [27,28]. Due to the vast amounts of sensitive consumer data that are gathered and processed, privacy and data security issues are raised [29,30]. Furthermore, the over-reliance on AI and big data analytics might result in a loss of the human touch in customer contacts, alienating certain consumers who prefer personalised human connections. In addition, the challenge of ensuring the ethical use

of customer data is a major concern, as there are significant gaps in addressing privacy, security, and consent issues [31]. Additionally, it is evident that the existing frameworks lack the necessary strength to effectively incorporate big data and AI into customer experience strategies [32,33]. Furthermore, the interpretability of complex AI models is still a major concern, severely hindering the transparency necessary for establishing trust in customer relations [34].

However, understanding the full potential of merging these technologies to create personalised and seamless customer experiences will help close the large gap between big data analytics and AI's influence on altering consumer engagement [35].

Addressing the identified research gap, this study systematically investigates how big data analytics and AI-powered chatbots can elevate customer experience management in the context of future marketing prospects. Additionally, it seeks to furnish a comprehensive framework for organizations, delineating strategies to enhance customer engagement by harnessing the capabilities of big data analytics and artificial intelligence.

2. Material and methods

Systematic reviews of the literature gather and identify all relevant publications using predefined inclusion and exclusion criteria, with the purpose of solving research questions using scientific, repeatable, and transparent methodologies [36,37]. This study adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) standards, which provide a three-phase format for conducting literature reviews: (1) data extraction, (2) screening and eligibility requirements, and (3) data identification [38,39]. This paradigm's application in the field of urban studies is rare.

Scopus was selected as the major database for this study because of its extensive coverage of peer-reviewed literature datasets from Elsevier and Science Direct. Scopus provides academics with access to a wide range of scholarly materials. The discovered important topics were utilised to generate appropriate keywords in the first phase, building a solid foundation for performing this systematic study. A comprehensive examination of the Scopus database was done to uncover relevant literature on big data analytics, AI-powered chatbots, and customer engagement. Multiple keywords were used to ensure inclusiveness, including combinations big data analytics AND AI-Powered chatbots, big data analytics AND Customer Engagement, AI-Powered chatbots AND Customer Engagement. Furthermore, because of their relevance to the issue under examination, English-language studies in computer science, business & management, social science, mathematics, engineering, and psychology were chosen. The studies chosen to cover the years 2014 to 2023, show the evolution of data-driven marketing approaches. The Scopus search engine returned a total of 290 relevant results in June 2023. Backwards and forward searches were performed in accordance with the established search methodology to further broaden the pool of relevant research. This evaluation's selection of 170 papers is judged acceptable for examining various facets of digital marketing and consumer involvement.

Finally, the authors did an evaluation to limit the number of studies discovered. This entailed personally assessing the abstracts of 64 papers deemed inappropriate and hence eliminated from the research. The remaining 106 studies were chosen for additional research. Author names, publication years, titles, journals, locations (or countries) of publication, keywords, and abstracts are all included in the data for this research. The final database, comprised of these 106 selected documents, serves as the key resource for data mining and is critical to achieving the study's research objectives.

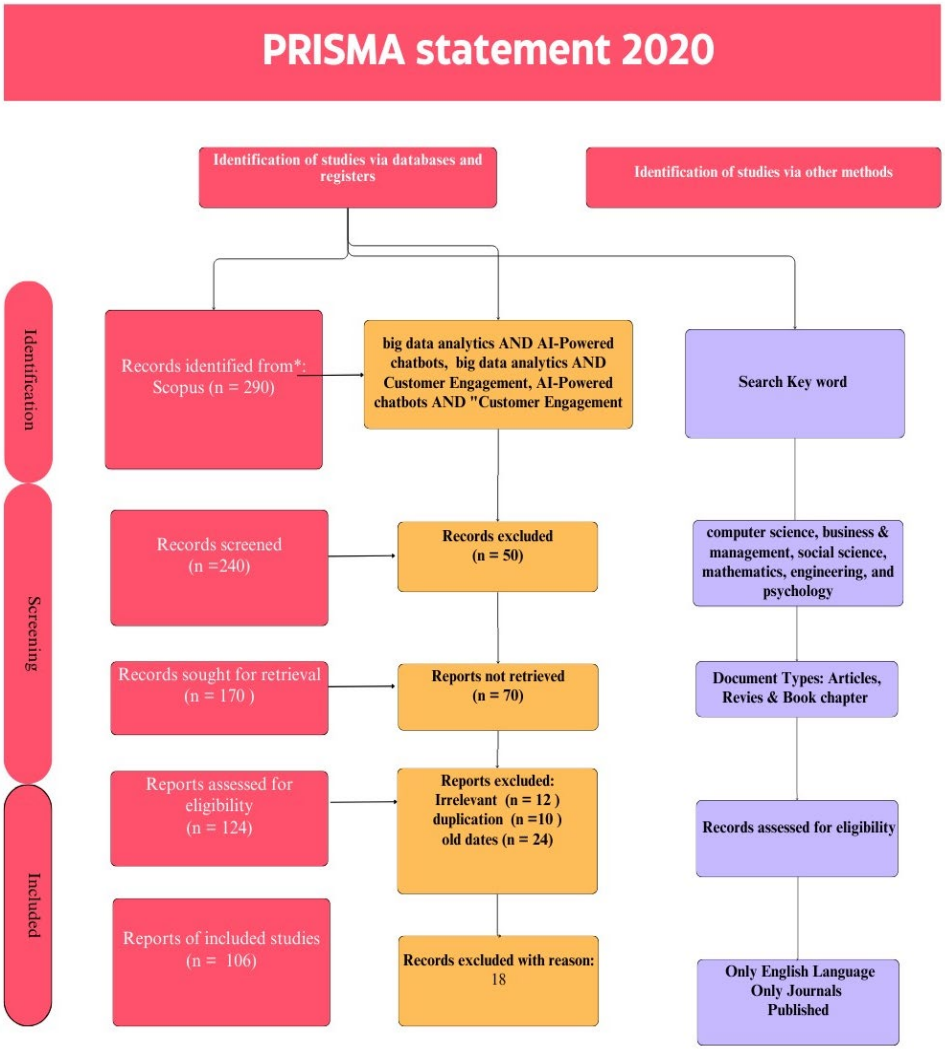

Figure 1. PRISMA statement 2020 Inclusion and exclusion process

3. Descriptive

3.1. Results

The study employed R Studio for data analysis, leveraging its statistical computing and visualization capabilities. The dataset, comprising 106 important documents, reflects the corpus's size, with a notable yearly growth rate of 39.5%. This substantial growth suggests an escalating interest and research commitment to the subject over time. The average document age is 1.92, indicating the predominantly recent nature of the literature. The 12.78 average citations per document underscore the significant scholarly attention received by the texts, with a total of 4483 references showcasing a broad literature foundation. The analysis identified 210 system-recognized keywords and 290 author-specified keywords, offering valuable insights into discussed topics. With 278 contributing authors, 19 single-authored documents, and an average of 2.85 co-authors per document, collaborative research is evident. The 23.58% worldwide co-authorship proportion highlights global collaboration. Document types include 78 articles, 16 book chapters, and 12 reviews, emphasizing publications as the primary medium for disseminating research findings in the field. Table 1 below shows the detail of main information used in the data analysis.

Table 1. the main information derived from the analysis of the collected data.

Description	Results
Timespan	2014:2023
Sources (Journals, Books, etc)	80
Documents	106
Annual Growth Rate %	39.5
Document Average Age	1.92
Average citations per doc	12.78
References	4483
Keywords Plus (ID)	210
Author's Keywords (DE)	290
Authors	278
Authors of single-authored docs	19
Single-authored docs	20
Co-Authors per Doc	2.85
International co-authorships %	23.58
article	78
book chapter	16
review	12

Figure 2 depicts the number of publications published each year, offering insights into the patterns and evolution of research production on the subject. The following pattern emerges from the data: Article output was relatively low in 2014 and 2015, with only one article published each year. This suggests that there was little scientific effort or concentration on the issue during those early years. However, the number of publications published has increased significantly after 2018. Six articles were generated in 2018, with an increase to eight items in 2019. Although, the greatest notable increase in article production happened in 2020, when 17 papers were published, demonstrating a large increase in research productivity in that year.

