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The impact model of demographic indicators on Internet marketing processes

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ABSTRACT

The organization of advertising and marketing by widely using the capabilities of the Internet has paved the way for the successful solution of economic processes. The use of demographic indicators to increase the efficiency of online advertising and marketing activities is a relevant and important issue to solve. This article determines the options of new campaigns to be conducted based on the personal data of online advertising and marketing users. The use of demographic indicators of customers for the study of marketing or public opinion creates conditions for identifying a specific consumer market. The article proposes a new model for the successful implementation of advertising and marketing based on the analysis of demographic indicators. This enables to adapt marketing messages and offers to specific population groups, increase their relevance and effectiveness. The impact of demographic indicators on advertising and marketing strategies can be useful for attracting new customers and can lead to an increase in the number of customers in sales. The article examines the theoretical aspects of using demographic data in Internet marketing and proposes a model for increasing the effectiveness of advertising campaigns. An analysis of existing research identifies the main factors affecting the effectiveness of marketing. The results of the study can be used by marketers to optimize their strategies and increase their competitiveness.

1. Introduction

The emergence and widespread use of Artificial Intelligence (AI) in recent years has affected many areas, including advertising and marketing. By analyzing large amounts of data, AI identifies information recorded by the customer and plays a significant role in increasing the effectiveness of marketing strategies. In advertising and marketing, demographic indicators such as age group, gender, income and education of people affect consumer behavior. By analyzing demographics, marketers can run more successful campaigns based on digital technologies. The application of AI to marketing, which describes the sequence of operations from the initial awareness of the customer to the final purchase, i.e., forecasting demand, determining

customer sentiment, etc., has led to significant progress in this area (Hajirahimova et al., 2021).

Demographics are the main point to be focused by the consumer. Understanding how different demographics respond to marketing processes is important for developing effective strategies. AI is used to analyze demographics using large databases. Here, it is possible to process data and make decisions by obtaining implicit knowledge (Eddy et al., 2015). Particularly, machine learning algorithms can identify the relationships between demographics and consumers and manufacturers with traditional analytical methods. Marketers face consumer groups with different demographic profiles in the market, as well as their problems. Therefore, marketers must

interact with different demographic segments and study marketing processes in detail for new applications. One of the main factors is the correct decision-making by analyzing step-by-step how marketing processes occur in different demographic environments (Gasimova et al., 2022).

The impact of demographic processes on marketing is related to many areas, and these processes are constantly being studied in the world.

2. Related works

The main indicator is the accurate targeting of online advertising campaigns. The effectiveness of an advertising campaign in the Internet space is relatively easy to assess precisely. New technologies are widely used to regulate direct relations between the consumer and the manufacturer. However, there are social networks such as chat, whatsapp, telegram, etc. for information about new brand products, purchases and other communication effects. The widespread use of the Internet and digital technologies in the collection and processing of demographic data has led to the emergence of a new area, namely digital demography (Hobcraft et al., 1985).

Many mathematical models based on qualitative and quantitative analysis of demographic processes are now available. Along with traditional sociological methods for collecting and analyzing demographic indicators (survey models, observation, document analysis, cohort customers (a group of customers united by a common characteristic), sample surveys), modern analysis models (machine learning models, etc.), the latest achievements of information technologies which meet the requirements of the 4th industrial revolution, are also widely used (Mason et al., 2001; Savelyev, 2015).

In order to better meet the needs of buyers in the online environment, virtual consumers, as well as their scopes of interest, are divided into segments by specialists and marketers. There are many studies on this topic: the work "Customer Segmentation Analysis Using LRFM Based Product and Brand Dimensions" by Mirdatul H. and Aulia V.R. discusses the categorizing of customers into segments based on demographics. Customer segmentation is carried out using LRFM models (Loginom, Recency, Frequency, Monetary) with fuzzy C-means algorithm. Here, the cluster, group 1, is characterized by customers with a passion for branded products, a variety of products or long-term branded product sales,

constant innovation, high sales and high monetary value. Group 2 represents a set of customers who are minimally loyal buyers or have no knowledge of the product or branded product (Mirdatul et al., 2023) In another article, Lulaj provides extensive information about the three areas of business: technology, innovation and services. The special role of demographics in this field is highlighted. Moreover, (Patel, 2018; Lulaj, 2023; Merkel, 2005) and others have relevant studies on this topic.

