



## Big Data Around the World

*Matthew N. O. Sadiku*

*Department of Electrical & Computer Engineering, Prairie View A&M University, Prairie View, USA*

*Uwakwe C. Chukwu*

*Department of Engineering Technology, South Carolina State University, Orangeburg, SC, USA*

*Janet O. Sadiku*

*Juliana King University, Houston, TX, USA*

**Abstract:** Big data has taken the world by storm. It is an umbrella term referring to the ever-growing volume of data, increasing velocity in the generation of that data, and increased variety of types of data. It is the large amounts of digital data generated by the global population. It is a major player in the digital age. The big data revolution is not restricted to the industrialized world. Since big data plays such a crucial role in the modern business landscape, we want to examine its impact in different nations in this paper.

**Keywords:** big data, applications, big data around the world.

### INTRODUCTION

Advances in digital technology are making it possible to collect, store, and process ever-expanding amounts of data. This massive volume of information is known as big data. The term “big data” refers to complex and humongous data sets that far exceed the potential of traditional data processing applications. It is the increasingly large datasets of information being amassed as a result of our social, mobile, and digital world. As shown in Figure 1, data is everywhere in an interconnected world [1]. It can be found in the things we buy, the places we visit, the people we interact with, and our engagement in social media. Sources such as online or mobile financial transactions, social media traffic, and GPS now generate over 2.5 quintillion bytes of so-called big data every day.

Internet users spent approximately 2.8 million years online in 2018 alone. Data generated by Internet users comes in different forms and is unstructured. In 2021, It was predicted in 2021 that the amount of data generated, consumed, copied, and stored worldwide would reach 79 zettabytes. It is forecast that this amount will double by 2025. There is no stopping data growth [2]. The explosion of data holds tremendous potential to boost innovation, productivity, efficiency, and economic growth.

As shown in Figure 2, data comes from a variety of sources or sensors all around us [3]. For example, sensors exist in our homes, from security cameras and voice assistants to smart fridges and thermostats. The data generated by these sensors is collected from over a course of time.

### REVIEW ON BIG DATA

Big data (BD) refers to a collection of data that cannot be captured, managed, and processed by conventional software tools. It is a relatively new technology that can help many industries. The three main sources of big data are machines, people, and companies. Big data can be described with 42 Vs [4]. The first five Vs are volume, velocity, variety, veracity, and value [5].

- *Volume*: This refers to the size of the data being generated both inside and outside organizations and is increasing annually. Some regard big data as data over one petabyte in volume.
- *Velocity*: This depicts the unprecedented speed at which data are generated by Internet users, mobile users, social media, etc. Data are generated and processed in a fast way to extract useful, relevant information. Big data could be analyzed in real time, and it has movement and velocity.
- *Variety*: This refers to the data types since big data may originate from heterogeneous sources and is in different formats (e.g., videos, images, audio, text, logs). BD comprises of structured, semi-structured or unstructured data.
- *Veracity*: By this, we mean the truthfulness of data, i.e. whether the data comes from a reputable, trustworthy, authentic, and accountable source. It suggests the inconsistency in the quality of different sources of big data. The data may not be 100% correct.
- *Value*: This is the most important aspect of the big data. It is the desired outcome of big data processing. It refers to the process of discovering hidden values from large datasets. It denotes the value derived from the analysis of the existing data. If one cannot extract some business value from the data, there is no use managing and storing it.

On this basis, small data can be regarded as having low volume, low velocity, low variety, low veracity, and low value. Additional five Vs has been added [6]:

- *Validity*: This refers to the accuracy and correctness of data. It also indicates how up to date it is.
- *Viability*: This identifies the relevancy of data for each use case. Relevancy of data is required to maintain the desired and accurate outcome through analytical and predictive measures.
- *Volatility*: Since data are generated and change at a rapid rate, volatility determines how quickly data change.
- *Vulnerability*: The vulnerability of data is essential because privacy and security are of utmost importance for personal data.
- *Visualization*: Data needs to be presented unambiguously and attractively to the user. Proper visualization of large and complex clinical reports helps in finding valuable insights.