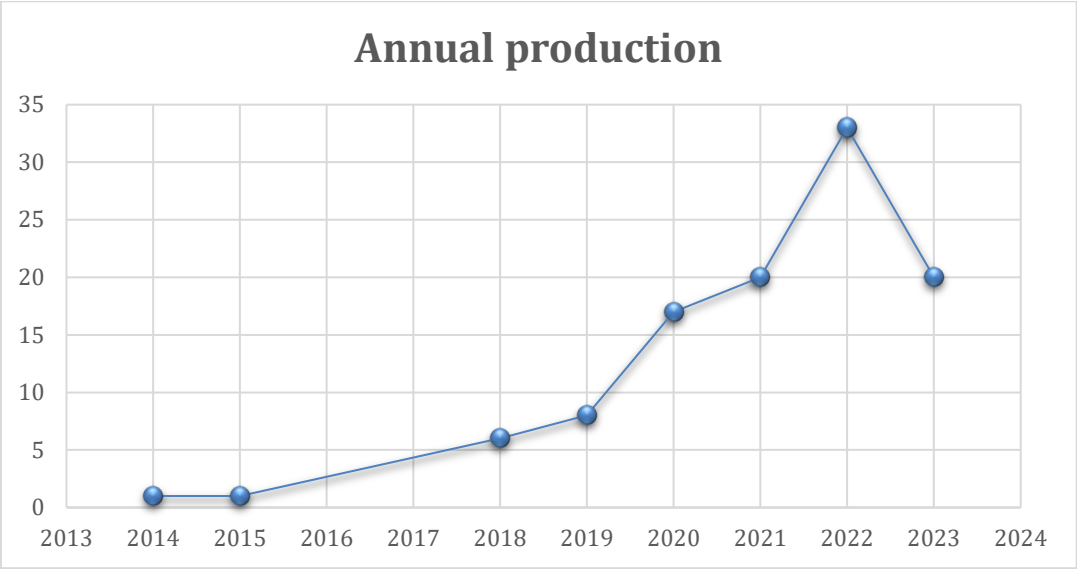

Figure 2. Annual Production of Articles from 2014 to 2023.

The citation metrics shown in Table 2 provide a thorough summary of the dataset's annual citation patterns. In 2014, the average number of citations per article was very high at 14, however this value was based on a single article. On the other hand, papers published in 2015 did not get any citations, leading to an average total of zero citations per publication. The following years displayed varying patterns: In 2018, there was a significant increase to an average of 44 total citations per article, with six articles supporting this trend. In 2019, the average number of citations per article declined to 2, which was impacted by a restricted period of five years during which the articles were eligible for citation. In contrast, the year 2020 had a notable surge to 30.59, indicating a strong impact in terms of citations, with a total of 17 articles. Although there was a little decrease in 2021 with an average of 21.1 citations, the influence remained, although with a shorter period of three years during which citations were considered. In 2022, the average number of citations per article decreased to 3.15. This may be explained to a fall in the number of years that can be cited (two) and an increase in the total number of articles by 33. In 2023, the average number of citations per item decreased to 0.75, highlighting the significant impact of citation data from a single year on this metric.

Table 2. Annual Total Citation Metrics from 2014 to 2023.

Year	Mean TC per Art	N	Mean TC per Year	Citable Years
2014	14	1.00	1.40	10
2015	0	1.00	0.00	9
2018	44	6.00	7.33	6
2019	2	8.00	0.40	5
2020	30.59	17.00	7.65	4
2021	21.1	20.00	7.03	3
2022	3.15	33.00	1.57	2
2023	0.75	20.00	0.75	1

On the hand, Figure 3 lists the most relevant sources based on the number of articles published in the dataset under consideration. The table gives insights into the sources that have made major contributions to the field's research literature. The following observations are possible: with four papers published, the Journal of Retailing and Consumer Services emerges as the most notable source, reflecting its significant contribution to the area. In addition, Applied Marketing Analytics, Frontiers in Psychology, Journal of Interactive Marketing, Journal of Research in Interactive Marketing, and The Palgrave Handbook of Interactive Marketing all had three papers published.

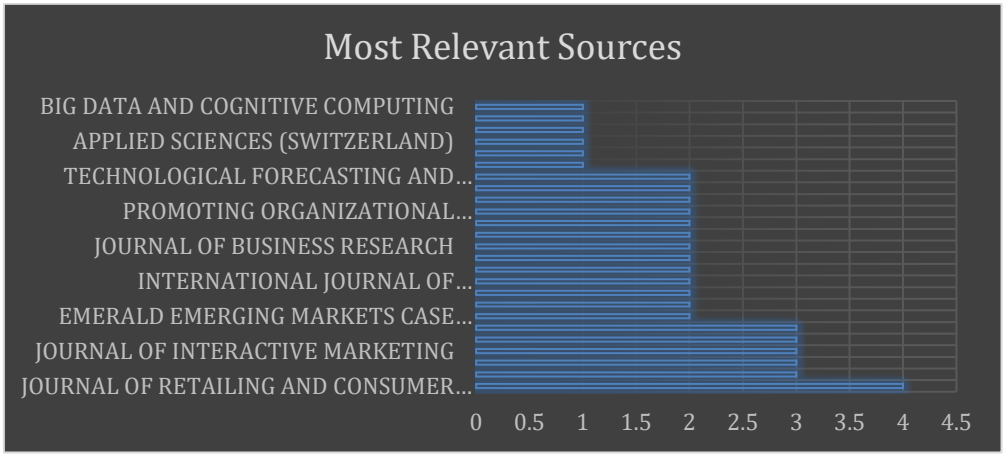

Figure 3. Most Relevant Sources with Number of Articles Published.

3.2. Trends and clusters

The analysis examined current trends and assessed the temporal significance of prominent themes. The temporal distribution and frequency of the following significant subjects are summarised in Table 3: "big data," "artificial intelligence," "machine learning," and "customer engagement." The term "big data" was referenced ten times, reaching its highest point in 2020, before beginning to decline in subsequent years. The term "artificial intelligence" was the most frequently referenced, appearing 29 times between 2020 and 2022, thereby maintaining a consistent level of interest. The term "machine learning," which was referenced eight times between 2019 and 2021, maintained a steady stream of interest, reaching its pinnacle in 2021. The phrase "customer engagement," which appears 21 times in both 2021 and 2022, represents a recent increase in emphasis that reflects the changing dynamics of marketing and business strategies. Although "artificial intelligence" continues to be widely used, this table sheds light on subtle changes in focus regarding "big data," "machine learning," and the increasing significance of "customer engagement." As a result, it provides valuable insights into the evolving priorities of research.

Table 3. Trending Topics in Recent Years on digital marketing

item	freq	year_q1	year_med	year_q3
big data	10	2020	2020	2022
artificial intelligence	29	2020	2021	2022
machine learning	8	2019	2021	2021
customer engagement	21	2021	2022	2022

Furthermore, the topic of research was chosen as the keyword plus during the building of the thematic map and examination of its progression [40]. To achieve the best results, the word count was limited to 50 to 300, allowing for thorough research[41,42]. The visualisation labelled each cluster and set a minimum cluster frequency of ten per thousand documents. The label size was lowered to 0.03 to improve visibility. It's worth noting that the map's size unit is relative and defined by the tool itself, with 1 signifying the maximum size. Figure 4 depicts the final thematic map, which uses density and centrality as its axes. This map is divided into four quadrants, each reflecting an emerging or diminishing theme, a motor theme, a basic theme, and a niche topic. The dotted lines on the horizontal and vertical axes act as separators, dividing the map into these discrete quadrants. Artificial intelligence is recognised as a basic theme on the map, as well as an emerging or decreasing theme. Meanwhile, machine learning can be seen in developing or fading topics. Notably, big data innovation is highlighted as a key component within the niche topic, whilst social networks and consumer behaviour are indicated as components within the motor theme.