The studies mentioned above on consumer-producer relationships are based on the satisfaction of customer interests. Conducting new research to achieve customer satisfaction is of great importance.

This article aims to explore the role of demographic indicators in Internet marketing processes and the main causes of the problems that arise in this regard and to provide solutions.

Problem statement. This study presents a demographic impact model that analyzes the state of demographic indicators such as age, gender, income, education, etc. of consumers using basic AI methods for the success of advertising and marketing. An AI-based model of demographic indicators is proposed to increase the effectiveness of the marketing process in the online environment. This model, by applying demographic indicators, helps marketers develop more effective strategies tailored to specific consumer groups.

3. Materials and methods

The use of demographic data is important in Internet marketing processes. Let's review some models that are suitable for this. The AIDA model describes the stages of the purchase: Attention, Interest, Desire, Action (Walter et al., 2001). This model can be used at each stage of demographic data.

- The Stimulus-Response model is valuable for understanding how demographic characteristics affect consumer responses to various marketing stimuli.
- The Kano model categorizes the customer needs into groups such as basic, expected, desired and unexpected. This model is used to determine what results demographic groups are likely to experience from using a product or service.

Research companies such as Forrester, Gartner, McKinsey can be used for the study. These companies regularly publish studies on marketing

trends and the impact of demographic factors. Articles on marketing, consumer psychology and sociology are published in scientific journals. Social Media provides a wealth of user information for analyzing demographics and behavior. Web analytics data such as Google Analytics, Yandex, Metrika and other tools collect information about user behavior on websites that can be used for audience segmentation. Cloud technologies provide configurable resources (computer networks, servers, storage, programs, services) and special-purpose organizations can access databases for data analysis when needed (Don et al., 2001). Some of the technical features of cloud technologies are listed below:

- Self-service – reducing the waiting time for the provision of resources;
- Shared, standard, durable – adjustable special resource parts.

By taking advantage of these features, it is possible to become a participant, as well as a researcher of demographic indicators. Through cloud technologies, the process of analyzing demographic indicators of advertising and marketing processes becomes constantly accessible. Thus, fast and efficient analysis of data, namely big data, and performing complex calculations are mainly implemented through cloud technologies. Demographic analysis methods include the followings (Paley et al., 2017):

- Statistical analysis based on demographic indicators;
- Multidimensional analysis of demographic indicators;
- Knowledge discovery based on demographic indicators;
- Visualization based on demographic indicators;
- Decision-making system based on demographic indicators;
- Forecasting based on demographic indicators;
- Modeling based on demographic indicators.

Demographic analysis methods play an important role in the proper management of social and economic processes. The choice of the appropriate model depends on the specific task and available data. Modern computer technologies, primarily AI, build complex and accurate models to predict demographic changes and develop effective development strategies. These models include:

- Statistical models;
- Cohort analysis;
- Dynamic models;

- Simulation model;
- Stochastic models.

3.1. Cohort customer analysis

The grouping of demographic factors into segments, and consumers into different groups, leads to faster sales of the product and delivery of the product to the right customers. Marketers mainly use customer data in segmenting demographic indicators. This ensures the relevance and effectiveness of advertising and marketing. In the process of developing a marketing strategy, companies use various socio-economic indicators, the dynamics of cohort customers (Levitsky et al., 2002). Cohort refers to, for example, customers who have the same time, date of registration, first purchase, etc. This group includes where the customer comes from, from what source, from advertising on Facebook, from the Google search engine, etc., and those who make a transition from sites.

The dynamics of population growth always interacts with the dynamics of economic processes, and changes in social processes directly or indirectly affect the market. Demographic indicators make forecasts based on AI, based on the size and structure of the consumer market, and develop the marketing policy of the organization. Here, the analysis of cohort customers by demographic indicators is one of the central goals.

