FUNDAMENTAL PRINCIPLES OF PREDICTIVE ANALYTICS IN MARKETING

Yuri GORODETSKY[1]
[1] *Kyiv National University of Technologies and Design, Kyiv, Ukraine*

INTRODUCTION. This article highlights the fundamental principles of predictive analytics as they apply to marketing, providing the reader with a thorough understanding of the methodologies and techniques used to predict consumer behavior and optimize marketing strategies.

RESEARCH HYPOTHESIS. The article examines the key concepts and approaches underlying predictive analytics, including machine learning, statistical analysis, and forecasting algorithms.

THE AIM of particular attention is paid to the application of these methods in various areas of marketing, such as market segmentation, pricing, product portfolio management, and determining the effectiveness of advertising campaigns.

METHODS. The article examines the ethical and legal aspects of predictive analytics in marketing, emphasizing the importance of responsible use of data and algorithms.

FINDINGS. The final section of the article focuses on the future development of predictive analytics in marketing, discussing new technologies, methods, and approaches that can contribute to improving the accuracy and efficiency of forecasts.

CONCLUSION. The author expresses confidence that the further development and integration of predictive analysis into marketing strategy will contribute to the creation of more targeted and effective marketing campaigns while ensuring sustainable growth and competitiveness of companies in the market.

KEYWORDS: predictive analysis; marketing; pricing; business development; marketing strategies; marketing tactics.

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
18	0	0

ФУНДАМЕНТАЛЬНІ ПРИНЦИПИ ПРЕДИКТИВНОГО АНАЛІЗУ У СФЕРІ МАРКЕТИНГУ

Юрій ГОРОДЕЦЬКИЙ[1]
[1] Київський національний університет технологій та дизайну, Київ, Україна

ВСТУП. У цій статті висвітлюються фундаментальні принципи предиктивного аналізу, які знаходять застосування у сфері маркетингу, надаючи ґрунтовне розуміння методологій та технік, які застосовуються для прогнозування споживчої поведінки та оптимізації маркетингових стратегій.

ГІПОТЕЗА ДОСЛІДЖЕННЯ. У статті розглядаються ключові концепції та підходи, що лежать в основі предиктивного аналізу, включаючи машинне навчання, статистичний аналіз та алгоритми прогнозування.

МЕТА це виявлення оптимального застосування цих методів у різних галузях маркетингу, таких як сегментація ринку, ціноутворення, управління продуктовим портфелем та визначення ефективності рекламних кампаній.

МЕТОДИ. У статті розглядаються етичні та юридичні аспекти та методи предиктивного аналізу у маркетингу, наголошуючи на важливості відповідального використання даних та алгоритмів.

РЕЗУЛЬТАТИ. Завершальний розділ статті присвячений майбутньому розвитку передиктивного аналізу у маркетингу, обговорюючи нові технології, методи та підходи, які можуть зробити свій внесок у покращення точності та ефективності прогнозів.

ВИСНОВКИ. Автор висловлює впевненість у тому, що подальший розвиток та інтеграція предиктивного аналізу в маркетингову стратегію сприятиме створенню більш цілеспрямованих та результативних маркетингових кампаній, забезпечуючи при цьому стійке зростання та конкурентоспроможність компаній на ринку.

КЛЮЧОВІ СЛОВА: предиктивний аналіз; маркетинг; ціноутворення; розвиток бізнесу; маркетингові стратегії; маркетингові тактики.

Statement of the problem. With the continuous development of technology and the increasing complexity of the market environment, predictive analytics is becoming a key tool in the arsenal of marketers. Predictive analytics, based on machine learning, statistical analysis, and predictive algorithms, offers unique opportunities to understand and anticipate consumer behavior, optimize marketing strategies, and improve the effectiveness of advertising campaigns.

However, despite the vast opportunities offered by predictive analytics, there are many outstanding issues and challenges that require the attention of researchers and practitioners. Key among these include selecting and applying appropriate methodologies and techniques, adapting them to specific marketing contexts and challenges, and ensuring the ethical and legitimate use of data and algorithms.

