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## MODERN DIGITAL DATA PREPARATION TOOLS IN MARKET RESEARCH

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**Summary.** *The comprehensive research of the transformation of market research processes in the context of the rapid growth of digital information volumes, the development of the global digital environment, and the active implementation of artificial intelligence technologies is carried out in this paper. Current trends in data generation characterized by exponential dynamics, as well as the growth in the number of Internet users as key factors driving changes in approaches to data collection, the processing, and analysis were analyzed. It is substantiated that the increasing volumes of structured and unstructured data require the use of innovative tools for their systematization, cleaning, integration, and preparation for further application in analytical models. The essence of data preparation tools is revealed and their place in the modern analytical process is determined. Differences between data preparation tools and traditional ETL processes, particularly in terms of flexibility, operational efficiency, support for self-service analytics, and facilitation of team collaboration are identified. It is proven that the use of such tools helps eliminate information fragmentation, improve its quality, standardize formats, remove duplicates, handle missing values, and create a unified information base for managerial decision-making. Special attention is paid to the role of artificial intelligence and machine learning technologies in market research. It is determined that AI models enable the identification of hidden patterns, consumer segmentation, forecasting of market trends, and modeling of customer behavior with a high degree of accuracy. It is emphasized that their application effectiveness directly depends on the availability of high-quality, properly structured, and accurately labeled data. The practical advantages of implementing modern data preparation and integration platforms in marketing research are summarized, highlighting their improved operational efficiency, reduced labor intensity of processes, and the ability for specialists to focus on strategic analysis. The conclusion about need of comprehensive integration of data preparation tools and artificial intelligence technologies as a key prerequisite for the formation of effective, adaptive, and competitive market research system in the context of digital economy is made.*

**Key words:** *market research, data preparation tools, artificial intelligence technologies, digital technology era.*

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## СУЧАСНІ ЦИФРОВІ ІНСТРУМЕНТИ ПІДГОТОВКИ ДАНИХ У ДОСЛІДЖЕННЯХ РИНКУ

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**Резюме.** *Комплексно досліджено трансформацію процесів дослідження ринку в умовах стрімкого зростання обсягів цифрової інформації, розвитку глобального цифрового середовища та активного впровадження технологій штучного інтелекту. Проаналізовано сучасні тенденції генерації даних, що*

характеризуються експоненційною динамікою, а також зростання чисельності користувачів Інтернету як ключові чинники зміни підходів до збору, опрацювання та аналізу інформації. Обґрунтовано, що збільшення масивів структурованих і неструктурованих даних потребує застосування інноваційних інструментів їх систематизації, очищення, інтеграції та підготовки до подальшого використання в аналітичних моделях. Розкрито сутність інструментів підготовки даних та визначено їх місце в сучасному аналітичному процесі. Встановлено відмінності між інструментами підготовки даних і традиційними ETL-процесами, зокрема у фокусі на гнучкість, оперативність, підтримання аналітики самообслуговування та забезпечення командної взаємодії. Доведено, що використання таких інструментів сприяє усуненню фрагментованості інформації, підвищенню її якості, стандартизації форматів, видаленню дублікатів, опрацюванні пропущених значень і створенню цілісної інформаційної бази для прийняття управлінських рішень. Окрему увагу приділено ролі технологій штучного інтелекту та машинного навчання у дослідженнях ринку. Визначено, що AI-моделі дозволяють виявляти приховані закономірності, сегментувати споживачів, прогнозувати ринкові тенденції та моделювати поведінку клієнтів із високим рівнем точності. Підкреслено, що ефективність їх застосування безпосередньо залежить від наявності якісно підготовлених, структурованих і коректно маркованих даних. Узагальнено практичні переваги впровадження сучасних платформ підготовки та інтеграції даних у маркетингових дослідженнях, що забезпечують підвищення операційної ефективності, скорочення трудомісткості процесів та зосередження фахівців на стратегічному аналізі. Зроблено висновок про необхідність комплексної інтеграції інструментів підготовки даних і технологій штучного інтелекту як ключової умови формування ефективної, адаптивної та конкурентоспроможної системи дослідження ринку в умовах цифрової економіки.