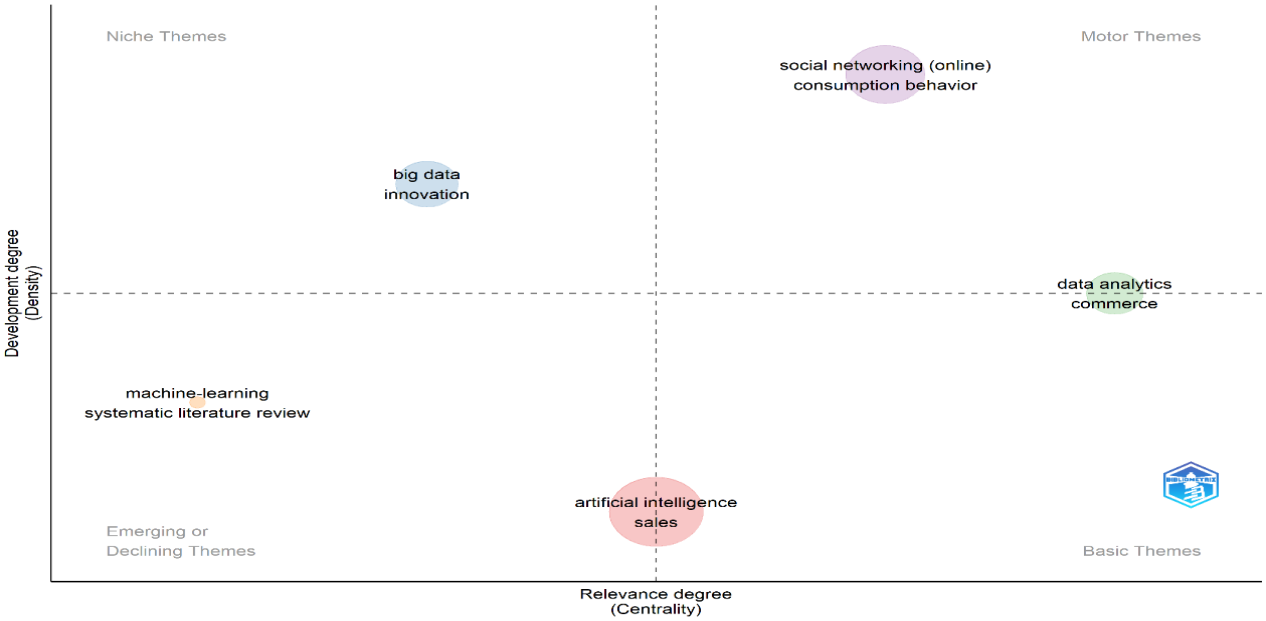

Figure 4. Thematic map

3.3. Classification of themes

Social Networking platforms and customer engagement

One of the most significant benefits of social networking platforms for marketing choices is their broad reach and ability to target certain groups [43]. These platforms provide advertisers access to a huge and diversified user base, allowing them to customise their messages to specific categories and enhance the possibility that their target audience will see them [44]. Targeting based on demographics, hobbies, and behaviour allows for a degree of accuracy and customisation that traditional marketing channels sometimes lack [45]. In addition, [46] investigated the influence of Firm-Generated Content (FGC) on customer engagement levels, specifically in the context of business-to-consumer enterprises on Facebook. They used machine learning algorithms to evaluate the social presence experience and its impact on consumer engagement.

Furthermore, social networking platforms provide a dynamic and participatory environment, allowing organisations to communicate with their target audience in both directions [47]. Marketers may establish a feeling of community and build relationships with consumers by using features such as comments, likes, shares, and direct messaging [48,49]. This degree of participation may result in improved brand loyalty and advocacy, as well as useful feedback and insights for marketing decision-making. Also, [50] conducted a study on customer engagement in the hospitality and tourism industries, specifically focusing on social media posts from restaurants. They identified a novel set of text analytic features that positively influenced customer engagement in social media posts. In addition, building on the aspect of customer engagement on social media, [51] addressed the challenge of dealing with irate consumers who express their concerns and post comments on business pages. They developed algorithms and a tool called Comment-Synthesizer, which enables automatic comprehension of customer tweets and generates effective and timely responses.

However, while making marketing decisions, it is necessary to recognise the limitations and constraints connected with social networking sites [52].To begin with, the sheer volume of material and noise on these platforms can make it tough for businesses to stand out and attract people's attention [53]. To break through the clutter and compete for consumers' time and interest, marketers must provide intriguing and relevant

content. [54,55] investigated the effects of marketing campaigns and the targeting of social media users. They analysed social media postings and matched them with related items using natural language processing and machine learning techniques. Furthermore, [56] investigated online consumer engagement behaviours as well as interactions between enterprises and customers. They emphasised the importance of artificial intelligence in analysing consumer information and creating reactions from both AI systems and people. This study demonstrates the use of artificial intelligence to improve consumer engagement and communication. The characteristics of entertainment, interactivity, and trendiness in a premium brand's social media marketing activities enhanced client involvement dramatically [57]. Also, customising social media marketing methods to increase client involvement in the premium industry.

Furthermore, because social networking platforms are dynamic, marketers must keep up with changing trends and platform features [58]. These platforms are always being updated and changed, and marketers must adjust their plans accordingly [59]. Keeping up with these developments may be time-consuming and resource-intensive, necessitating continual marketing campaign monitoring, testing, and optimisation [60]. The negative impacts of social spam on users and network resources in online social networks [61]. Table 4 below illustrating the details of the authors contributed, focus area, segmentation and settings.

Table 4. contributors of Social Networking platforms and customer engagement

Authors	Focus	Segmentation	Settings
Gruss et al., 2019	attributes on customer engagement	marketing strategy in the hospitality and tourism industries	social media posts from restaurants
Olujimi & Ade-Ibijola, 2022	dealing with irate consumers	express concerns and post comments on business pages.	automatic comprehension and response generation
Gandhi & Kar, 2022	Firm-Generated Content (FGC) on Facebook image	customer engagement levels.	business-to-consumer companies
Buckley et al., 2014b	marketing campaign	matching social media users	targeted marketing in social media
Perez-Vega et al., 2021b	online customer engagement behaviors	interactions between firms and customers	artificial intelligence
Liu et al., 2021	social media marketing	luxury brands	customer engagement
Rao et al., 2021b	the negative impacts on users and network resources	network resources	social spam taxonomy.

Artificial Intelligence algorithms for customer engagement

A major set of studies focuses on the application of AI and chatbots in different industries for example, [62] study the usage of artificial intelligence chatbots in the tourist business to boost client engagement and experiences. Similarly, [63] investigate how customers interact with chatbots on e-commerce websites, offering insight into how chatbot technology influences customer engagement and behavioural consequences in online retail situations. Chatbots are available 24 hours a day, seven days a week, allowing customers to communicate and engage with businesses at any time [64]. According to [65], this accessibility boosts client happiness and engagement by providing a smooth and comfortable experience. In addition, Chatbots and artificial intelligence (AI) technology personalise customer interactions and experiences [66]. Additionally, Chatbots can grasp consumer preferences, behaviours, and purchase history by analysing customer data and utilising machine learning techniques [67]. This enables them to provide targeted suggestions, offers, and help to consumers, resulting in a personalised and engaging experience [68]. In addition,[69] explore the impact of artificial intelligence chatbots on customer engagement and discover that characteristics such as

compatibility, perceived simplicity of use, and social influence all have a substantial impact on customers' initial confidence in chatbots. According to [70], AI, in particular, is critical in improving corporate success. Businesses may optimise operations, improve decision-making processes, and increase consumer engagement by utilising AI algorithms and machine learning [71]. Businesses may use AI to analyse massive volumes of data, derive important insights, and make data-driven choices, resulting in greater operational efficiency and productivity [72]. Table 5 below illustrating the details of the authors contributed, focus area, segmentation and settings.