CRM (Customer Relationship Management) is a customer relationship management technology. It is a tool for organizing and optimizing business communication, customer-seller relationships. The purpose of this research is to verify the effectiveness of the model in a set of e-commerce records, to find critical signs related to customer awareness. The analysis of cohort customers includes the technical characteristics and statistics of the collected data (Patel et al., 2018). With the analysis of cohort customers, it is possible to find solutions to various business issues, and e-commerce can successfully solve real customer problems. E-commerce typically simplifies the information obtained about the awareness and loyalty of its customers, the likelihood of the user making a purchase or interacting with the platform (Wilming et al., 2002). According to customer demand, e-business aspects are analyzed and interests are identified to strengthen customer relationships in e-commerce.

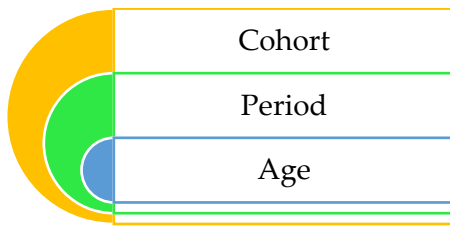


Fig. 1. The relationship of cohort, age group and period

As can be seen from fig. 1, the analysis of cohort customers depends on the relationship between age and period. This model is widely used in demography, sociology and other fields to analyze changes in various age-related phenomena over time. It categorizes the common changes into three components:

Age group: The changes related to the natural aging process. For example, aging of an individual leads to a decrease in productivity and an increase in the likelihood of disease.

Period: The changes related to general historical and social processes occurring over a certain period of time. For example, the impact of economic crises on birth rate or migration.

Cohort: The changes related to certain characteristics of people born in the same year, for example, the overlapping interests of most of the same generation, affect the consumer market. The problem of identifying models in cohort analysis exists regardless of the data structure. This analysis is one of the methods of studying consumer behavior. It shows how small groups (cohorts) who have performed any action behaved during a certain period of time. For example, if users subscribe to a book between May 1 and May 30, they can be referred to one group. In this case, the subscription to the book becomes the same action.

This analysis identifies the commercial relationship of only one customer with the store out of the large number of customers visiting the store. Identifying a cohort customer determines existing problems in the commercial process and paves the way for a more efficient organization of the store's further work (Heidari et al., 2023). The advantage of the study is that it categorizes the general trend into components related to age, time and cohort membership. It also identifies long-term trends and changes. The ability to compare different generations and identify their characteristics can also be used to predict further changes.

3.2. Advantages of analyzing demographic indicators in online environment

The impact of demographic indicators in many cases shapes consumer behavior, leading to purchasing decisions, brand choices, and product assortment diversity. For example, people born in different years have different preferences for consumer products (Hashimova et al., 2022):

- Those born in 1946-1964 (Baby Boomers) valued reliability and affordability in products.
- Those born in 1981-1996 (Millenniums) preferred experience and continuity of interaction.

Gender differences affect product choices and purchasing behavior, requiring tailored marketing approaches (Kumar et al., 2021). The main goal of these approaches is customer satisfaction. Customer satisfaction can vary depending on demographics, customer lifestyle, and product. For example, Table 1 illustrates the differences in product selection approaches between female and male in detail.

Table 1. Key differences between customers and marketing approaches

Feature	Male	Female	Marketing approach
Purchase capacity	Functionality, problem solving, status	Emotion, attitude, self-expression	Highlighting the product's advantages, emphasizing its status, using rational arguments; creating stories by referring to emotions, emphasizing the social aspect
Decision-making process	Fast, fact-based	Deliberate, attentive to others' views	Delivering short and clear messages are, focusing on benefits, building trust without providing detailed information
Communication channels	Visual images, short messages	Text information	Using dynamic visual elements, short slogans; emotional and touching stories
Values	Independence, competition, achievement	Connection, collaboration, care	Emphasizing individuality and success; caring for surrounding people
Connection	Technology, sports, cars	Fashion, beauty, health	Using technological innovations, sponsoring sports events; collaborating with fashion brands, offering personalized services

As can be seen from the table, marketing has a unique approach to each customer. That is, if a product creates satisfaction in one customer, it cannot be guaranteed that the same product will

create satisfaction in other customers as well. Thus, each customer has different demographic indicators. Fig. 2 show some of the main characteristics that shape customer satisfaction.