The article seeks to systematize the existing knowledge in the field of predictive analytics in marketing, highlight the main principles and approaches, and assess their applicability in different areas of marketing activities. Special attention is paid to the analysis of ethical and legal aspects of the use of predictive analytics, which is a relevant and important task in the context of increasing requirements for the protection of personal data and responsibility for their use.

Thus, the article is aimed at forming a comprehensive view of the application of predictive analytics in marketing, identifying promising areas of research in this area, and offering recommendations for practitioners seeking to effectively use the potential of predictive analytics to achieve competitive advantages and improve the effectiveness of marketing strategies.

Analysis of recent publications on the problem. In recent years, there has been significant progress in the development of new methods of predictive analysis. In particular, machine learning methods based on artificial neural networks are being actively developed. These methods allow for solving more complex problems than traditional statistical methods.

In the field of marketing, new methods of predictive analysis are used to solve the following tasks: demand forecasting, personalization of marketing messages, and determining the effectiveness of advertising campaigns.

There is a large number of studies evaluating the effectiveness of predictive analyses in various marketing tasks. These studies show that predictive analytics can be an effective tool for improving the effectiveness of marketing campaigns.

Overall, predictive analytics is a rapidly growing field that has great potential for use in marketing. Further research in this area will focus on developing new predictive analytics methods, evaluating their effectiveness in various marketing tasks, and addressing the ethical and legal issues associated with the use of predictive analytics.

The purpose of the study. This study aims to comprehensively analyze and systematize the fundamental principles of predictive analytics relevant to the

context of marketing. The aim is to provide readers with a thorough understanding of how predictive analytics techniques, including machine learning, statistical analysis, and predictive algorithms, can be applied to predict consumer behavior and optimize marketing strategies.

The study focuses on analyzing the use of predictive analytics in various aspects of marketing such as market segmentation, pricing policy formulation, product portfolio management, and evaluating the effectiveness of advertising campaigns. The aim is to identify how these techniques can help improve the accuracy and efficiency of marketing decision-making, which can ultimately lead to increased profits and a stronger market position for the company.

The aim of the study is not only to provide a broad overview of the principles and methods of predictive analytics in marketing but also to identify areas for further research and improvement of these methods within marketing activities.

The main results and their justification. The article discusses the basics of predictive analytics in marketing, an overview of the main concepts and definitions, as well as methods that are actively used by businesses today.

Predictive analytics is a data analysis methodology that uses statistical algorithms and machine learning techniques to predict future events and trends based on available historical data. In marketing, predictive analytics can predict consumer preferences, customer behavior, and the results of marketing campaigns, which helps companies plan their marketing efforts more effectively and make informed decisions.

The core concepts of predictive analytics in marketing include:

• Machine Learning: it is a subsection of artificial intelligence that provides computers with the ability to learn from experience and data without explicit programming. Machine Learning is used in predictive analytics to create models that can predict future events based on analyzing past data.

• Training Dataset: is a dataset that is used to train machine learning models. It consists of historical data including various variables and a target variable to be predicted. The model is learned from the training data to identify patterns and regularities.

• Target Variable: this is the variable that the machine learning model is trying to predict. In marketing, this could be, for example, the likelihood of a customer buying a product, the conversion rate of a marketing campaign, or the cost of a purchase.

• Features: these are the variables that are used to predict the target variable. In marketing, features can be data about customers such as age, gender, purchase history, interests, and other factors that influence their behavior.

• Machine learning algorithms: there are many machine learning algorithms that are used to solve various predictive analytics problems. Some of

the most common algorithms include linear regression, decision trees, random forest, gradient boosting, and neural networks.

• Cross-Validation: it is a method of evaluating the performance of machine learning models based on available data. It evaluates how well a model generalizes its results to new data and avoids overfitting.

• Prediction: is the process of using a trained model to predict the values of a target variable on new data that the model has not seen before.