For example, Figure 3 shows the first 5V's of big data [7]. In addition, the 10V's above, some suggest the following 5V's: Venue, Variability, Vocabulary, Vagueness, and Validity) [8].

To thrive in today's complex business environment, businesses must adopt a data-driven culture and leverage analytics platforms to make key decisions that improve productivity. Industries that benefit from big data include the healthcare, financial, airline, travel, restaurants, automobile, sports, agriculture, manufacturing, and hospitality industries. Figure 4 shows the use of data in several areas [9].

## HOW BIG DATA IS CHANGING THE WORLD

The spread of mobile phone technology to the hands of billions of individuals may be the single most significant innovation that has affected developing countries in the past decade. Across the developing world, mobile phones are used daily to transfer money, buy and sell goods, and communicate information [10].

Social media apps and platforms are a growing contributor to the world of big data. The number people using social media is growing rapidly in both developed and developing nations [10]. Smartphones in developing countries are often used for communication through social media since this is cheap.

In this new age of instant information, data is transforming our world and revealing things about us we have never seen before. Business giants like Facebook, Google, LinkedIn, Twitter, IBM, etc. have been working on big data around the world. Big data has been a godsend for businesses and industries

particularly in the field of marketing. Business leaders can use big data to make smarter decisions about job market trends, hire better employees, and offer more effective training. Data enables businesses to get a better feel for their potential customers in a given area. Data reveals residents' race, age, gender, income, and education level [11].

Besides using big data in business, the local police departments are discovering new ways to use data. Big data now drives personalized learning in today's schools—from kindergarten through college. It helps teachers tailor lessons to students' strengths. With the above applications, we can see that big data has started its journey of ruling the world.

### **BIG DATA IN DIFFERENT NATIONS**

All over the world, companies are competing with each other in the race towards digital transformation. Ideas are the new currency today, and the fuel that drives those ideas is big data. The world is saturated with data. Organizations are now making data-driven decisions using big data analytics. Through big data analytics, organizations can uncover hidden patterns, unknown correlations, undiscovered market trends, and customer preferences. Today's software allows managers and anyone in the company to access vast silos and streams of data [12].

Big data has attracted the attention of many advanced countries and international organizations such as United Nations, World Bank, the World Economic Forum (WEF), and the Organization for Economic Co-operation and Development (OECD). The potential benefit of big data for development has been noted by the United Nations. "Global Pulse" initiative was proposed by the United Nations in 2009. It was for the development of countries, overcoming of poverty, crisis situations, and improving people's living (life) standards. To evaluate the effectiveness of harnessing big data for development, UN Global Pulse has worked on several research projects in collaboration with public and private partners. Through strategic public-private partnerships and R&D carried out across its network of Pulse Labs in New York, Jakarta, and Kampala, Global Pulse functions as a hub for applying innovations in data science and analytics to global development and humanitarian challenges [13]. Big data around the world is illustrated in Figure 4 [14]. We now consider how some countries handle big data [11,14,15].

- *United States:* The US government is actively working with universities across the country to leverage the power of big data to thwart terrorists and stop the illegal spread of nuclear weapons. Big data plays an important role in crime prevention. In 2011, Georgia State University set out to improve its student retention and graduation rates by partnering with a data analytics company. Other institutions are using big data analytics in all areas of education. Big data is used to support the healthcare sector. Financial services have widely adopted big data analytics to inform better investment decisions with consistent returns. Big Data has provided opportunity to companies like Citi bank to see the big picture due to balancing the sensitive nature of the data along with prioritizing the privacy and protection of information. In March 2012, the Obama Administration launched the Big Data Research and Development Initiative with an investment of more than US\$ 200 million. The initiative involves six federal government agencies: Department of Defense (DoD), Defense Advanced Research Projects Agency (DARPA), Department of Energy (DoE), National Institutes of Health (NIH), National Science Foundation (NSF), and US Geological Survey (USGS). In the United States, there are over 2,600 data centers spread across the country.
- *United Kingdom:* The UK regards advances in science and technology as key for delivering benefits to society and the economy. The UK is one of the forerunners concerning the development of a policy on big data. In January 2013, the British government announced a big-data plan of £189 million. The UK is utilizing big data through establishment and management of the Foresight Horizon Scanning Centre. The British Foreign and Commonwealth Office plans to establish a Data Director and to strengthen the use of data-mining. Most established franchisors in the United Kingdom are using either their system to capture significant amounts of data--both in terms of sales generation (leads to conversions, etc.), and service or product delivery. It is easy for the franchisor to gather hard data on the number and value of sales made. A growing trend in the UK is for franchisors to use third parties to gather objective data on how well they are doing.