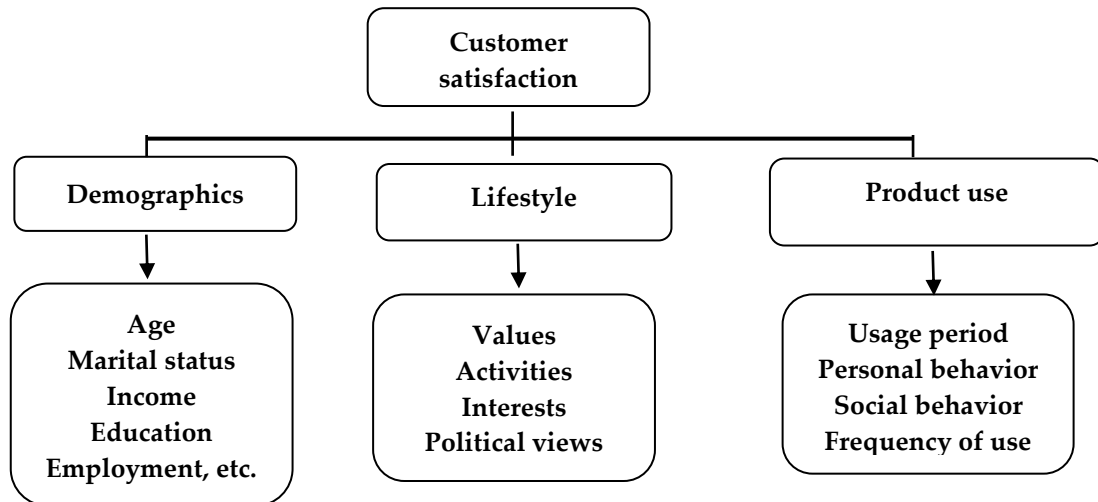


Fig. 2. Key factors shaping customer satisfaction

As the figure shows, demographics are the top factor in customer satisfaction. Marketers can use demographics to predict consumer needs and tailor their strategies accordingly (Dolislager et al., 2023). The model proposed is designed to measure the impact of demographics (D) on online marketing processes (P):

$$M = f\{(D_1, D_2, \dots, D_n), P_i\} \quad (1)$$

M – denotes the overall impact of demographics on online marketing processes (a metric for the effectiveness of a marketing campaign);

f – denotes a function representing the relationship between demographics and marketing processes;

$D_1 - D_n$ – denotes individual demographics (e.g., age, gender, income, location);

P_i – denotes marketing campaign parameters (number of clicks, amount of traffic and advertising costs).

To take into account the impact of demographics on various marketing processes, it can be further developed.

$$M_{klik} = w_1 D_{yaş} + w_2 D_{cins} + w_3 D_{gönlir} \quad (2)$$

where, M_{klik} – denotes the impact of the demographic indicators of the Internet user on the number of clicks, $w_1 - w_3$ – denotes the weight of the demographic indicator for each attribute.

3.3. AI-based advertising and marketing in the Internet environment

AI-based advertising and marketing activities in

the Internet environment greatly assist company management in regulating business using demographic indicators. Analysis of demographic indicators is gradually becoming an integral part of business decision-making (Shen et al., 2019). Most advertising companies apply modern research models using demographic indicators and modern technologies to identify customers with high purchasing ability (Jedwab et al., 2017).

For example:

- Optimal solution of product assortment issues based on demographic analysis;
- Developing a strategy for interaction with customers;
- Increasing the efficiency of implementing advertising campaigns;
- Determining the mood, behavior and interests of customers in providing personalized offers, etc.