In marketing, predictive analytics is used to forecast various events and indicators, such as the likelihood of customer churn, assess the effectiveness of marketing campaigns, determine the most likely customer purchases, and others. It helps companies make more informed decisions, reduce risks, and optimize their marketing efforts to achieve more successful results.

In marketing, predictive analytics has a wide range of applications and can be used in a variety of areas to improve the effectiveness of marketing strategies and enhance customer interactions. Some of the most common applications of predictive analytics in marketing include:

• Predicting the likelihood of customer churn: Predictive analytics can help companies identify customers at high risk of leaving and predict the likelihood of churn for each customer. This allows timely action to be taken to retain customers, such as offering personalized discounts, bonuses, or loyalty programs.

• Personalized marketing: Predictive analytics helps to understand customer preferences and needs based on their previous actions and behaviors. This allows companies to offer personalized offers and recommendations, which improves customer experience and increases the likelihood of purchases.

• Optimize advertising campaigns: with predictive analytics, companies can identify the most effective advertising channels and optimize marketing campaign budgets. Predictive analytics models can predict the results of advertising campaigns and identify the most promising audience segments.

• Sales Forecasting: predictive analytics can help companies forecast future sales based on historical sales data and factors affecting demand. This helps companies plan their production activities and manage inventory of goods more accurately.

• Identifying the most promising customers: predictive analytics can be used to identify the most promising customers who have the highest probability of making a purchase in the near future. This allows you to focus your marketing efforts on the most promising audiences and increases conversion rates.

• Determining optimal prices: predictive analytics can help determine the optimal prices for a company's products or services, taking into account demand,

competition, and other factors. This allows you to set prices that maximize profits and meet customer needs.

• Analyze the effectiveness of communication channels: predictive analytics can help determine the most effective channels for communicating with customers, such as email, social media, SMS, etc. This helps optimize marketing efforts and improve audience engagement.

All these applications of predictive analytics in marketing help companies make better-informed decisions, improve customer interactions, and enhance the effectiveness of marketing strategies. It allows companies to be more competitive in the market and successfully adapt to changing conditions and consumer demands.

By analyzing the current situation with the study of scientific works of world authors, it is possible to summarise all the methods and approaches to data analysis for predicting and identifying trends in consumer behavior and markets that exist and are currently used.

Predictive analytics in marketing is a powerful tool that allows companies to predict future trends and events based on the analysis of historical data. Various data analysis techniques and approaches are used to achieve this goal. Let's take a look at some of them:

1. *Regression Analysis:* Regression analysis is used to assess the relationship between a dependent variable (target) and one or more independent variables (attributes). In marketing, it can be used to forecast sales based on advertising costs, determine the effect of price on demand, or assess the impact of marketing campaigns on customer behavior.

2. *Cluster Analysis:* Cluster analysis is used to group objects (e.g., customers) based on their similarity in a number of characteristics. This identifies audience segments with common needs and behaviors. Cluster analysis helps in creating more personalized marketing strategies for different customer segments.

3. *Time Series Methods:* Time series methods are used to predict future values based on temporal data (e.g., sales by month, and daily website visits). This helps in identifying seasonal fluctuations, trends, and other periodic patterns that help companies take appropriate actions in their marketing strategies.

4. *Classification models:* Classification models are used to predict whether an object belongs to a particular class or category. In marketing, this can be used to determine the likelihood of a customer making a certain decision (e.g., buying a product) based on their profile and behavior.

5. *Machine learning techniques:* Machine learning methods involve various algorithms that allow computers to "learn" from data and make predictions on new data. Some of the popular machine learning techniques used in marketing include random forests, gradient boosting, and neural networks.

6. *Network Analysis:* Network analysis is used to study the relationships between objects in a network (e.g., social networks). In marketing, it can be used to analyze the influence of key opinion leaders on the behavior of other users and identify the most important nodes in the network to attract new customers.

7. *Text analysis*: Text analysis allows companies to analyze textual information from customer reviews, social media, and other sources. This helps to understand public opinion about the brand and products, identify trends and issues, and develop more effective communication strategies.

