

# The Impact of Big Data-Based Customer Segmentation on Programmatic Purchasing Efficiency: The Role of Chatbot-Based Interactions

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## Abstract

This study examines the contribution of big data-based customer segmentation applications to productivity increase in programmatic purchasing processes and the role of integration of chatbot-based customer interactions into this process. In line with the theoretical approaches and current application examples in the literature, the relationship between the accuracy of segmentation and the effective use of media investments is examined; the impact of chatbot technology on data collection, analysis and personalization processes is evaluated. The findings obtained indicate the importance of data-oriented automation systems in the restructuring of digital advertising strategies.

## Keywords

Big Data, Customer Segmentation, Programmatic Purchasing, Chatbot, Digital Marketing, Personalization, Artificial Intelligence

## 1. Introduction

With the digital transformation process, marketing communication tools have evolved radically, and data-driven strategies have come to the fore in marketing and advertising [1] [2]. This transformation has caused traditional media planning to be replaced by big data-based, automated, and real-time applications. Programmatic purchasing methods, especially in the field of digital advertising, stand out with their ability to deliver advertising content suitable for the target audience at the right time and place, allowing businesses to reach their target audiences more effectively and efficiently [3]. Thanks to big data technologies, brands can

perform micro-level customer segmentation by analyzing structured and unstructured data including user behavior, demographic information, social media interactions, and purchase history [4]. This data allows marketing campaigns to be personalized and the return on advertising spending to be increased. The use of artificial intelligence and machine learning-based algorithms in the segmentation process offers significant advantages in terms of accurate targeting and meaningful insight generation [1]. Programmatic purchasing, on the other hand, optimizes processes and provides efficiency in resource use by automating the purchase of advertising inventory by combining these analyses with real-time data [5]. One of the key elements of success in programmatic advertising is the accuracy of big data-supported customer segmentation. Correctly determining the target audience and presenting content appropriate to these segments directly affects the efficiency of programmatic purchasing strategies [6]. At this point, chatbot technologies, which have become an important tool in enriching the digital customer experience, come into play. Chatbots are interaction tools developed with natural language processing (NLP) and machine learning techniques that help determine customer expectations, behavioral patterns and interests by communicating with users in real time [7]. These tools play a strategic role not only in customer service but also in data collection, analysis and personalization processes.

The data obtained through chatbots makes customer segmentation processes more dynamic and up-to-date, while contributing to the optimization of programmatic purchasing strategies [8]. Thanks to chatbot-based user interactions, retargeting campaigns supported by real-time data can be created, which enables ads to work with higher conversion rates [9].

This study examines the impact of big data-based customer segmentation on programmatic purchasing efficiency in a multidimensional manner [10]. In particular, the integration of chatbot-supported data collection and interaction mechanisms into these processes is analyzed, and the potential to increase the effectiveness of data-driven decision-making mechanisms in marketing communication processes is evaluated. In this context, the place of chatbot technologies in strategic marketing processes is addressed in a holistic manner by adopting a methodological approach based on literature review, case studies and data-based application analysis [11].

## 2. Big Data and Segmentation

Big data is an analytical approach that enables the production of meaningful information by processing high-volume, fast and diverse data sets [12]. In the context of marketing, big data enables more precise structuring of customer segmentation with dynamic and behavioral elements [13].

Programmatic purchasing is the automatic purchase of digital advertising spaces through software-based systems [14]. In these systems, algorithms ensure that advertisements are displayed in accordance with the digital profile of the target audience [15].

Chatbots are digital assistants that interact with users in writing or by voice using artificial intelligence and natural language processing (NLP) techniques [16]. They are widely used especially in e-commerce, banking and customer service [17]. Chatbots offer significant contributions in terms of real-time collection and analysis of customer data [18].

### **3. The Effect of Big Data-Supported Segmentation on Programmatic Purchasing**

The technological transformation experienced in the field of digital marketing has made the concept of big data a strategic element in the processes of collecting, analyzing and transforming consumer data into action [19]. Since programmatic purchasing systems, in particular, aim to present the most appropriate content to the target audience at the right time and on the right platform, segmentation quality plays a decisive role in the success of these systems [20]-[22]. While traditional segmentation models are generally shaped by limited demographic data, customer profiling has become more comprehensive thanks to big data, including behavioral, temporal, contextual and emotional dimensions. In this regard, the impact of big data-supported segmentation on programmatic purchasing processes can be evaluated in two main dimensions: deepening segmentation and dynamic segmentation with real-time data [19].