**Ключові слова:** дослідження ринку, інструменти підготовки даних, технології штучного інтелекту, епоха цифрових технологій.

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**Statement of the problem.** Collection, processing, and preparation of data for application is an important stage in market research. Previously, the work with various data was the responsibility of a narrow circle of technical specialists before the results became available to others. At present it is a collaborative effort of the entire research team. Whether it involves creating dashboards, training artificial intelligence models, or fast obtaining of the answers to new queries, the quality of the data and the ease of its processing directly determine the efficiency and success of the researchers' work.

In the context of the above mentioned, the application of modern data preparation tools in market research is of significant importance. They make it possible for researchers to transform disparate or incompatible sets of information into useful, understandable data that everyone can work with. Such data become the basis for prompt decision-making and achievement of tangible results in market research. Since the increasing number of from sales, marketing, finance, and operations specialists are directly involved in working with data, the need for simple, flexible, and intuitive data preparation tools grows as well.

**Analysis of available researches and publications.** Marketing research in general, and market research in particular, have recently been attracting the increasing attention not only from academic marketers but also from practitioner-researchers. Among Ukrainian scholars in the field of marketing, the significant scientific contributions of V. A. Litynska should be highlighted. In her work she draws attention to the transformation of traditional marketing research methods influenced by the era of digital technologies and changes in consumer behavior [8]. G., While investigating the problem of marketing research for business, Sukhorukova H. draws attention to the issue of personalized customer experience and the need to use online technologies in research [11]. The structure of marketing research also includes market research. The issue of market research was directly studied by M. Bahorka, I. Kadyrus, and N. Yurchenko [1], who analyzed, summarized, and systematized market research methods depending on the buyer archetype. The authors focused on the investigation of consumer behavior, which made it possible to form two groups of methods: non-traditional and

traditional, used to study consumer behavior [1]. The work by T. Chernychko, N. Hladynets, and V. Hladynets, who studied the food market through the lens of consumer behavior within it [8] can be considered to be the follow-up to these researches. A significant contribution to the investigation of the market has been made by marketing practitioners, who presented their findings in [7]. In particular, issues of market evaluation using modern digital tools, risk assessment, and others were investigated.

**The objective of the investigation** is to substantiate the role of modern data preparation tools and artificial intelligence technologies in the transformation of market research processes, as well as to determine their impact on the quality, speed and effectiveness of analytical activities of enterprises under the conditions of rapid growth in information volumes.

**Statement of the task.** In order to achieve the set goal, it is necessary to solve the following problems: to analyze the dynamics of global data growth and the increase in the number of Internet users as a prerequisite for transformation of approaches to market research; to characterize the essence and features of market research under the conditions of the digital economy; to reveal the content and functional capabilities of data preparation tools; identify the key advantages of data preparation tools application by market researchers; to investigate the role of artificial intelligence and machine learning models concerning the efficiency of market data analysis; to analyze the possibilities for practical application of modern data preparation and integration platforms in market research; and to substantiate the need to use well-prepared data as the basis for forming and substantiating management decisions.