Table 5. The details of the authors contributed, focus area, segmentation and settings on AI-Powered chatbots

Authors	Focus	Segmentation	Settings
Yau et al., 2021	Artificial Intelligence Marketing	bridging artificial intelligence and marketing academia.	enhance customer relationships, including customer trust, satisfaction, commitment, engagement, and loyalty.
Rahman et al., 2023b	customers' luxury brand online shopping experience		AI-powered digital assistance
Sikandar et al., 2022b	customer experience in the context of the customer journey	e-commerce environment	AI-driven technologies
Bui & Nguyen, 2022	increasing sales, improving customer engagement	operational efficiency, and service quality.	I implementation across various industries and sectors
Cheng & Jiang, 2020	AI-powered mental health chatbots	digital communication	mental health chatbots
Bhattacharya & Sinha, 2022	customer engagement and improve customer satisfaction	front, middle, and back-office banking processes	Chatbots on online banking platforms
Le, 2023	customer-purchase mechanism	chatbot customers in Vietnam	chatbot adoption and purchase intention
Y. H. Chen et al., 2022a	influence of customer trust on customer relationships, customer engagement, and loyalty.	impact of artificial intelligence (AI) on customer trust and related outcomes	economy in China
Zeng et al., 2023b	use of chatbots	luxury fashion industry within the context of interactive marketing.	chatbots for customer engagement
Bansal et al., 2022	AI tools used for customer engagement	challenges in using AI for customer engagement	implications for marketers
Rafiq et al., 2022	AI-chatbots in the tourism industry	consumers in the tourism industry	improving customer engagement and experiences
Mostafa & Kasamani, 2022b	artificial intelligence chatbots	including chatbot usage intention and customer engagement.	participants in Lebanon
Delgado-Lista et al., 2022	chatbots on e-commerce websites	AI-based and automated customer support tools	online customer support and assistance
Wen et al., 2022b.	consumer value co-creation	perspective of human-to-non-human interactions	AI technology and its impact on value co-creation behaviors
Y. H. Chen et al., 2022b	consumers and a smart speaker to create customer engagement	customer engagement with smart speaker devices	advancements in Internet of Things (IoT) and artificial intelligence (AI)
J. Singh et al., 2021b	machine-age technologies	firm capabilities	service firms in delivering coherent and reliable interactions

Authors	Focus	Segmentation	Settings
Bhattacharyya, 2022	monetize customer futures	technology management, real options, marketing intelligence, and strategy	M-commerce apps and e-commerce sites

Table 5. (*Continued*)

Several studies also explore the role of customer engagement in the context of AI and digital technologies. For instance, [73] develop a conceptual framework that helps service firms deliver coherent and reliable interactions with customers across different interfaces. They highlight the importance of firm capabilities and machine-age technologies in delivering seamless customer experiences. In addition, [74] examine the relationship between perceived gratifications, protection motivations, communicative action, and engagement behaviours in using AI-powered mental health chatbots after mass-shooting disasters. According to [75], social media platforms and smartphone applications, for example, have given marketers new ways to contact and connect with their target audiences [76]. These platforms enable marketers to develop direct connections with customers and build better relationships through real-time communication, interactive content, and quick feedback [77].

Moreover, [78] investigate the impact of AI on customer trust and its subsequent effects on customer relationships, engagement, and loyalty. Their study provides insights into how AI adoption influences customer engagement and highlights the importance of customer trust in fostering positive customer outcomes. Similarly, [79,80] emphasize the role of AI in delivering coherent and reliable interactions, which can contribute to improved customer engagement and satisfaction. Additionally, [81] discusses the monetization of customer futures and highlights the importance of real options strategy in timing investments in persuasive technologies.

Big Data Analytics for decision making.

Big data analytics and digital technology have had a significant influence on marketing decision making [82]. They have transformed the way businesses gather, analyse, and use data to better understand consumer behaviour, make educated decisions, and improve marketing tactics. However, it is crucial to consider the consequences and problems of using big data analytics in the context of marketing [83]. According to [84] investigated digital analytics in Germany, Switzerland, and Austria, considering the maturity level, benefits, challenges, and future developments in this field. Their research highlighted how digital analytics supports analysis and optimization in various areas, including digital marketing campaigns, user experience, search engine marketing, and data-driven decisions. In addition, [85] explored the application of data science in marketing, focusing on digital advertising and utilizing methods such as micro-segmentation, real-time application, and natural language processing. They emphasized the extensive use of data science methods in marketing to enhance customer engagement. Additionally, the readiness of small and medium-sized companies (SMEs) in Germany when adopting big data analytics (BDA), machine learning (ML), and AI. The research indicated a strong interest among German SMEs in implementing these technologies in their business models [86].

Furthermore, one of the most significant advantages of big data analytics in marketing is its capacity to deliver useful insights about client preferences, trends, and behaviour. Organisations may spot trends, segment their target demographic, and personalise marketing strategies by analysing massive volumes of data. This data-driven strategy has the potential to improve targeting precision, personalisation, and, ultimately, consumer engagement and conversion rates. According to [87] the challenges faced in

implementing marketing analytics are due to factors such as a lack of top management support, funds, resources, enthusiasm, and skills. On the other hand, [88] explored customer involvement in new product development, specifically the dual aspects of customer involvement as data analysts (CDP) and data analyzers (CDA) in business-to-business (B2B) innovation projects. Their findings emphasized the importance of understanding customer roles and their contribution to data analytics in the context of new product development.

In addition, [89], investigated algorithmic word of mouth (WOM) and its transition from traditional WOM to electronic WOM (eWOM) and the emerging trend of algorithmic WOM (aWOM). According to [90] business model innovation driven by digitalization is enhancing the impact of digital capabilities on company performance and digital technologies enhance the balanced communication between companies and customers [91]. In this context, [92] focused on the operationalization of customer analytics (CA) capability in the retailing context using AI. They employed the resource-based view (RBV) capability theory to examine how AI can engage customers and enhance customer delight. Table 6 below illustrating the details of the authors contributed, focus area, segmentation, and settings.

Table 6. The details of the authors contributed, focus area, segmentation, and settings on big data analytics.

Authors	Focus	Segmentation	Settings
Williams et al., 2020b	algorithmic word of mouth	automated tools, driven by advances in AI natural language processing	traditional word of mouth (WOM) to electronic word of mouth (eWOM) and the emerging trend of aWOM
M. K. Hossain et al., 2022	artificial intelligence (AI) in operationalizing customer analytics (CA) capability	AI in the retailing context.	resource-based view (RBV)-capability theory
Wang et al., 2023	business performance	innovation and value creation	Business innovation driven by digitalization
Afrashteh et al., 2020	communication between organizations and customers	use of algorithms in decision-making processes	customer communication regarding algorithms.
ROSÁRIO et al., 2021.	Data Science to Marketing	digital advertising,	including micro-segmentation, real-time application, natural language processing
Zumstein et al., 2022.	digital analytics in Germany, Switzerland, and Austria.	maturity level, benefits, challenges, and future developments in digital analytics	digital marketing campaigns, user experience, search engine marketing, and data-driven decisions
Japonas, 2020	financial services industry	data protection and privacy.	legal and regulatory requirements
Khalid Osaysa, 2022	marketing analytics systems	marketing activities' impact on firm performance	Lack of top management support, funds, resources, enthusiasm, and skills
Zhang & Xiao, 2020	new product development	Customer as Data Analyst	Business-to-Business (B2B) innovation projects
Kristiana et al., 2023	ontribution to generating business value	banking industry, data governance, and technology investment.	data governance, technology investment, and capability development
Grupac & Lăzăroiu, 2022	the interconnected metaverse	retail business analytics, social commerce capabilities, and deep learning-based	predictive analytics, simulation modeling, and computer vision algorithms
Earley, 2015	the Internet of Things (IoT) for monitoring,	ustomer experience and digital marketing	analytics, big data, IoT, customer experience, and digital marketing.

Authors	Focus	Segmentation	Settings
	controlling, and optimizing performance		
Cuțitoi, 2022	the retail metaverse.	eal-time sensor data and machine vision algorithms.	virtual reality experiences, retail, and virtual marketplaces.

Table 6. (*Continued*)

For instance, [93] examined the advancements in the use of AI in the financial services industry, particularly in relation to data protection and privacy. The study emphasized the importance of complying with legal and regulatory requirements while leveraging AI for different purposes in the financial sector. However, the ethical and privacy problems related to big data analytics and digital technology must be addressed [94]. Consumer data gathering and analysis raise concerns about data privacy, security, and the appropriate use of personal information [95]. To preserve customer confidence and comply with legal obligations, organisations must prioritise openness, consent, and data protection [96].