AI has created new opportunities for increasing the effectiveness of advertising campaigns in online marketing. It is a convenient tool for marketers to analyze big data, predict user behavior and examine advertising messages. AI analyzes large amounts of information about users, including their demographic characteristics, search history, behavior on websites and social networks. Based on this information, advertisements that are more interesting to the user are designed. Moreover, it analyzes campaigns by optimizing offers and guides marketers in the right direction.

Machine learning algorithms can predict user behavior and the probability of making purchases.

This optimizes marketing budgets and return on investment. AI also recommends changes to advertising campaigns in real time, in accordance with changing market conditions and user behavior.

AI helps produce content tailored to user interests and needs, which leads to an increase in sales. AI enables customers to communicate with chatbots to provide personalized recommendations and 24/7 support. Recommendation algorithms, such

as those used by platforms like Amazon and Netflix, help users find products and services that may interest them (Stritesky et al., 2016). AI can also change the prices of goods and services based on demand, time of day, and other factors. It also analyzes user reviews on social media and other online resources to understand what customers think about brands and other products.

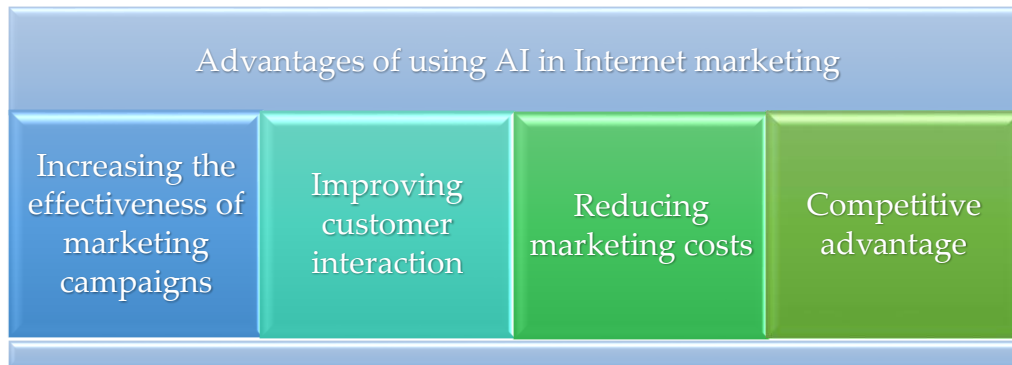


Fig. 3. Advantages of using AI in Internet marketing

From the factors shown in fig. 3, it is clear that AI plays a fundamental role in the development of advertising and marketing. The satisfaction of the manufacturer and consumer is a great achievement. Initial research conducted through online surveys is used to identify potential customers, sometimes even different customer groups. For example, online surveys, which are easily generated and conducted using Internet services such as “Survey Monkey”, have become one of the most widely used market research tools. “Survey Monkey”, designed in the USA, is one of the most popular platforms for generating and conducting online surveys. This platform performs online surveys via the Internet, uses the knowledge obtained through AI to produce the final result. The obtained knowledge is an important indicator for making decisions in business (Fedushko et al., 2022; Merkel, 2005).

AI is becoming an increasingly important tool for marketers. It generates effective advertising campaigns and increases the number of customers. However, in order to successfully use AI, it is necessary to take into account ethical aspects and develop this area.

3.4. The impact model of demographic indicators on Internet marketing processes

The impact of demographic indicators on Internet marketing processes is crucial. Building a quantitative model more accurately assesses the

effective impact of marketing campaigns compared to other demographic indicators. This model emphasizes the importance of moving from qualitative assessments to accurate quantitative measurements (Walter et al., 2001). The quantitative model more accurately predicts the results of further campaigns based on the results of campaigns. It also identifies the areas where campaigns provide the most value and optimizes the return on investment. The model is also convenient for making decisions about marketing strategy, and helps to detect the factors that affect the effectiveness of campaigns most.