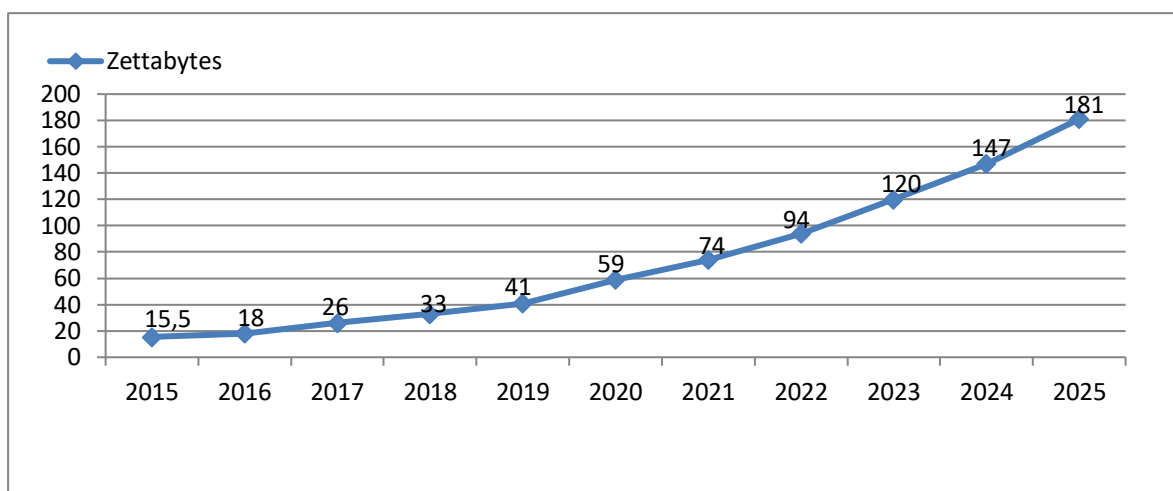
In the course of the study, we used the following general scientific and special methods that ensured the consistency and validity of the obtained results: analysis and synthesis - to generalize scientific approaches to interpreting market research, data preparation tools, and artificial intelligence technologies; systemic approach – to consider the market research process as an integrated system that combines the stages of data collection, preparation, processing, and analysis; comparative analysis – to compare traditional information processing methods with modern data preparation tools and artificial intelligence technologies, as well as to identify their advantages and differences (in particular in relation to ETL (Extract, Transform, Load) processes, which include data extraction, transformation, and loading); statistical analysis – to investigate the dynamics of global data growth and the number of Internet users, as well as to interpret quantitative indicators of digital development; graphical method – for visual presentation of trends in the growth of information volumes and the dynamics of the digital environment development; generalization method – to draw conclusions regarding the role of data preparation tools and artificial intelligence in increasing the efficiency of market research.

The combined application of the above mentioned methods made it possible to assess comprehensively the transformation of market research processes in the context of the active implementation of digital technologies and artificial intelligence.

**Presentation of the main research material.** Every day we are faced with a large amount of data, and every year these volumes are increasing at an ever faster rate. According to research by Exploding Topics Company, about 402 million terabytes of data are created every day worldwide [6]. The created data include those that have just been generated, received, copied, or used. In zettabytes, this is approximately 147 zettabytes per year, nearly 12 zettabytes per month, 2.8 zettabytes per week, or 0.4 zettabytes per day [10].

In 2024, approximately 147 zettabytes of data were generated, and in 2025 this figure reached 181 zettabytes [10]. Each year, these volumes are increasing at an ever faster rate. More than half of Internet traffic consists of video.

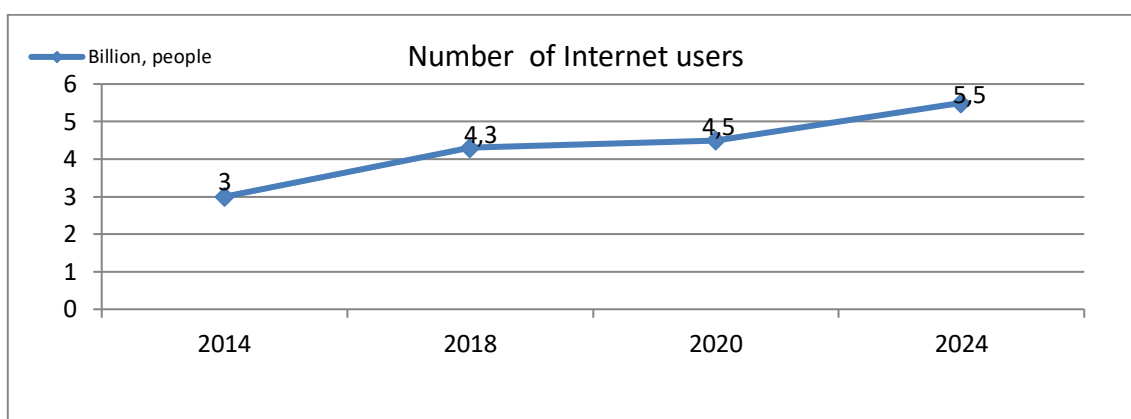
Analysis of the dynamics of global information volume for the period 2015–2025 is presented using the diagram in Fig. 1. The given data indicate that during the investigated period, the volume of information increased by 11.6 times. This trend still exists.