Furthermore, relying on algorithms and automated decision-making processes may introduce unexpected biases and exacerbate existing disparities 97. Data collecting bias, algorithmic prejudice, and a lack of diversity in training data can all lead to discriminatory practices and the exclusion of specific populations 98. To maintain fair and equitable digital marketing practices, it is necessary to critically assess and minimise these prejudices. The complexity and quick growth of big data analytics and digital technology is another barrier. To properly exploit new technologies, organisations must invest in experienced individuals and infrastructure. Data availability, data integration, data quality, and data governance are all critical concerns for effective deployment.

4. Conclusion

This systematic review advances understanding of how big data analytics and AI-powered chatbots can revolutionize customer engagement strategies in contemporary business environments. Through a comprehensive PRISMA-guided analysis of 106 scholarly publications spanning 2014-2023, this study reveals the transformative potential of integrating these technologies to create more personalized, efficient, and data-driven customer experiences. The findings demonstrate three critical dimensions of technological impact on customer engagement. First, social networking platforms have emerged as powerful engines for targeted data collection and customer interaction, enabling businesses to reach diverse audiences with unprecedented precision while fostering bidirectional communication that builds brand loyalty and generates valuable consumer insights. Second, AI-powered chatbots have proven instrumental in delivering continuous, personalized customer service across multiple industries, leveraging machine learning capabilities to understand consumer preferences and provide tailored recommendations while optimizing operational efficiency. Third, big data analytics has fundamentally transformed marketing decision-making processes, enabling organizations to extract actionable insights from vast information repositories to enhance targeting precision, personalization strategies, and overall customer engagement effectiveness.

The study's bibliometric analysis reveals significant growth in research attention, with publication rates increasing substantially after 2018 and artificial intelligence emerging as the most frequently referenced concept across 29 publications. This growth trajectory reflects the accelerating integration of these technologies in business practice and their recognized importance in contemporary customer engagement strategies. These findings contribute to existing literature by providing a comprehensive framework for understanding the synergistic relationship between big data analytics and AI-driven chatbots in customer engagement contexts. Unlike previous studies that examine these technologies in isolation, this research

demonstrates how their integration creates multiplicative effects that enhance customer experience management. The study extends theoretical understanding by revealing how data-driven insights inform AI algorithm optimization while AI-generated customer interactions provide rich datasets for analytical refinement, creating a virtuous cycle of technological enhancement.

The practical implications are substantial for organizations seeking to modernize their customer engagement strategies. The research provides evidence-based guidance for leveraging social media platforms for data collection, implementing AI chatbots for customer service optimization, and utilizing big data analytics for strategic decision-making. These insights are particularly valuable for businesses navigating digital transformation initiatives and seeking competitive advantages through technological innovation.

Several limitations warrant acknowledgment. The exclusive reliance on Scopus as the primary database may have limited the scope of included literature, potentially excluding relevant studies from other academic repositories. Additionally, the focus on English-language publications from specific disciplinary domains may have constrained the diversity of perspectives represented in the analysis. The rapid evolution of AI and big data technologies also means that emerging developments may not be fully captured in the reviewed literature.

5. Future business and customers prospective

Future research should explore several promising directions. Empirical studies examining the specific mechanisms through which big data analytics enhances AI chatbot performance would provide deeper insights into their synergistic relationship. Longitudinal investigations tracking the evolution of customer engagement metrics following technology implementation would offer valuable evidence of real-world impact. Additionally, research examining the ethical dimensions of data collection and AI deployment in customer engagement contexts is essential, particularly regarding privacy protection, algorithmic bias, and transparency requirements. Cross-cultural studies investigating how these technologies perform across different market contexts would also enhance understanding of their global applicability.

Conflict of interest

The authors declare no conflict of interest

References

1. Afrashteh, S., Someh, I., & Davern, M. (2020). Explanations as discourse : towards ethical big data analytics services. Australasian Journal of Information Systems, 24. https://doi.org/10.3127/AJIS.V24I0.2519
2. Alasmar, A., Kong, A. C., So, A. D., & DeCamp, M. (2022). Ethical challenges in mass drug administration for reducing childhood mortality: a qualitative study. Infectious Diseases of Poverty, 11(1). https://doi.org/10.1186/S40249-022-01023-6
3. Aldboush, H. H. H., & Ferdous, M. (2023). Building Trust in Fintech: An Analysis of Ethical and Privacy Considerations in the Intersection of Big Data, AI, and Customer Trust. International Journal of Financial Studies 2023, Vol. 11, Page 90, 11(3), 90. https://doi.org/10.3390/IJFS11030090
4. Alzoubi, H., Alshurideh, M., Kurdi, B. Al, Akour, I., & Aziz, R. (2022). Does BLE technology contribute towards improving marketing strategies, customers' satisfaction and loyalty? The role of open innovation. International Journal of Data and Network Science, 6(2), 449–460. https://doi.org/10.5267/J.IJDNS.2021.12.009
5. Ameen, N., Hosany, S., & Tarhini, A. (2021). Consumer interaction with cutting-edge technologies: Implications for future research. Computers in Human Behavior, 120, 106761. https://doi.org/10.1016/J.CHB.2021.106761
6. Appel, G., Grewal, L., Hadi, R., & Stephen, A. T. (2020). The future of social media in marketing. Journal of the Academy of Marketing Science, 48(1), 79–95. https://doi.org/10.1007/S11747-019-00695-1/TABLES/2
7. Bag, S., Dhamija, P., Luthra, S., & Huisingh, D. (2023). How big data analytics can help manufacturing companies strengthen supply chain resilience in the context of the COVID-19 pandemic. International Journal of Logistics Management, 34(4), 1141–1164. https://doi.org/10.1108/IJLM-02-2021-0095/FULL/XML

