Big Data as the oil of the digital economy

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Abstract. The rapid advancement of the information revolution has profoundly transformed global business and everyday life, placing data at the core of economic growth and innovation. Big Data, defined by its volume, velocity, variety, veracity, variability, and value, has emerged as a key resource of the digital economy, enabling organizations to identify trends, improve decision-making, and develop new services. This paper explores the essence and structure of Big Data, highlighting technologies such as MapReduce, Hadoop, and cloud services, as well as analytical methods including data mining, text mining, call mining, and web mining. The study reviews the role of infrastructure providers, system integrators, data managers, and service developers in creating comprehensive Big Data ecosystems. Furthermore, it examines the development prospects of Big Data in Uzbekistan under the "Digital Uzbekistan – 2030" strategy, which aims to expand digital infrastructure, enhance e-government, and integrate advanced technologies like artificial intelligence and blockchain to drive national economic growth. Effective implementation of Big Data is expected to increase GDP, improve operational efficiency across sectors, and strengthen Uzbekistan's position in the global digital economy.

1 Introduction

The information revolution has significantly reshaped nearly every aspect of business and, indeed, the everyday lives of people across the globe. The emergence of vast, fast-moving data flows has generated economic value that, according to recent research, has even exceeded the worth of global merchandise trade. Within this context, data-driven business models have become powerful drivers of economic growth while offering innovative answers to complex social issues.

Throughout history, each phase of human advancement has been defined by a dominant resource. In the era of agricultural civilization, land was considered the most vital and strategic asset. During the industrial era, raw materials and energy sources served as the primary engines of development. By contrast, today's digital economy relies on data and expertise as its core resources. Clive Humby, a British mathematician and the creator of Tesco's Clubcard system, famously described data as "the new oil." Yet, just like crude oil,

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raw data holds little value on its own; it must be refined—collected, processed, analyzed, and interpreted—to generate useful insights and create real economic gains [1].

This comparison is echoed by Wired magazine, which likewise equated information and analytics to oil. In the 18th century, few could predict the immense profitability of oil, but those who recognized its potential gained a major advantage. A similar pattern is evident today in the data economy, where those who effectively harness and manage data secure leading positions in innovation and economic competitiveness [2].

The pivotal role of data in contemporary economies is also acknowledged in policy discourse. In 2013, during a visit to the Chinese Academy of Sciences, China's Secretary General Xi Jinping emphasized that big data is a free resource in an industrial society and that those capable of controlling and utilizing it would gain a competitive edge. This perspective highlights the global recognition of data not only as a technical resource but also as a crucial factor in shaping national strategies, guiding business decisions, and driving social progress.

As the digital economy accelerates, mastering the skills to manage, analyze, and extract value from data has become indispensable for organizations, researchers, and policymakers alike. Embedding data analytics into strategic planning and daily operations is no longer a choice, it is essential for staying relevant and competitive in a rapidly changing world.

2 Big data essence

To stay competitive, businesses must be able to extract valuable insights from massive and varied datasets. Organizations that excel in analyzing and leveraging big data are well-positioned to thrive in the digital economy. This ability allows them to spot trends, enhance decision-making, and develop innovative solutions that fuel business growth.

Studies on the digital economy often begin with the concept of big data. In his article "How Is Your Data Growing?", Clifford Lynch noted the explosive increase in the volume of information worldwide. This rapid growth in data offers significant opportunities for companies, as long as the data is effectively managed and utilized. Therefore, it is crucial to continually collect, analyze, structure, process, and store data to extract meaningful information, spark new ideas, and support strategic decisions [3].

Big data refers to a combination of established and emerging technologies that enable organizations to gain insights from existing datasets. It is commonly described as the ability to handle vast, diverse data at high speeds—allowing real-time analysis and quick responses [4, 5]. With these capabilities, companies can remain adaptable and proactive in rapidly changing markets.