**Figure 1.** Dynamics of the information volume of stored in the world\*

\*Compiled by the authors based on [10].

According to research by Domo Company, the number of Internet users worldwide reached a record 5.52 billion people in 2024 (Fig. 2) [4]. Over the past 10 years, the number of Internet users has increased by 1.8 times.



**Figure 2.** Dynamics of the number of Internet users in 2014–2024\*

\*Compiled by the authors based on [4].

Over the past decade, the research company Domo has tracked global data usage and noted a significant increase in activity across various online platforms, from Instagram and X to Amazon, Venmo, and many others [4]. The annual infographic by this research company provides an overview of the vast amount of data generated on the Internet every minute, illustrating how data continuously evolve and change since more and more people interact with digital platforms and services. Thus, the 2025 infographic reflects the huge amount of data generated every 60 seconds online, highlighting the need to use modern tools for data preparation, processing, and analysis, as well as in market research [4].

It should be noted that market research is a set of actions aimed at the investigation of all environmental factors that influence the state and development of the market, including changes in its volume and structure, etc. [1]. As the result of market research, we obtain information about opportunities and threats by studying the competitive environment, as well as carrying out research of the target audience.

During market research, large amounts of information are obtained, therefore data preparation tools are important, as they ensure systematic cleaning, structuring, and enrichment of primary information arrays for their further application in analytical reports or models [11]. They make it possible to detect and eliminate errors, unify data formats, integrate information from various sources, and organize it for use in information and analytical dashboards, reports, or models. Thus, data preparation tools increase the reliability of the information base and ensure informed and confident use of data in the decision-making process.

Data preparation tools significantly simplify operations that previously required complex queries or significant time-consuming data processing. Modern data preparation platforms increasingly use simple interfaces, enabling analysts and researchers to generate and refine data quickly [9]. Such shift toward self-service analytics increases researchers' autonomy while ensuring consistency in metric definitions and data sources.

Data preparation is often equated with ETL (extract, transform, load) processes; however, there are significant differences in their focus and purpose. While ETL tools are used mainly for transferring large amounts of data into storage systems, data preparation tools are focused on ease of use and efficiency [6]. They emphasize real-time analysis, team collaboration, and rapid responses, unlike rigidly structured data processing pipelines.

In the context of the growing role of data in researchers' daily activities, the ability to clean and prepare information independently without complete dependence on technical specialists becomes particularly important [12]. It is data preparation tools that provide this opportunity, combining it with scalability and process efficiency.

Typical scenarios for the application of data preparation tools include, in particular, the following areas [8, p. 75]:

- preparation of data concerning the effectiveness of advertising campaigns for the creation of marketing dashboards;
- cleaning and unifying sales funnel data for the application in market forecasting models;
- structuring financial information for managerial and analytical reporting needs;
- compiling customer data for further application in market forecasting models.

In all of the above mentioned cases, the common goal is to provide researchers with high-quality data-accurate, complete, and suitable for practical use in the decision-making process.

Since market researchers work with large amount of information, selecting the right and effective data preparation tools is an important component of building modern analytical workflow. The main key advantages of using data preparation tools are [3, 7]:

1. Eliminating data fragmentation and isolation. Modern research teams work with data coming from dozens of diverse sources, including CRM systems, spreadsheets, cloud applications, and other information resources. Data preparation tools ensure the integration and harmonization of these sources, creating a integrated and unified information representation. This makes it impossible to make management decisions based on outdated information or fragmented view of the situation.

2. Improving the quality of data and analytical results. Low data quality can result in incorrect conclusions and significant financial losses for companies. Data preparation tools provide the detection and correction of errors, handling of missing values, removal of duplicates, as well as standardization of heterogeneous data formats. As a result, reliable and consistent information arrays are created. They make it possible for researchers to assess performance metrics more accurately and to develop well-founded long-term development strategies.