#### **3.1. Deepening the Segmentation**

Big data technologies make it possible to analyze customer data more comprehensively, not only in terms of volume but also variety and speed [9] [23]. Thanks to these technologies, many parameters related to the consumer [24]—such as browsing history, device usage, social media interactions, location information, purchase frequency, interests, and even sentiment analysis—are evaluated in an integrated manner [25] [26]. Multi-dimensional segmentation can be performed. Thus, large audiences that were previously considered homogeneous can now be separated at a micro level, and specific behavioral patterns of each sub-segment can be identified [20]-[22]. Deepened segmentation enables marketing communications to be made more personal, relevant, and contextual. For example, analyzing users who are active on e-commerce sites but have not made a purchase, and creating an “undecided consumer” segment makes it possible to develop persuasive and transformative messages for this group [27]. Such strategic micro-segments allow for more efficient advertising spending in programmatic purchasing systems. Because deep segmentation increases conversion rates by ensuring that ad impressions are focused not only on large audiences but also on narrow groups that are more likely to purchase [9] [23]. In addition, updating these segments over time through machine learning algorithms increases the flexibility of marketing strategies against changes in consumer behavior. This shows that segmentation deepened with big data is not static, but has a learning and evolving structure [20]-[22].

### 3.2. Dynamic Segmentation with Real-Time Data

One of the most important advantages of programmatic advertising is that campaigns can be optimized in real time thanks to instant data flow. However, for this function to work effectively, segmentation structures must also be sensitive to real-time data [19]. Dynamic segmentation not only analyzes user behavior based on history; it also allows redefining which segment users will be included in by taking into account instant interactions, online activities and contextual factors (e.g. time, location, season, device type) [9] [23].

Thanks to this structure, it is possible to target different advertising content at different times of the day by recognizing that a user may be searching for information in the morning and tend to shop in the afternoon. This flexibility directly increases not only the visibility of the advertisement but also its level of impact. Because presenting the user with the “right message, at the right time, in the right context”; maximizes the effectiveness of marketing communications [9] [23].

Another advantage of real-time dynamic segmentation is that it reduces “intra-segment behavior variance”. In other words, while users who exhibit similar behaviors in different contexts are included in the same segment, this variance can be eliminated with instant data [9] [28]. For example, if a user who is inclined to shop on weekends interacts with different content on weekdays, the advertising content to be presented to this user should be shaped according to instant behavior. Dynamic segmentation makes this possible, thus increasing the effectiveness of advertising investments [19] [28].

Segmentation systems that work with real-time data work in accordance with the nature of programmatic advertising; they optimize ad display not only according to the user profile, but also according to contextual awareness. This situation both improves the user experience and increases the commercial return of marketing activities [9] [23]. Big data-supported segmentation is the cornerstone of programmatic purchasing strategies. Segmentation structures that gain depth and become dynamic increase both the accuracy rate and flexibility of marketing strategies; thus, contributing to both the cost-effectiveness and customer satisfaction of digital advertising. In this context, segmentation should no longer be considered only as an analysis tool, but also as a strategic competence that creates competitive advantage [25] [26].

### 4. The Role of Chatbot-Based Interactions

Artificial intelligence-based applications are increasingly playing critical roles in the data-driven transformation of digital marketing. In this transformation process, chatbot technologies stand out as an active component not only for the purpose of automating customer services, but also in the processes of collecting, analyzing, and personalizing marketing strategies [20]-[22]. Chatbots, thanks to their ability to communicate with customers in two-way and real-time, both increase operational efficiency and strengthen the knowledge base of strategic marketing decisions. In this context, the contributions of chatbots to marketing pro-

cesses can be addressed under three main headings: data collection and enrichment, customer intent prediction and segment development, personalized offers, and retargeting [29].

#### **4.1. Data Collection and Enrichment**

Customer data, which is difficult to obtain with traditional methods, can be collected more naturally and voluntarily thanks to chatbots [26] [29]. Requests, questions, complaints and behavioral responses conveyed by users during the chat provide rich insights that can be directly integrated into data analytics processes [30]-[33]. These interactions produce both structured and unstructured data; this data can be processed with natural language processing (NLP) techniques and transformed into meaningful information sets. The constant activity of chatbots in digital channels ensures that data is collected instantly and marketing databases are kept up to date [30]-[33].