Big data originates from various sources, including social media networks, user interactions with different applications, banking transactions, and data generated by the global Internet of Things (IoT). These data types are generally divided into structured, semi-structured, and unstructured categories. About 20% of data is structured—such as numbers, dates, or name-address combinations—while approximately 80% is unstructured, covering elements like social media content, images, website data, satellite visuals, and recordings from surveillance systems.

The increasing need to store and process growing volumes of data has spurred the creation of new storage solutions and analytical tools. Innovations like MapReduce, Hadoop, and BigTable have driven the development of next-generation data management systems, which help uncover new insights and guide the creation of products, services, and actions based on that knowledge.

Data mining—or deep analysis—refers to methods used to detect hidden, objective, and practically useful patterns in data that can support decision-making. This process

allows organizations to reveal relationships and trends not immediately visible in raw datasets, offering a significant strategic edge.

Text mining technology provides advanced methods for semantic analysis, information retrieval, and information management, including sentiment analysis. It enables the examination of large or even massive collections of unstructured text, supporting deeper understanding and quicker decisions. Call mining, in contrast, integrates speech recognition, analysis, and data mining, helping organizations search through recorded customer interactions to uncover valuable insights into behavior and service quality.

Web mining applies data-mining techniques to discover new and previously unknown knowledge from website data. It focuses on analyzing unstructured, diverse, distributed, and extensive information contained in online platforms. According to the characteristics defined by Meta Group, big data is marked by:

- Volume – starting from 150 GB per day,
- Velocity – rapid data generation requiring high processing speed,
- Variety – tools can process both structured and unstructured data,
- Veracity – reliability of data and its analysis,
- Variability – data flows are not always stable, making them more complex to analyze,
- Value – the significance and usefulness of the information, from simple social media posts to complex banking transactions.

Market research highlights the explosive growth of data. IBM reported that by 2003, the world had accumulated 5 exabytes of data; by 2008, this had reached 0.18 zettabytes. In 2013, the figure rose to 4.4 zettabytes. Statista shows that data volume grew to 64.2 zettabytes in 2020, 79 zettabytes in 2021, and is projected to surpass 180 zettabytes by 2025. By 2035, data is expected to increase exponentially to more than 2,100 zettabytes.

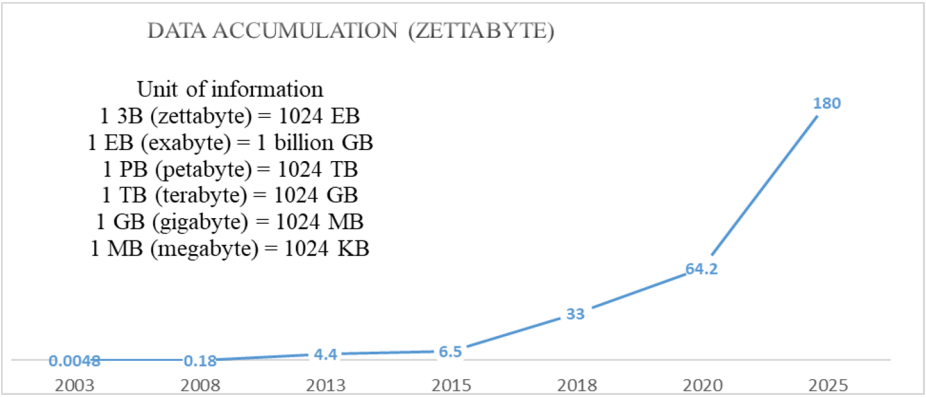

Fig. 1. Exponential growth of global data accumulation (in zettabytes) from 2003 to 2025.

The surge in demand brought about by the COVID-19 pandemic led to the generation and synthesis of new data throughout 2020. The crisis triggered by the spread of the coronavirus accelerated the transition from offline activities to a predominantly online environment—more people worked and studied from home and relied increasingly on home-based entertainment.