- *Europe:* Consumer data is tightly regulated in the European Union (EU). The European Commission (EC) says that the people or bodies that collect and manage personal data must respect EU law when handling such data. This is a challenge for US franchisors used to owning their franchisees' customer database. The EC states that big data technology and services are expected to grow worldwide. RAND Europe is assessing the availability and use of digital technologies in infectious disease surveillance, prevention, and control. The European Commission accepted next Horizon 2020 program in the field of scientific research and innovation. 120 million euro investment has been allocated for application and research of big data production. France has only recently developed a policy for Big Data.
- *India:* With its vast size in terms of area and population, India is a huge opportunity that comes with the challenge of understanding the market. Retail brands are depending heavily on such data as the market is evolving. Shopping destinations are deploying innovative mobile phone-based solutions that channel data insights from customers visiting shopping malls. Leading companies like Flipkart, Snapdeal, and HomeShop claim they generate 30-40 percent of their orders with the help of big data tools that they use.
- *Australia:* In August 2013, the Australian federal government announced the Australian Public Service Big Data strategy. It intends to promote the service reformation of public sectors by making use of big data analysis, developing better public policies, and protecting citizen privacy in order to make Australia among the world's most advanced in the big data field. This vision aims to support enhanced services, create business partnership opportunities, improve policy development, and protect personal information privacy, and leverage the Government's investments in ICT technologies. The aims of the Strategy are broadly identified as [13]: Delivering better services through building capability and improving services; Improving the efficiency of government operations by investing optimally and encouraging innovation; Engaging openly through creating knowledge and collaborating effectively.
- *China:* China has the world's largest mobile phone market, with over 1.2 billion mobile subscriptions. With over 600 million Internet users, it also has the biggest Internet user population in the world. Moreover, China has the world's most active environment for social media. The massive numbers of real-time information streams and people who use mobile phones, Internet, and social media in China creates a favorable environment where the big data approach could be effective in providing insights on emerging concerns that are highly relevant to China's development. The use of big data is intended in the following areas: improve productivity of the public sector; refine urban transport planning; strengthening understanding of socioeconomic trends; assess poverty situations; promote sustainable e-waste disposal practices; identify pollution hotspots in cities, etc. The largest Big Data conferences took place or are going to take place in China, including the Big Data Technology Conference, Big Data & Analytics Innovation Summit, China Legal Big Data Symposium, Big Data Asia Showcase, and Big Data World Forum. There are signs that the government has also started to examine the potential of big data in the public sector.

## **BENEFITS**

Big data plays a significant role in modern society, impacting our daily experiences and habits in ways most of us do not even think about. Big data offers protection by helping companies identify and stop the fraudulent use of patents and trademarks. If properly mined and analyzed, big data can improve the understanding of human behavior and well-being and offer policymaking support for global development. Big data can improve the customer experience, increase efficiency, and help you decide whether a certain neighborhood is likely to make a new franchise location in that community a success. Big data has changed recruitment and other HR operations. The possibilities of big data is only limited by the imagination.

## CHALLENGES

Digital technologies have created both opportunities and challenges for the fostering, safeguarding, and promotion of human rights. The use of big data raises many concerns, such as access, ownership, accuracy, validity, privacy, security, governance, standards, interoperability, and intellectual property rights. Privacy is a major concern of an end user. Users need to feel secure and assured that their personal information they access is not leaked to some other party. People wonder about what happens if data falls into the wrong hands. For example, law enforcement's use of big data raises big questions: Which is more important—the public's safety or an individual's privacy? Both are of great value. But safeguarding all that personal data poses a challenge for health care providers. Protecting the credentials of the end user is of the utmost importance. Latency or timeliness is another challenge that big data faces in the real world. Massive data, requiring large processing time, causes delay in the decision making process. In social media, security is the key issue that big data is struggling with [16].