Chatbots also have the capacity to collect a wide range of contextual data (such as the user's location, device type, and previous interaction history) [25] [26]. Such contextual data allows for more nuanced groupings in segmentation processes. Thus, customer profiling becomes more accurate and actionable; and marketing campaigns have the opportunity for more effective targeting [34].

#### **4.2. Prediction of Customer Intention and Segment Development**

Chatbots produce interactive data that indirectly reveals customers' interests, doubts, satisfaction levels, and purchase tendencies regarding products or services. When this data is analyzed with machine learning algorithms, it is possible to make strong predictions about customer intention [35]. For example, a user who frequently inquires about certain products, researches campaign conditions or compares prices can be classified as a high-potential purchase candidate [34]. In this context, chatbots not only provide data to existing segmentation models; they also contribute to the creation of dynamic and behavioral segments [36]. The evolution of segmentation from a static structure to a structure that is constantly updated in a way that is sensitive to user intent and context enables programmatic purchasing systems to target more accurately. Thus, marketing strategies gain a predictive and personalized structure [3] [37].

#### **4.3. Personalized Offers and Retargeting**

Data and insight-based interactions provided by chatbots provide a significant resource for personalizing marketing campaigns [35]. User-specific offers, recommendations based on past interactions, and personalized campaign content can be delivered directly through chatbots. This improves the customer experience, strengthens brand loyalty, and increases conversion rates [38]-[40]. Chatbots also serve a strategic function in terms of retargeting strategies. For example, if a user interacts with a chatbot and receives product information but has not completed the purchase, this information can be used to present the user with a personalized

reminder message or a discount offer [25] [26]. Such personalized follow-up strategies enable the evaluation of potential interactions that do not convert into sales. The integration of chatbots with retargeting algorithms is particularly well-suited to the dynamic nature of programmatic purchasing systems [34] [39].

## 5. Strategic Implementations and Implementation Recommendations

A multidimensional approach has been taken to address the impact of big data-based customer segmentation on programmatic purchasing efficiency in the data-based transformation process of digital marketing and how chatbot-based interactions contribute to this process [20]-[22]. Research findings indicate that in today's digital marketing ecosystem, in order for businesses to gain competitive advantage, they must move away from the traditional understanding that focuses only on data collection and reach a maturity level that includes extracting meaning from data and taking action [20]-[22].

Achieving data-based marketing maturity is possible not only with technical infrastructure investments of organizations, but also by internalizing the culture of analytical thinking [29] [32]. In this context, the integration of large data warehouses with chatbot systems enables real-time analysis of customer data, making strategic decision processes more accurate [41] [42] [34]. Not only collecting data, but also interpreting it and transforming it into customer insights directly contributes to the personalization of marketing activities.

The interactive data sources provided by chatbots increase the accuracy of customer segmentation and provide data production at every stage of users' digital journeys. Beyond this, the fact that chatbots assume analytical roles enables segmentation processes to become more in-depth and dynamic [30]-[32]. Thus, chatbots are not only tools that automate operational processes, but also function as part of decision support systems [43].

The success of programmatic advertising is closely related to the direct integration of data obtained from customer segmentation into purchasing systems [37] [3]. In this context, the integration of insights obtained from big data analytics and chatbot interactions into the programmatic ecosystem directly supports the success of omnichannel marketing strategies [20]-[22]. Data-driven integration processes increase the effectiveness and return on investment (ROI) of advertising expenditures, as well as ensuring the continuity of the customer experience [34] [44]. The integration of big data-supported customer segmentation, chatbot-based customer interactions and programmatic purchasing systems reveals the necessity of developing a holistic strategy in digital marketing applications. This integrative approach will not only increase operational efficiency but also customer satisfaction and brand loyalty [36]. In future studies, examining this relationship network within the framework of interaction models in different sectors and user groups will provide valuable contributions to the academic literature and the application world [20]-[22].

Considering chatbots not only as customer service tools but also as analytical elements increases the quality of segmentation processes [43] [45].

Integrating the results of chatbot-based interactions into programmatic systems with big data analytics directly affects the success of omnichannel marketing strategies [34] [44] [46].

## 6. Method

In this study, a qualitative research design was adopted to examine the relationship between big data-based customer segmentation and productivity increase in programmatic purchasing processes and to evaluate the integration of chatbot-based customer interactions into this process. Two main methods were used in the research: systematic literature review and multiple case analysis.