The main feature for building a model is data collection – the data on the demographic indicators of users and the results of the advertising campaign are collected (Banerjee et al., 2012). This information can be attained from analytical systems (Google Analytics, Yandex. Metrica), advertising accounts (Google Ads, Facebook Ads), CRM systems and other sources (Hashimova et al., 2016).

Regression analysis assesses the impact of each demographic characteristic (for example, CTR or CPA). Let’s show how to build a linear regression model as follows:

CTR (Click-Through Rate) – The percentage of users who click on an ad;

CR (Conversion Rate) – The percentage of users who complete an operation (purchase, subscription, etc.);

CPA (Cost per Action) – The value of attracting a customer;

ROI – The return on investment.

This model shows how linear regression can be used to obtain initial information about the impact of demographic data on purchasing behavior:

$$CTR = \beta_0 + \beta_1 * Yaş + \beta_2 * Cins + \beta_3 * Gəlir + \dots + \varepsilon \quad (3)$$

CTR – indicates regression rate.

β_0 – free regression coefficient

$\beta_1, \beta_2, \beta_3$ - regression coefficients indicating the impact of each attribute on CTR

ε - random error

For example: $CTR = 0.05 + 0.02 * Age(n) + 0.03 * Gender(male=1, female=0)$

This means that with an increase of 1 age group, CTR increases by 0.02%, and CTR for males is averagely (CR) – 0.03% higher than for females.

Linear regression is a powerful tool for analyzing the impact of demographic variables on customer purchasing behavior (Harmon-Jones et al., 2006). Using linear regression in conjunction with other machine learning methods may achieve a deeper understanding of customer behavior and improve the effectiveness of marketing campaigns.

4. Discussion

The presented article touches upon an extremely relevant topic in modern marketing. The use of demographic data to personalize advertising campaigns and increase their effectiveness has become an integral part of the marketing strategies of most companies.

The importance of demographic data is the main tool for segmenting the audience and producing more personalized advertising messages. This increases the relevance of advertising and, consequently, the effectiveness of marketing campaigns. This article provides a detailed description of the model (3) and the results of its application in practice for a more complete assessment of its effectiveness based on the analysis of demographic data. The use of demographic data can upsurge sales. An individual approach allows for more accurate identification of customer needs and offers them relevant products or services.

The use of demographic data in online marketing generates more personalized and effective advertising campaigns. However, it is important to maintain ethical standards and constantly improve marketing strategies. AI predicts the demographic data to play an even more important role in online marketing in the future, allowing companies to build deep and

long-term relationships with their customers. This article highlights important issues related to the use of demographic data in online marketing. However, additional research is planned to obtain a more complete picture. Personalized marketing based on the analysis of demographic data is a promising development area that will allow companies to intensify the effectiveness of marketing campaigns and strengthen their positions in the market.

5. Conclusion

If the well-being and mood of the people are high, their purchasing ability will also be high. One of these issues is related to the demographic indicators of people. Therefore, it is not surprising that manufacturers need to design the ways to attract customers to advertising. Using AI, marketers can more accurately predict and optimize the impact of demographic indicators on marketing effectiveness. This approach generated personalized and highly targeted marketing strategies. This led to improved results. Demographic indicators play an important role in shaping online consumer behavior. The model was proposed for quantitative assessment of this impact and for making strategic decisions in online advertising and marketing. Demographic indicators were associated with AI to measure their impact on online marketing processes. By effectively using demographic indicators, companies can increase their online marketing efforts in a wider area, employment, etc. Therefore, this study was conducted to consider the impact of demographic indicators on the formation of advertising and marketing strategies, cohort analysis. In order to solve the problems arising from the role of demographic indicators in Internet marketing processes and the role of demographic indicators in Internet marketing processes, the article proposed a model that quantitatively assessed the relationship between demographic and online marketing processes through AI.

Building a quantitative model allowed for a more accurate assessment of the impact of demographic characteristics on the effectiveness of Internet marketing and making more informed decisions (Wilming et al., 2017). However, given the limitations of the model, it can be used in conjunction with other analysis methods. The study can help marketers gain information about the studied areas and explore existing vulnerabilities for further research opportunities.

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