The basic methods and approaches to data analysis in predictive analytics help marketers predict consumer preferences, identify trends in the market, forecast the results of marketing campaigns, and optimize strategies to improve customer interactions and achieve more successful results.

Let's continue with a look at the methods and approaches of predictive analytics in marketing:

8. *Social Media Analytics:* Social media is a rich source of data on consumer behavior and opinions. Social media analysis allows companies to monitor discussions about their brand, products, and customer feedback. This helps in identifying trends, identifying key themes and sentiments, and tracking reactions to marketing campaigns.

9. *Forecasting LTV (customer lifetime value):* Determining the LTV of a customer is an important task for marketing. Predictive analytics can predict how much revenue a customer will bring to the company over their lifetime with the brand. This helps in determining the cost of customer acquisition and allocating marketing budget keeping in mind the potential profit from the customers.

10. *Cohort Analysis:* Cohort analysis is used to study groups of customers who started interacting with a company in the same period of time. Cohort analysis helps to understand how customer behavior changes over time and what factors influence customer loyalty and engagement. This helps in identifying successful marketing strategies and attractive customer segments.

11. *Network effects analysis:* In certain business areas such as social media platforms, messengers, and online marketplaces, network effects play an important role. Predictive analytics can assess the impact of network effects on attracting new users and increasing activity on the platform.

12. *Conversion Forecasting:* Conversion prediction in marketing is important to understand which engagement channels and marketing efforts are most effective. Predictive analytics helps to determine the likelihood of customer conversions at each stage of the sales funnel and identify the most significant factors influencing purchase decisions.

13. *Assortment Analysis:* Assortment analysis helps to determine which products or services are most popular with customers and which ones can be

most profitable. Predictive analytics helps to determine the optimal product mix that satisfies customer needs and generates the most profit for the company.

14. *Price sensitivity analysis:* Pricing is an important aspect of marketing. Price sensitivity analysis helps to determine how changes in the prices of products or services affect the demand and revenues of a company. Predictive analytics can predict customer reactions to price changes and determine optimal pricing strategies.

15. *Universal Salsa method.* The predictive analytics method allows to creation of links between all structural units of the business for predictive calculations, creation of strategic plans, and compensation of external and internal risks for the company.

All these methods and approaches of predictive analytics in marketing help companies to more accurately predict customer behavior, identify trends in the market, make informed decisions, and optimize marketing strategies. This allows companies to be successful in the marketplace, retain existing customers attract new ones, and effectively utilize their marketing resources.

Examples of successful use of predictive analytics in marketing and brand management include:

• *Personalized marketing and product recommendations:* Major online retailers such as Amazon and Netflix have successfully used predictive analytics to provide personalized recommendations to customers. They analyze historical data on users' purchases, views, or ratings to predict which products or movies each customer might be interested in. This approach increases the likelihood of customer purchase and retention.

• *Predicting customer churn:* Telecom companies, ISPs, and banks are actively using predictive analytics to predict customer churn. By analyzing data on customer behavior, activity, and interactions, predictive analytics can identify signs of potential churn. This enables companies to take measures to retain customers by offering personalized offers and discounts.

• *Optimization of advertising campaigns:* Advertising agencies and advertisers use predictive analytics to optimize advertising campaigns. By analyzing data on audience behavior, audience characteristics, and advertising platforms, they can identify the most effective advertising channels and formats. This approach helps to reduce advertising costs and increase conversion rates.

• *Determining optimal pricing:* Retailers and manufacturers use predictive analytics to determine optimal product pricing. By analyzing data on price changes and customer response to them, optimal price ranges can be identified to maximize revenue and customer satisfaction.

• *Analyzing the effectiveness of marketing campaigns:* Companies can apply predictive analytics to analyze the effectiveness of their marketing

campaigns. Predicting the results of future campaigns based on analyzing past data can identify the most promising approaches, channels, and messages.

• *Demand Prediction:* Manufacturing companies use predictive analytics to forecast demand for their products. By analyzing data on sales, seasonal factors, marketing promotions, and other influencing factors, trends can be identified and predictions become more accurate.