Effective and skillful use of Big Data provides significant advantages. Processing large datasets enables predictive analysis and delivers business recommendations for the future. Today, Big Data is applied across various sectors such as government, industry, healthcare, commerce, agriculture, real estate, sports, tourism, transportation, and construction. In public administration, Big Data analysis supports decision-making in areas like

employment, economic regulation, and security. In healthcare, processing extensive datasets helps detect epidemics, enables swift decision-making in emergencies, ensures more accurate diagnoses, and contributes to the discovery of new medicines. In industry, predictive production systems allow for more precise demand forecasting. In agriculture, precision farming uses data from specialized weather station sensors in the fields to produce highly accurate hourly weather forecasts.

In real estate, Big Data technologies allow developers to analyze information flows and present buyers with the most relevant options, enabling them to explore properties independently. In sports, data analysis helps identify promising athletes and develop effective strategies for both teams and opponents. Within the business sector, Big Data offers benefits such as streamlining planning processes, accelerating the launch and demand of new projects, optimizing supply chain integration, expanding target audiences, and enhancing customer service quality—ultimately fostering stronger customer loyalty.

According to BARC, organizations adopting Big Data experience substantial gains: a 69% improvement in making strategic decisions, a 54% improvement in operational process control, a 52% improvement in understanding consumer behavior, and a 47% improvement in cost efficiency. Companies leveraging Big Data reports, on average, an 8% increase in revenue alongside a 10% reduction in costs.

3 Big data structure

The Big Data ecosystem consists of several key participants: infrastructure providers, data managers, system integrators, end users, and turnkey service developers. Let's take a closer look at each component.

One of the main challenges in Big Data lies in data storage. Infrastructure providers play a key role in storing and maintaining data, typically through three main methods: traditional storage, public cloud storage, and private cloud storage.

In the traditional or "on-premises" approach, data is saved on disks, tapes, or other local storage devices. This method keeps data physically close, making it familiar and convenient—connections to local media are quick and the cost is usually reasonable. However, it has significant drawbacks: disks and servers can fail due to wear and tear, access is limited when you are not onsite, and storage capacity is finite, requiring the purchase and placement of additional media.

Public cloud storage, on the other hand, offers data storage services for a fee based on the volume of data and additional services provided. The leading countries offering cloud technologies include the United States, China, the United Kingdom, Germany, and Japan. Amazon was among the first companies to generate entirely new revenue by renting out its unused computing resources. Today, the largest cloud providers are Amazon Web Services (AWS), Microsoft Azure, Google Cloud, IBM Bluemix, and Oracle, with Amazon recognized as the global leader in data storage.

Chinese companies have rapidly narrowed the gap with international competitors in cloud services. The top cloud providers in China include Alibaba (Alibaba Cloud), Tencent (Tencent Cloud), Huawei (Huawei Cloud), and Baidu (Baidu Cloud).

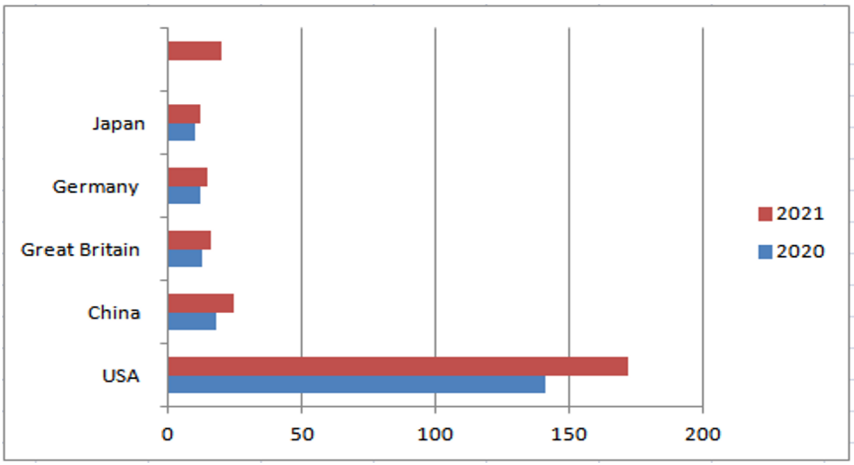

Fig. 2. Revenues of cloud technology leaders

The benefits of public clouds include:

- Convenience: Companies are not required to purchase or maintain physical servers, which makes daily operations simpler and more efficient.
- Security: Most providers offer built-in data protection through their own encryption systems, ensuring a reasonable level of safety.
- Cost-effectiveness: Storage prices, which used to range from 5 to 10 cents per gigabyte per month, have been steadily decreasing over time.
- Reliability and future potential: Data can be replicated in case of loss, providing a relatively reliable system while also opening up new possibilities for future improvements.

Public clouds have several disadvantages, including psychological concerns—such as the feeling that others might have access to your data—access speed, since internet speeds measured in megabytes per second are about ten times slower than access to local storage, and cost, as cloud storage is generally more expensive than local options.

Private clouds, on the other hand, are storage systems integrated into a company's own infrastructure and are accessible exclusively to its employees. These types of repositories are widely used in the corporate sector. At present, Scandinavian companies are at the forefront of adopting corporate cloud services in Europe (see fig 3).

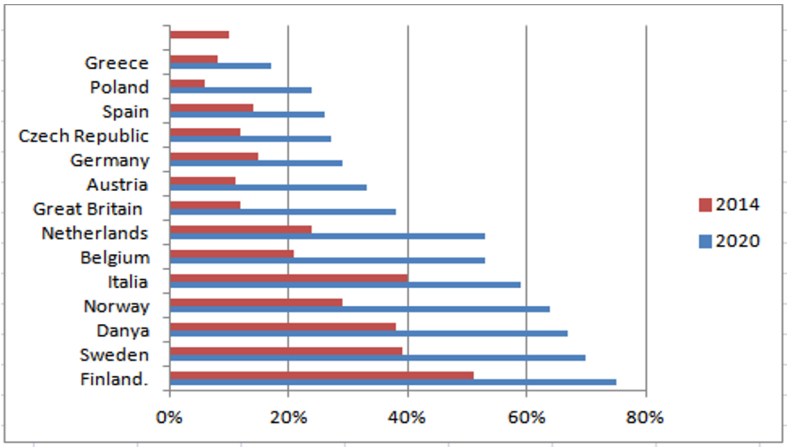

Fig. 3. Proportion of companies adopting corporate cloud services in various European countries

System integrators are companies or professionals that provide solutions to automate business processes by connecting various systems so teams and organizations can work more efficiently. As described in the Gartner glossary, their role is to organize and streamline systems from different vendors, which involves implementing, planning, coordinating, scheduling, testing, improving, and maintaining information systems to ensure they function seamlessly and support overall operational effectiveness.

Datamaners are experts in data retrieval, intelligence gathering, and in-depth analysis. Through their analysis, patterns and relationships within data can be identified, which in turn allows predictions or the development of neural network models. For instance, analyzing customer behavior in appliance stores might reveal that refrigerators are commonly purchased on credit, or that customers buying computers often also purchase printers. Insights like these support better management decisions and help boost sales.

Ready-made service developers provide turnkey solutions by utilizing big data to create practical and innovative tools for businesses. One example is Value Appz, which offers entrepreneurs a cost-effective, ready-to-use platform for developing applications and web solutions that support digital transformation. This platform enables the creation of apps for various industries, including ondemand delivery services (such as food, groceries, and medicines), home services (like repairs, beauty treatments, car washing, and dog walking), online consultations (with doctors, nutritionists, tutors, and fitness trainers), and online stores (selling jewelry, clothing, books, or gifts). These solutions are designed to meet the specific needs of different business sectors, helping entrepreneurs attract customers, increase profits, and gain a competitive edge.