8. Bandari, V. (2021). A Comprehensive Review of AI Applications in Automated Container Orchestration, Predictive Maintenance, Security and Compliance, Resource Optimization, and Continuous Deployment and Testing. International Journal of Intelligent Automation and Computing, 4(1), 1–19. https://research.tensorgate.org/index.php/IJIAC/article/view/1
9. Bansal, R., Pruthi, N., & Singh, R. (1 C.E.). Developing Customer Engagement Through Artificial Intelligence Tools: Roles and Challenges. Https://Services.Igi-Global.Com/Resolvedoi/Resolve.Aspx?Doi=10.4018/978-1-6684-4496-2.Ch008, 130–145. https://doi.org/10.4018/978-1-6684-4496-2.CH008
10. Barredo Arrieta, A., Díaz-Rodríguez, N., Del Ser, J., Bennetot, A., Tabik, S., Barbado, A., Garcia, S., Gil-Lopez, S., Molina, D., Benjamins, R., Chatila, R., & Herrera, F. (2020). Explainable Artificial Intelligence (XAI): Concepts, taxonomies, opportunities and challenges toward responsible AI. Information Fusion, 58, 82–115. https://doi.org/10.1016/J.INFFUS.2019.12.012
11. Bhattacharya, C., & Sinha, M. (2022). The Role of Artificial Intelligence in Banking for Leveraging Customer Experience. Australasian Accounting, Business and Finance Journal, 16(5), 89–105. https://doi.org/10.14453/aabfj.v16i5.07
12. Bhattacharyya, S. S. (2022). Monetization of customer futures through machine learning and artificial intelligence based persuasive technologies. Journal of Science and Technology Policy Management, 14(4), 734–757. https://doi.org/10.1108/JSTPM-09-2021-0136/FULL/XML
13. Buckley, S., Ettl, M., Jain, P., Luss, R., Petrik, M., Ravi, R. K., & Venkatramani, C. (2014). Social media and customer behavior analytics for personalized customer engagements. IBM Journal of Research and Development, 58(5–6). https://doi.org/10.1147/JRD.2014.2344515
14. Bui, T. H., & Nguyen, V. P. (2022). The Impact of Artificial Intelligence and Digital Economy on Vietnam's Legal System. International Journal for the Semiotics of Law, 36(2), 969–989. https://doi.org/10.1007/S11196-022-09927-0/FIGURES/2
15. Campbell, C., Sands, S., Ferraro, C., Tsao, H. Y. (Jody), & Mavrommatis, A. (2020a). From data to action: How marketers can leverage AI. Business Horizons, 63(2), 227–243. https://doi.org/10.1016/J.BUSHOR.2019.12.002
16. Campbell, C., Sands, S., Ferraro, C., Tsao, H. Y. (Jody), & Mavrommatis, A. (2020b). From data to action: How marketers can leverage AI. Business Horizons, 63(2), 227–243. https://doi.org/10.1016/J.BUSHOR.2019.12.002
17. Cartwright, S., Liu, H., & Raddats, C. (2021). Strategic use of social media within business-to-business (B2B) marketing: A systematic literature review. Industrial Marketing Management, 97, 35–58. https://doi.org/10.1016/J.INDMARMAN.2021.06.005
18. Chen, X., Lun, Y., Yan, J., Hao, T., & Weng, H. (2019). Discovering thematic change and evolution of utilizing social media for healthcare research. BMC Medical Informatics and Decision Making, 19(2), 39–53. https://doi.org/10.1186/S12911-019-0757-4/FIGURES/10
19. Chen, Y. H., Keng, C. J., & Chen, Y. L. (2022a). How interaction experience enhances customer engagement in smart speaker devices? The moderation of gendered voice and product smartness. Journal of Research in Interactive Marketing, 16(3), 403–419. https://doi.org/10.1108/JRIM-03-2021-0064/FULL/XML
20. Chen, Y. H., Keng, C. J., & Chen, Y. L. (2022b). How interaction experience enhances customer engagement in smart speaker devices? The moderation of gendered voice and product smartness. Journal of Research in Interactive Marketing, 16(3), 403–419. https://doi.org/10.1108/JRIM-03-2021-0064/FULL/XML
21. Cobo, M. J., López-Herrera, A. G., Herrera-Viedma, E., & Herrera, F. (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: A practical application to the Fuzzy Sets Theory field. Journal of Informetrics, 5(1), 146–166. https://doi.org/10.1016/J.JOI.2010.10.002
22. Cuțitoi, A.-C. (2022). Machine Vision Algorithms, Sensory Data Mining Techniques, and Geospatial Mapping Tools in the Blockchain-based Virtual Economy. Review of Contemporary Philosophy, 21, 223–238.
23. Delgado-Lista, J., Alcala-Diaz, J. F., Torres-Peña, J. D., Quintana-Navarro, G. M., Fuentes, F., Garcia-Rios, A., Ortiz-Morales, A. M., Gonzalez-Requero, A. I., Perez-Caballero, A. I., Yubero-Serrano, E. M., Rangel-Zuñiga, O. A., Camargo, A., Rodriguez-Cantalejo, F., Lopez-Segura, F., Badimon, L., Ordovas, J. M., Perez-Jimenez, F., Perez-Martinez, P., Lopez-Miranda, J., … Visioli, F. (2022). Long-term secondary prevention of cardiovascular disease with a Mediterranean diet and a low-fat diet (CORDIOPREV): a randomised controlled trial. The Lancet, 399(10338), 1876–1885. https://doi.org/10.1016/S0140-6736(22)00122-2
24. Devereux, E., Grimmer, L., & Grimmer, M. (2020). Consumer engagement on social media: Evidence from small retailers. Journal of Consumer Behaviour, 19(2), 151–159. https://doi.org/10.1002/CB.1800
25. Dolega, L., Rowe, F., & Branagan, E. (2021). Going digital? The impact of social media marketing on retail website traffic, orders and sales. Journal of Retailing and Consumer Services, 60, 102501. https://doi.org/10.1016/J.JRETCONSER.2021.102501
26. Earley, S. (2015). Executive roundtable series. IT Professional, 17(5), 62–69. https://doi.org/10.1109/MITP.2015.81

27. Fisichella, M., Russo, A., Lee, Y.-I., & Trim, P. R. J. (2022). Enhancing Marketing Provision through Increased Online Safety That Imbues Consumer Confidence: Coupling AI and ML with the AIDA Model. Big Data and Cognitive Computing 2022, Vol. 6, Page 78, 6(3), 78. https://doi.org/10.3390/BDCC6030078
28. Founta, A. M., Djouvas, C., Chatzakou, D., Leontiadis, I., Blackburn, J., Stringhini, G., Vakali, A., Sirivianos, M., & Kourtellis, N. (2018). Large scale crowdsourcing and characterization of twitter abusive behavior. 12th International AAAI Conference on Web and Social Media, ICWSM 2018, 491–500. https://doi.org/10.1609/icwsm.v12i1.14991
29. Gandhi, M., & Kar, A. K. (2022). How do Fortune firms build a social presence on social media platforms? Insights from multi-modal analytics. Technological Forecasting and Social Change, 182, 121829. https://doi.org/10.1016/J.TECHFORE.2022.121829
30. Grupac, M., & Lăzăroiu, G. (2022). Image Processing Computational Algorithms, Sensory Data Mining Techniques, and Predictive Customer Analytics in the Metaverse Economy. Review of Contemporary Philosophy, 21, 205–222. https://doi.org/10.22381/RCP21202213
31. Gruss, R., Kim, E., & Abrahams, A. (2019). Engaging Restaurant Customers on Facebook: The Power of Belongingness Appeals on Social Media. Https://Doi.Org/10.1177/1096348019892071, 44(2), 201–228. https://doi.org/10.1177/1096348019892071
32. Guo, L., Hua, L., Jia, R., Zhao, B., Wang, X., & Cui, B. (2019). Buying or browsing?: Predicting Real-time Purchasing Intent using Attention-based Deep Network with Multiple Behavior. Proceedings of the ACM SIGKDD International Conference on Knowledge Discovery and Data Mining, 1984–1992. https://doi.org/10.1145/3292500.3330670
33. Gupta, S., Drave, V. A., Dwivedi, Y. K., Baabdullah, A. M., & Ismagilova, E. (2020). Achieving superior organizational performance via big data predictive analytics: A dynamic capability view. Industrial Marketing Management, 90, 581–592. https://doi.org/10.1016/J.INDMARMAN.2019.11.009
34. Gupta, S., Justy, T., Kamboj, S., Kumar, A., & Kristoffersen, E. (2021). Big data and firm marketing performance: Findings from knowledge-based view. Technological Forecasting and Social Change, 171, 120986. https://doi.org/10.1016/J.TECHFORE.2021.120986
35. Haleem, A., Javaid, M., Asim Qadri, M., Pratap Singh, R., & Suman, R. (2022a). Artificial intelligence (AI) applications for marketing: A literature-based study. International Journal of Intelligent Networks, 3, 119–132. https://doi.org/10.1016/J.IJIN.2022.08.005
36. Haleem, A., Javaid, M., Asim Qadri, M., Pratap Singh, R., & Suman, R. (2022b). Artificial intelligence (AI) applications for marketing: A literature-based study. International Journal of Intelligent Networks, 3, 119–132. https://doi.org/10.1016/J.IJIN.2022.08.005
37. Himeur, Y., Sayed, A., Alsalemi, A., Bensaali, F., Amira, A., Varlamis, I., Eirinaki, M., Sardianos, C., & Dimitrakopoulos, G. (2022). Blockchain-based recommender systems: Applications, challenges and future opportunities. Computer Science Review, 43, 100439. https://doi.org/10.1016/J.COSREV.2021.100439
38. Hossain, M. K., Raihan, G. A., Akbar, M. A., Kabir Rubel, M. H., Ahmed, M. H., Khan, M. I., Hossain, S., Sen, S. K., Jalal, M. I. E., & El-Denglawey, A. (2022). Current Applications and Future Potential of Rare Earth Oxides in Sustainable Nuclear, Radiation, and Energy Devices: A Review. ACS Applied Electronic Materials, 4(7), 3327–3353. https://doi.org/10.1021/ACSAELM.2C00069/ASSET/IMAGES/MEDIUM/EL2C00069_0009.GIF
39. Huang, H., Zhao, B., Zhao, H., Zhuang, Z., Wang, Z., Yao, X., Wang, X., Jin, H., & Fu, X. (2018). A cross-platform consumer behavior analysis of large-scale mobile shopping data. The Web Conference 2018 - Proceedings of the World Wide Web Conference, WWW 2018, 1785–1794. https://doi.org/10.1145/3178876.3186169
40. Huang, M. H., & Rust, R. T. (2021). A strategic framework for artificial intelligence in marketing. Journal of the Academy of Marketing Science, 49(1), 30–50. https://doi.org/10.1007/S11747-020-00749-9/TABLES/4
41. Hyland, K. (2023). Academic publishing and the attention economy. Journal of English for Academic Purposes, 64, 101253. https://doi.org/10.1016/J.JEAP.2023.101253
42. Iglesias-Pradas, S., Acquila-Natale, E., Saura, J. R., Sakas, D. P., Reklitis, D. P., Terzi, M. C., & Vassilakis, C. (2022). Multichannel Digital Marketing Optimizations through Big Data Analytics in the Tourism and Hospitality Industry. Journal of Theoretical and Applied Electronic Commerce Research 2022, Vol. 17, Pages 1383-1408, 17(4), 1383–1408. https://doi.org/10.3390/JTAER17040070
43. Islam, M. R., Liu, S., Wang, X., & Xu, G. (2020). Deep learning for misinformation detection on online social networks: a survey and new perspectives. Social Network Analysis and Mining, 10(1), 1–20. https://doi.org/10.1007/S13278-020-00696-X/TABLES/4
44. Japonas, E. (2020). AI and the Law. The AI Book, 209–213. https://doi.org/10.1002/9781119551966.CH56
45. Khalid Osaysa, E. (n.d.). Essam Khalid Osaysa 1 IMPROVING THE QUALITY OF MARKETING ANALYTICS SYSTEMS. International Journal for Quality Research, 16(1), 119–132. https://doi.org/10.24874/IJQR16.01-08