• *Competitor Analysis:* Predictive analytics helps companies analyze data about competitors and their market activity. This helps in predicting competitors' actions, their reactions to marketing strategies, and adapting their actions according to the market situation.

• *Inventory Management:* Retailers and manufacturing companies use predictive analytics to optimize inventory and stock management. Forecasting future demand based on sales data and seasonal variations can reduce storage costs and mitigate the risk of surplus or shortages.

These are just a few examples of the successful use of predictive analytics in marketing and brand management. All of these applications enable companies to make informed decisions, improve customer engagement, optimize marketing strategies, and achieve outstanding market results.

Further examples of successful uses of predictive analytics in marketing and brand management can also be discussed below:

1. *Predicting content performance.* Content marketing companies can use predictive analytics to predict the effectiveness of content material. By analyzing data on audience response to different types of content (articles, videos, infographics, etc.), they can identify the formats and topics that are most appealing to audiences.

2. *Analyzing the impact of events and promotions.* Predictive analytics helps assess the impact of various events and marketing promotions on customer behavior. Companies can predict the effects of discount promotions, loyalty programs, advertising campaigns, and events on sales and customer loyalty.

3. *Analyzing the effectiveness of email marketing.* Predictive analytics is used to analyze the results of email marketing and determine the best strategies to engage with customers. This includes determining the optimal time to send emails, content that is most appealing to different audience segments, and assessing the likelihood of opening and responding to emails.

4. *Web content optimization.* Predictive analytics helps in optimizing the web content provided to website visitors. By analyzing data about users' on-site behavior, interests, and actions, it can predict what content is most appealing to audiences and adapt the site to improve user experience and conversions.

5. *Analyzing the effectiveness of social media.* Predictive analytics allows you to measure the results of your social media marketing efforts. Analyzing

data on user interactions with content, posts, and ad campaigns helps identify the most effective platforms, content types, and topics to engage audiences.

6. *Predicting product popularity.* Manufacturers and retailers use predictive analytics to predict the popularity of new products. By analyzing data from previous sales and advertising campaigns, they can estimate the potential demand for a new product and determine its success in the market.

7. *Predicting the outcome of events and sponsorships.* Companies sponsoring events or sports teams can use predictive analytics to forecast the outcome and performance of their investments. This allows them to determine which events or teams are most appealing to audiences and which events will generate the greatest return.

These examples demonstrate how predictive analytics is being used to optimize marketing strategies, improve customer engagement, and achieve successful brand management outcomes. It enables companies to adapt to rapidly changing market conditions, anticipate customer needs, and act more effectively to drive business growth and brand strength.

But still, the main point of using predictive analytics is a company's product policy. Applying predictive analytics to select an optimal brand portfolio is a critical success factor for a company, especially in economic crises. An effective brand portfolio allows a company to maximize revenues, improve competitiveness, and manage risk effectively. Let's look at how predictive analytics can be applied to this task:

1. *Analyzing sales and profitability data.* Predictive analytics allows you to analyze the sales and profitability data of each brand in the company. Based on this data, it can be determined which brands are generating the most revenue and which may have the potential for further growth. Such analyses identify the most successful and promising brands to focus on.

2. *Forecasting demand and trends.* Predictive analytics allows you to forecast future demand for each brand's products. This involves analyzing data on sales, marketing promotions, competitive factors, and customer behavior. Demand forecasting helps to determine which brands will be most in demand in the market and which may face a decline in demand.

3. *Analyzing the competitive environment.* Predictive analytics allows you to analyze data about the competitive environment and competitors' actions. This includes analyzing prices, marketing campaigns, market positioning, and customer response to competitive offerings. Such analyses help in identifying the advantages and weaknesses of each brand as compared to its competitors.

4. *Audience segmentation.* Predictive analytics allows you to segment your audience based on their preferences, behaviors, and characteristics. This helps in determining which brands are most popular among different audience segments and which can be more successful in certain market segments.