3. Expanding the availability of data preparation tools. Modern analytics tools enable researchers to clean, transform, and structure data independently. As a result, marketing analysts can quickly obtain necessary data without delays.

4. Improving operational efficiency. Manual data cleaning and integration is labor-intensive and repetitive process, often accompanied by errors. Data preparation tools, through automation and control, reduce the amount of routine work, increase accuracy, and ensure effective coordination. This makes it possible for specialists to spend more time analyzing market development trends and less time managing spreadsheets [1].

5. Application of artificial intelligence and machine learning. The phenomenal dynamics of artificial intelligence development has dominated in digital discussions in recent years [2]. We are witnessing the revolution of artificial intelligence, which is actively entering all areas, including the field of research. The impact of artificial intelligence on data generation can be compared to the early days of social media platforms. The results of the investigation carried out in 2025 showed that the digital landscape is constantly changing, with the rapid growth in popularity of artificial intelligence models such as ChatGPT, Sora, Gemini, Grok, and others [2].

The effectiveness of these artificial intelligence models is largely determined by the availability of correct, properly labeled and structured data. Data preparation tools play a key role in this process, whether it involves preparing data for market segmentation or for using predictive market development models. As researchers find new ways to apply artificial intelligence in analytics, having reliable and properly prepared data becomes critical to drawing accurate and meaningful conclusions.

Thus, artificial intelligence has significantly transformed the field of market research. Due to the implementation of AI solutions, this process has become faster, more accurate, and more efficient. Artificial intelligence models are opening new, more effective approaches to analytics. Tools operating on the basis of artificial intelligence, have significantly accelerated the collection and processing of data from various sources – such as online forums, social networks, and customer feedbacks – compared to traditional research approaches.

In addition to artificial intelligence models, market research most often relies on other modern tools and platforms that enable rapid and efficient transformation of raw information into formats ready for data analysis. Today, companies are encouraged to use various modern data preparation tools for market research [5]. Among them is Microsoft Power Query as a tool for cleaning, transforming, and preparing data from various sources. Since 2016, it has been built into Excel and allows data preparation to be automated, recording all actions and steps in the editor. Talend is data integration and quality management platform that helps businesses consolidate information from various sources (POS, CRM, ERP) for analysis. The platform for data integration, processing, synchronization, and migration - Informatica PowerCenter ensures efficient data warehouse construction and information exchange. For data flows automation, Apache NiFi tool should be used, as it provides real-time data collection, routing, transformation, and delivery. For transforming data into storage, the data build tool (dbt) automates the process of converting raw data into structured models, providing their testing, documentation, and version control, which simplifies the work of analysts.

**Conclusions.** It is substantiated in this paper that the rapid growth of digital information and active digitalization of society are creating new requirements for the organization and methodology of market research. The dynamics of data generation and the increasing number of Internet users necessitate the use of modern tools for data preparation, integration, and analysis. It is proved that data preparation tools play a key role in the formation of high-quality information base for sound managerial decision-making. They provide data cleaning, structuring, standardization, and integration from various sources, minimize errors, eliminate information fragmentation, and enhance the reliability of analytical results. Unlike traditional ETL processes, modern data preparation platforms are focused on flexibility, operational efficiency, and support for self-service analytics.

It has been established that the use of artificial intelligence and machine learning technologies significantly increase the speed and accuracy of market research, enabling the identification of hidden patterns, forecasting consumer behavior, and modeling market trends. At the same time, the effectiveness of AI models directly depends on the quality and structure of the input data, which further emphasizes the importance of data preparation tools.

The feasibility of using modern data preparation and integration platforms in marketing research practice, as they contribute to improving operational efficiency, reducing the labor intensity of processes, and allowing specialists to focus on strategic analysis rather than routine data processing is substantiated. Thus, the integration of data preparation tools and artificial intelligence technologies is the required condition for building modern market research system that ensures the development of well-founded, timely, and competitive managerial decisions in the digital economy.

It is reasonable to focus further scientific research on in-depth investigation of the practical aspects of integrating data preparation tools and artificial intelligence technologies into the operation of Ukrainian enterprises, taking into account industry-specific characteristics.

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