46. Khan, M., Khan, N., Begum, S., & Qureshi, M. I. (2024). Digital future beyond pandemic outbreak: systematic review of the impact of COVID-19 outbreak on digital psychology. Foresight, 26(1), 1–17. https://doi.org/10.1108/FS-02-2021-0044/FULL/XML
47. Kristiana, I., Ramadhan, A., Trisetyarso, A., Abdurachman, E., & Zarlis, M. (2023). Capability Development to Generate Business Value Through Customer-centric Analytics in the Banking Industry: A Systematic Review. Journal of System and Management Sciences, 13(2), 64–82. https://doi.org/10.33168/JSMS.2023.0205
48. Kushwaha, A. K., Kumar, P., & Kar, A. K. (2021a). What impacts customer experience for B2B enterprises on using AI-enabled chatbots? Insights from Big data analytics. Industrial Marketing Management, 98, 207–221. https://doi.org/10.1016/J.INDMARMAN.2021.08.011
49. Kushwaha, A. K., Kumar, P., & Kar, A. K. (2021b). What impacts customer experience for B2B enterprises on using AI-enabled chatbots? Insights from Big data analytics. Industrial Marketing Management, 98, 207–221. https://doi.org/10.1016/J.INDMARMAN.2021.08.011
50. Le, X. C. (2023). Inducing AI-powered chatbot use for customer purchase: the role of information value and innovative technology. Journal of Systems and Information Technology, 25(2), 219–241. https://doi.org/10.1108/JSIT-09-2021-0206/FULL/XML
51. Leung, F. F., Gu, F. F., & Palmatier, R. W. (2022). Online influencer marketing. Journal of the Academy of Marketing Science, 50(2), 226–251. https://doi.org/10.1007/S11747-021-00829-4/TABLES/4
52. Li, C., Chen, Y., & Shang, Y. (2022). A review of industrial big data for decision making in intelligent manufacturing. Engineering Science and Technology, an International Journal, 29, 101021. https://doi.org/10.1016/J.JESTCH.2021.06.001
53. Li, H. (2019). Special Section Introduction: Artificial Intelligence and Advertising. Https://Doi.Org/10.1080/00913367.2019.1654947, 48(4), 333–337. https://doi.org/10.1080/00913367.2019.1654947
54. Limna, P., Siripipatthanakul, S., & Phayaphrom, B. (2021). The Role of Big Data Analytics in Influencing Artificial Intelligence (AI) Adoption for Coffee Shops in Krabi, Thailand. https://papers.ssrn.com/abstract=3944075
55. Liu, X., Shin, H., & Burns, A. C. (2021). Examining the impact of luxury brand's social media marketing on customer engagement: Using big data analytics and natural language processing. Journal of Business Research, 125, 815–826. https://doi.org/10.1016/J.JBUSRES.2019.04.042
56. Lund, B. D., Wang, T., Mannuru, N. R., Nie, B., Shimray, S., & Wang, Z. (2023). ChatGPT and a new academic reality: Artificial Intelligence-written research papers and the ethics of the large language models in scholarly publishing. Journal of the Association for Information Science and Technology, 74(5), 570–581. https://doi.org/10.1002/ASI.24750
57. Mariani, M. M., Perez-Vega, R., & Wirtz, J. (2022). AI in marketing, consumer research and psychology: A systematic literature review and research agenda. Psychology & Marketing, 39(4), 755–776. https://doi.org/10.1002/MAR.21619
58. Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big data analytics and firm performance: Findings from a mixed-method approach. Journal of Business Research, 98, 261–276. https://doi.org/10.1016/J.JBUSRES.2019.01.044
59. Misra, N. N., Dixit, Y., Al-Mallahi, A., Bhullar, M. S., Upadhyay, R., & Martynenko, A. (2022). IoT, Big Data, and Artificial Intelligence in Agriculture and Food Industry. IEEE Internet of Things Journal, 9(9), 6305–6324. https://doi.org/10.1109/JIOT.2020.2998584
60. Mostafa, R. B., & Kasamani, T. (2022). Antecedents and consequences of chatbot initial trust. European Journal of Marketing, 56(6), 1748–1771. https://doi.org/10.1108/EJM-02-2020-0084/FULL/XML
61. Mustapha, I., Khan, N., Qureshi, M. I., Sikandar, H., & Nu'man, D. (2024a). Revolutionising the Tourism Industry: The Role of Innovative Technologies in Enhancing Tourist Experiences. 79–86. https://doi.org/10.1007/978-3-031-55558-9_9
62. Mustapha, I., Khan, N., Qureshi, M. I., Sikandar, H., & Nu'man, D. (2024b). Revolutionising the Tourism Industry: The Role of Innovative Technologies in Enhancing Tourist Experiences. SpringerBriefs in Applied Sciences and Technology, Part F2588, 79–86. https://doi.org/10.1007/978-3-031-55558-9_9
63. Ngiam, K. Y., & Khor, I. W. (2019). Big data and machine learning algorithms for health-care delivery. The Lancet Oncology, 20(5), e262–e273. https://doi.org/10.1016/S1470-2045(19)30149-4
64. Ogbuke, N. J., Yusuf, Y. Y., Dharma, K., & Mercangoz, B. A. (2022). Big data supply chain analytics: ethical, privacy and security challenges posed to business, industries and society. Production Planning & Control, 33(2–3), 123–137. https://doi.org/10.1080/09537287.2020.1810764
65. Olujimi, P. A., & Ade-Ibijola, A. (n.d.). Synthesis of Comments to Social Media Posts for Business Applications. IJACSA) International Journal of Advanced Computer Science and Applications, 13(12), 2022. Retrieved July 9, 2023, from www.ijacsa.thesai.org