### *Literature Review Strategy*

The literature review was conducted based on academic publications, industry reports and technical documents published between 2019 and 2025. Articles in peer-reviewed journals included in indexes such as Scopus, Web of Science, Google Scholar and ScienceDirect were taken into consideration during the review process. The keyword combinations are as follows:

- “big data customer segmentation”,
- “programmatic advertising productivity”,
- “chatbot integration in digital marketing”,
- “data-driven personalization”,
- “automated media buying systems”.

### **As inclusion criteria:**

Priority was given to studies reporting the relationship between 1) big data applications in direct digital marketing processes,

2) use of chatbot technologies in marketing interactions,

3) programmatic media investments and ROI (Return on Investment).

As a result of the literature review, some studies were examined in detail.

## 7. Limitations

Although the findings presented in this study are supported by sectoral reports and secondary data, some limitations should be emphasized in order to evaluate the scope of the study more accurately:

### *Lack of Empirical Tests*

No original experimental or longitudinal dataset was used in this study. While secondary data and case studies are sufficient to show general trends, they are limited in terms of directly proving the causal relationship between segmentation quality and programmatic efficiency.

### *Data Privacy and Access Limitations*

Many businesses keep their customer segmentation algorithms and chatbot interaction data secret. This restricts access to comprehensive datasets and can cause publication bias in published case studies. In addition, legal regulations such as

KVKK, GDPR, CCPA limit the scope of individual tracking and profiling applications.

#### *Sectoral Differences*

The effectiveness of big data segmentation and chatbot technology varies by sector. For example, e-commerce and finance sectors benefit from these technologies highly, while their impact in areas such as public services or education is limited or has not yet been measured.

#### *Technological Maturity Level and Implementation Barriers*

The success of chatbot-based segmentation depends on the digital infrastructure of the business. Small and medium-sized businesses may have difficulty achieving this integration, which may reduce the homogeneity of the results.

Stating these limitations clearly increases the reliability of the study and provides a methodological basis for future research.

## **8. Conclusions and Recommendations**

Big data-supported customer segmentation provides higher accuracy and efficiency in programmatic purchasing processes. Supporting this process with chatbot technologies increases data quality and enables the development of personalized communication strategies. The place of chatbots in this ecosystem is becoming increasingly important in terms of both customer experience and return on advertising investments. In future studies, it is recommended to conduct research on sector-based application examples and user perceptions of chatbots in different cultural contexts.

With the impact of digitalization, consumer behavior has become more complex and dynamic, making it necessary to reshape marketing strategies within the framework of data-based approaches. In this context, big data has become central to decision-making processes in customer-focused marketing applications; it has become a fundamental source, especially in analyses related to customer segmentation. The findings obtained within the scope of the study reveal that big data-based customer segmentation provides significant contributions in terms of both effectiveness and efficiency in programmatic purchasing processes.

The implementation of segmentation not only through demographic variables but also through behavioral, psychographic and interactional data enables advertising content to reach the right person at the right time, through the right channel, thus, increasing the return on advertising expenditures. When programmatic purchasing systems are integrated with these advanced segmentation models, they work in harmony with the personalized and real-time nature of digital advertising and produce results that directly affect brand performance. Chatbot-based interactions, which constitute another important dimension of the study, stand out as versatile tools that contribute not only to service delivery but also to data production in digital communication channels established with the customer. User data obtained through chatbots allows for a deeper understanding of customer profiles; increases the success of applications such as sentiment analysis, interest detection

and personalized recommendation systems. Thanks to these interactions, dynamic and constantly updated segmentation models can be created, thus contributing to the agility and accuracy of programmatic purchasing strategies. As a result, the holistic evaluation of big data-based customer segmentation and chatbot-supported interactions creates a critical synergy that enables sustainable success in digital marketing strategies. Big data-based customer segmentation plays a significant role in increasing the breadth of programmatic purchasing services; while the integration of chatbot technologies during this period improves the acceleration and depth of communication. However, more empirical tests and sectoral comparative components are needed for this benefit to become general transitions. Future units are essential to reveal these relationships more concretely with regular and long-term data analyses. The findings of this study are instructive for marketing managers and digital advertising experts in terms of developing a data-driven decision-making culture and strategic use of artificial intelligence-based applications. In future studies, a more in-depth examination of this relationship with application examples specific to different sectors and cultural contexts will strengthen the interdisciplinary dimension of the subject and increase the potential to produce practical outputs.

### Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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