5. *Determining the strategic role of brands.* Predictive analytics helps in determining the strategic role of each brand in the company's portfolio. This involves analyzing data on each brand's positioning, unique characteristics, and target audience. Defining the strategic role identifies the core brands that serve as the foundation of the business, as well as complementary brands that can support the core brands or seek new markets.

6. *Making decisions to add or reduce brands.* Based on analyzing data and forecasts, predictive analytics helps companies make decisions to add new brands to the portfolio or reduce the number of brands. This allows optimizing the portfolio by removing less successful brands or investing in brands with high potential

7. *Risk and Opportunity Modelling.* Predictive analytics allows companies to model different risk and opportunity scenarios for each brand. This includes analyzing possible economic crises, changes in consumer behavior, competitive activity, and other factors that could affect the success of a brand. Modeling risks and opportunities allows companies to develop strategies to reduce risks and seize opportunities for each brand.

8. *Brand lifecycle analyses.* Predictive analytics allows analyzing the life cycle of each brand in a company's portfolio. This includes analyzing data on sales, growth, maturity, and decline of products. Life cycle analysis helps to identify brands that are at different stages of their development and make decisions on their future management.

9. *Analyzing the effectiveness of marketing investments.* Predictive analytics helps to evaluate the effectiveness of marketing investments for each brand in the portfolio. This includes analyzing data on the costs of marketing activities and their impact on sales and brand awareness. Evaluating marketing investment performance helps identify the most successful marketing strategies and allocate the budget most effectively.

10. *Analyzing the impact of brands on the overall value of the company.* Predictive analytics assesses the impact of each brand in the portfolio on the overall value of the company. This includes analyzing the revenue, profitability, and risk data of each brand. Analyzing the impact of brands on the value of the company allows you to identify the company's key assets and optimize the management of the brand portfolio to maximize value.

11. *Development of profitability forecasts.* Based on the data and forecasts generated by predictive analytics, companies can develop profitability forecasts for each brand in the portfolio. The forecasts help in determining the financial goals and development plans of the brands in the long and short term.

12. *Cannibalization effect analysis.* Predictive analytics helps in determining the cannibalization effect between different brands in the portfolio. Cannibalization occurs when one product or brand competes with other products

or brands of the same company. Analyzing the cannibalization effect allows companies to take measures to optimize product mix and positioning.

Predictive analytics is a powerful tool for companies looking to optimize their brand portfolio. By analyzing data and making predictions, companies can make informed decisions, adapt to changing market conditions, and create more successful marketing strategies for each brand in their portfolio.

Over the course of this article, we have taken a detailed look at the fundamental principles of predictive analytics and their application to marketing. Predictive analytics is a powerful tool that relies on statistical analysis, machine learning, and predictive algorithms to not only predict consumer behavior with a high degree of accuracy but also to optimize marketing strategies based on the findings.

We focus on the key concepts and methodologies that underpin predictive analytics and look at how these approaches can be integrated into marketing activities. Predictive analytics has a tremendous impact on making informed and effective marketing decisions, which ultimately leads to increased ROI and enhanced competitive advantage for the company.

However, it should be noted that the successful application of predictive analytics requires not only knowledge of relevant methods and tools but also the availability of quality data and an understanding of market specifics and consumer behavior. In addition, it is important to be aware of the possible ethical and legal implications of using predictive analytics, especially in the context of handling personal customer data.

In conclusion, we would like to emphasize that predictive analytics is an integral part of modern marketing, and its role will only increase as technology develops and the amount of available data increases. Mastering the principles and methods of predictive analytics will allow marketers not only to effectively predict future trends and consumer behavior but also to form more personalized and targeted marketing campaigns, thus increasing customer satisfaction and ensuring sustainable business growth.

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AUTHOR (S) BIOSKETCHES

Gorodetsky Yuri, postgraduate student, assistant at the Department of Marketing and Communication Design, Kyiv National University of Technologies and Design, Ukraine

https://orcid.org/0000-0003-3555-8234
E-mail: gorodetsky9535@gmail.com