66. Pavaloaia, V. D., Teodor, E. M., Fotache, D., & Danileţ, M. (2019). Opinion Mining on Social Media Data: Sentiment Analysis of User Preferences. Sustainability 2019, Vol. 11, Page 4459, 11(16), 4459. https://doi.org/10.3390/SU11164459
67. Perez-Vega, R., Kaartemo, V., Lages, C. R., Borghei Razavi, N., & Männistö, J. (2021). Reshaping the contexts of online customer engagement behavior via artificial intelligence: A conceptual framework. Journal of Business Research, 129, 902–910. https://doi.org/10.1016/J.JBUSRES.2020.11.002
68. Perifanis, N. A., & Kitsios, F. (2023). Investigating the Influence of Artificial Intelligence on Business Value in the Digital Era of Strategy: A Literature Review. Information 2023, Vol. 14, Page 85, 14(2), 85. https://doi.org/10.3390/INFO14020085
69. Prakash, K., Examiner, K., & Hannola, L. (2023). New value creation opportunities for digital twin for product design and development. https://lutpub.lut.fi/handle/10024/165929
70. Prentice, C., Weaven, S., & Wong, I. K. A. (2020). Linking AI quality performance and customer engagement: The moderating effect of AI preference. International Journal of Hospitality Management, 90, 102629. https://doi.org/10.1016/J.IJHM.2020.102629
71. Qureshi, M. I., Bhatti, S. H., & Khan, N. (2025). From hype to reality: a systematic literature review of blockchain's role in sustainable supply chain management. Journal of Management History, ahead-of-print(ahead-of-print). https://doi.org/10.1108/JMH-06-2024-0098/FULL/PDF
72. Rafiq, F., Adil, M., & Wu, J. Z. (2022). Examining ecotourism intention: The role of tourists' traits and environmental concerns. Frontiers in Psychology, 13, 940116. https://doi.org/10.3389/FPSYG.2022.940116/BIBTEX
73. Rahman, M. S., Bag, S., Hossain, M. A., Abdel Fattah, F. A. M., Gani, M. O., & Rana, N. P. (2023). The new wave of AI-powered luxury brands online shopping experience: The role of digital multisensory cues and customers' engagement. Journal of Retailing and Consumer Services, 72, 103273. https://doi.org/10.1016/J.JRETCONSER.2023.103273
74. Rao, S., Verma, A. K., & Bhatia, T. (2021). A review on social spam detection: Challenges, open issues, and future directions. Expert Systems with Applications, 186, 115742. https://doi.org/10.1016/J.ESWA.2021.115742
75. Rattanawiboonsom, V., & Khan, N. (2024). Blockchain Technology in Mobile Payments: A Systematic Review of Security Enhancements in Mobile Commerce. International Journal of Interactive Mobile Technologies , 18(21), 134. https://doi.org/10.3991/IJIM.V18I21.52099
76. Rattanawiboonsom, V., Sikandar, H., Thatsaringkharnsakun, U., & Khan, N. (2025). The Role of Mobile Technologies in Tracking Cyberbullying Trends and Social Adaptation among Teenagers. International Journal of Interactive Mobile Technologies (IJIM), 19(01), 171–186. https://doi.org/10.3991/IJIM.V19I01.52747
77. Rishi, B., & Kuthuru, N. R. (2021). A Review for Managerial Guidelines for Social Media Integration of IMC in Digital Era. Digital Entertainment, 187–212. https://doi.org/10.1007/978-981-15-9724-4_10/COVER
78. ROSÁRIO, A., MONIZ, L. B., & CRUZ, R. (2021). Data science applied to marketing: A literature review. Journal of Information Science and Engineering, 37(5), 1067–1081. https://doi.org/10.6688/JISE.202109_37(5).0006
79. Sengupta, S., & Vaish, A. (2023). A study on social media and higher education during the COVID-19 pandemic. Universal Access in the Information Society, 1, 1–23. https://doi.org/10.1007/S10209-023-00988-X/TABLES/5
80. Sharma, V., & Sood, D. (1 C.E.). Big Data Applications and Analytics: A Transformation in Digital India. Https://Services.Igi-Global.Com/Resolvedoi/Resolve.Aspx?Doi=10.4018/978-1-6684-8177-6.Ch016, 230–238. https://doi.org/10.4018/978-1-6684-8177-6.CH016
81. Sikandar, M. A., Munari, P. K., & Arli, M. (2022). A Systematic Literature Review of the Impact of Artificial Intelligence on Customer Experience. Machine Learning for Business Analytics, 117–127. https://doi.org/10.4324/9781003206316-10/SYSTEMATIC-LITERATURE-REVIEW-IMPACT-ARTIFICIAL-INTELLIGENCE-CUSTOMER-EXPERIENCE-SIKANDAR-PRAVEEN-KUMAR-MUNARI-MEGHRAJ-ARLI
82. Singh, J., Nambisan, S., Bridge, R. G., & Brock, J. K. U. (2021). One-Voice Strategy for Customer Engagement. Journal of Service Research, 24(1), 42–65. https://doi.org/10.1177/1094670520910267/ASSET/IMAGES/LARGE/10.1177_1094670520910267-FIG2.JPEG
83. Success, D. S.-Q.-A. to, & 2019, undefined. (n.d.). Study on the effects of digitisation in small and medium-sized german companies. Search.Ebscohost.Com. Retrieved July 9, 2023, from https://search.ebscohost.com/login.aspx?direct=true&profile=ehost&scope=site&authtype=crawler&jrnl=15822559&AN=135437270&h=dDTbmLy7WMpol3Ytw48J%2Bab6h6J4PZUmOxGvifui3RMhmq7VQKitUEOPvB4Q3679iTi6lP1cUckBeOhwhu3eaQ%3D%3D&crl=c
84. van Niekerk, L., Manderson, L., & Balabanova, D. (2021). The application of social innovation in healthcare: a scoping review. Infectious Diseases of Poverty, 10(1). https://doi.org/10.1186/S40249-021-00794-8
85. Wang, Z., Lin, S., Chen, Y., Lyulyov, O., & Pimonenko, T. (2023). Digitalization Effect on Business Performance: Role of Business Model Innovation. Sustainability 2023, Vol. 15, Page 9020, 15(11), 9020. https://doi.org/10.3390/SU15119020

86. Wen, H., Zhang, L., Sheng, A., Li, M., & Guo, B. (2022). From "Human-to-Human" to "Human-to-Non-human" – Influence Factors of Artificial Intelligence-Enabled Consumer Value Co-creation Behavior. Frontiers in Psychology, 13, 863313. https://doi.org/10.3389/FPSYG.2022.863313/BIBTEX
87. Williams, N. L., Ferdinand, N., & Bustard, J. (2020). From WOM to aWOM – the evolution of unpaid influence: a perspective article. Tourism Review, 75(1), 314–318. https://doi.org/10.1108/TR-05-2019-0171/FULL/XML
88. Xavier, J., & Picoto, W. N. (2023). Regulation of data-driven marketing and management theory: bibliometric analysis, systematic literature review and research agenda. International Journal of Law and Management, ahead-of-print(ahead-of-print). https://doi.org/10.1108/IJLMA-02-2023-0022
89. Yau, K. L. A., Saad, N. M., & Chong, Y. W. (2021). Artificial Intelligence Marketing (AIM) for Enhancing Customer Relationships. Applied Sciences 2021, Vol. 11, Page 8562, 11(18), 8562. https://doi.org/10.3390/APP11188562
90. Zare, P., Pettit, C., Leao, S., & Gudes, O. (2022). Digital Bicycling Planning: A Systematic Literature Review of Data-Driven Approaches. Sustainability (Switzerland), 14(23), 16319. https://doi.org/10.3390/SU142316319/S1
91. Zeng, N., Jiang, L., Vignali, G., & Ryding, D. (2023). Customer Interactive Experience in Luxury Retailing: The Application of AI-Enabled Chatbots in the Interactive Marketing. Springer Books, 785–805. https://doi.org/10.1007/978-3-031-14961-0_34
92. Zhang, H., & Xiao, Y. (2020). The Influence of Customer Involvement in Data Analytics on Innovation: An Abstract. Developments in Marketing Science: Proceedings of the Academy of Marketing Science, 279–280. https://doi.org/10.1007/978-3-030-42545-6_84/COVER
93. Zumstein, D., Brauer, C., Zelic, A., Zumstein, D., Brauer, C., & Zelic, A. (2022). Benefits, challenges and future developments in digital analytics in German-speaking countries: An empirical analysis. Applied Marketing Analytics: The Peer-Reviewed Journal, 7(3), 246–259. https://EconPapers.repec.org/RePEc:aza:ama000:y:2022:v:7:i:3:p:246-259