4 Big data development prospects in Uzbekistan

Globally, the digital economy represents 10.9% of total output, with China contributing 21% and India 5.5%. In Uzbekistan, however, this share remains below 2%. In 2020, Uzbekistan designated the year as the Year of Development of Science, Education, and the Digital Economy. That same year, the country adopted the “Digital Uzbekistan – 2030” strategy to build and expand its digital economy. This strategy introduces ambitious initiatives in key areas such as digital infrastructure, e-government, the digital economy, the national digital market, and the training of IT specialists.

Between 2020 and 2022, several measures were planned, including improving internet connectivity across communities, laying 20,000 kilometers of fiber-optic cables, deploying over 400 information systems to support regional socio-economic development, implementing more than 280 systems to automate management processes, and launching the “One Million Programmers” initiative aimed at teaching 500,000 young people the fundamentals of computer programming. The “Digital Department” project is also in progress.

The E-Government system was introduced to provide 178 types of public services through a unified interactive portal, ensuring greater openness, transparency, time efficiency, and reduced costs for citizens. As part of the “Digital Uzbekistan – 2030” plan, 13 model cities and districts were selected to undergo digital transformation over a three-year period, guided by detailed road maps. According to these plans, 2020–2021 included 172 projects to expand digital infrastructure, 54 projects introducing digital technologies in public administration, 190 projects in the social sector, 45 in housing and utilities, 51 in agriculture, 17 in industry, and 58 initiatives focused on training managers and employees.

The State Tax Committee was one of the first government institutions to launch a major initiative aimed at modernizing its tax information systems, incorporating business

process reengineering to improve tax administration. This effort led to the creation of an automated system capable of monitoring VAT payments in real time.

Within the broader "New Uzbekistan" development strategy, President Shavkat Mirziyoyev has emphasized the digital economy as a key priority across multiple sectors, including communications, telecommunications, information security, education, healthcare, finance and banking, construction, agriculture, water management, energy, transportation, and engineering. It is estimated that Uzbekistan currently loses 5–7% of its GDP each year due to untapped economic potential. By adopting advanced technologies such as blockchain, big data, cloud computing, and artificial intelligence, the country aims to increase GDP by 30% and raise average annual incomes to 45 million sums by 2030, with projections of reaching 50% of GDP and 50 million sums per year by 2040–2050.

5 Conclusion

Big Data has become a vital resource in the digital economy, driving innovation, efficiency, and growth across sectors such as government, healthcare, agriculture, and commerce. Through technologies like data mining and cloud systems, organizations can make better decisions, streamline processes, and gain a competitive edge despite challenges in storage, security, and access. Uzbekistan's "Digital Uzbekistan – 2030" strategy shows how investing in digital infrastructure, e-government, and workforce training can accelerate national development and boost economic performance. In essence, leveraging Big Data is no longer optional—it is essential for organizations and nations to unlock opportunities, enhance decision-making, and achieve sustainable growth in a rapidly evolving digital landscape.

References

1. S.A. Kurbonova, Mahsulot tannarxi hisobiga olishda boshqaruv hisobini ta'minlash masalalari. Scientific Progress. **2**, 8, 603-607 (2021).
2. S.M. Makhmudov, K.R. Abduraimova, Innovative designs and technologies in foundation engineering and geotechnics. International Journal of Scientific and Technology Research. **9**, 1, 3803–3807 (2020).
3. S. Sadriddin, M.M. Miralimov, S.M. Makhmudov, U.S. Akhmadiyorov, Modern methods of increasing energy efficiency of buildings in the Republic of Uzbekistan at the design stage. International Journal of Scientific and Technology Research. **8**, 11, 1333–1336 (2019).
4. S.Z. Zainabidinov, Kh.M. Madaminov, Charge transport mechanism in p-Sin-(Si2)i-x(CdS)x semiconductor structures. Herald of the Bauman Moscow State Technical University, Series Natural. **4**, 58–72 (2020).
5. A.X. Abduqaxorovich, K.I. Tojimatovich, Study of material and heat balances of rectification processes (2025).