## CONCLUSION

Big data is a big driver of innovation and there is no doubt that it is having a profound impact on business and society as a whole. It is a massive amount of information that no organization can afford to ignore. Organizations should make effective use of their data so that they can take crucial decisions which improve their business. For organizations that have embraced the use of data and analytics, a common set of benefits has emerged that continue to motivate their investments, including improved efficiency and productivity, faster and more effective decision making, and better financial performance.

Big data is set to revolutionize every industry and carve out a whole new niche for itself. It has made revolutionary changes in management, health, science, education, manufacturing, and other activities. Big data is here to stay. More information about big data around the world can be found in the books in [17-19] and a related journal: *Journal of Big Data*.

## REFERENCES

1. R. Krishanmurthy, "Big data in economics and policy," October 2020, <https://www.analyticssteps.com/blogs/big-data-economics-and-policy>
2. O. Djuraskovic, "Big data statistics 2023: How much data is in the world?" October 2023, <https://firstsiteguide.com/big-data-stats/>
3. "The world of big data," August 2019, <https://www.geeksforgeeks.org/world-big-data/>
4. "The 42 V's of big data and data science," <https://www.kdnuggets.com/2017/04/42-vs-big-data-data-science.html>
5. M. N. O. Sadiku, M. Tembely, and S. M. Musa, "Big data: An introduction for engineers," *Journal of Scientific and Engineering Research*, vol. 3, no. 2, 2016, pp. 106-108.
6. P. K. D. Pramanik, S. Pal, and M. Mukhopadhyay, "Healthcare big data: A comprehensive overview," in N. Bouchemal (ed.), *Intelligent Systems for Healthcare Management and Delivery*. IGI Global, chapter 4, 2019, pp. 72-100.
7. R. Roy, "Big data analytics," February 2023, <https://www.linkedin.com/pulse/big-data-analytics-rijika-roy-4f>
8. J. Moorthy et al., "Big data: Prospects and challenges," *The Journal for Decision Makers*, vol. 40, no. 1, 2015, pp. 74–96. <https://www.grandviewresearch.com/industry-analysis/industrial-wireless-sensor-networks-iwsn-market>
9. A. Kumar, "Will real time big data applications ever rule the world?" May 2019, <https://medium.com/@aakash.bachheriya123/will-real-time-big-data-applications-ever-rule-the-world-323b88656b1e>



10. “Big data for development: A primer,” [https://www.unglobalpulse.org/wp-content/uploads/2013/06/Primer-2013\\_FINAL-FOR-PRINT.pdf](https://www.unglobalpulse.org/wp-content/uploads/2013/06/Primer-2013_FINAL-FOR-PRINT.pdf)
11. “The impact of data on our world,” <https://www.futureoftech.org/big-data/4-impact-of-data-on-our-world/>
12. “How the availability of big data is transforming the world,” <https://totaluptime.com/how-the-availability-of-big-data-is-transforming-the-world/>
13. “Big data and global development,” [https://www.sas.com/en\\_us/insights/articles/big-data/big-data-global-development.html](https://www.sas.com/en_us/insights/articles/big-data/big-data-global-development.html)
14. W. Edwards, “Going big: Big data around the world,” [https://www.franchising.com/articles/going\\_big\\_big\\_data\\_around\\_the\\_world.html](https://www.franchising.com/articles/going_big_big_data_around_the_world.html)
15. M. S. Hajirahimova and A. S. Aliyeva, “Big data strategies of the world countries,” November 2015, [http://2015.nscf.ru/TesisAll/8\\_Integraciya\\_visokoyrovnevix\\_resyrsov/09\\_402\\_AliyevaAS.pdf](http://2015.nscf.ru/TesisAll/8_Integraciya_visokoyrovnevix_resyrsov/09_402_AliyevaAS.pdf)
16. “The world of big data,” <https://www.geeksforgeeks.org/world-big-data/>
17. B. Baesens, *Analytics in a Big Data World: The Essential Guide to Data Science and Its Applications*. Wiley, 2014.
18. T. Huang, T. C. Vance, and C. Lynnes (eds.), *Big Data Analytics in Earth, Atmospheric and Ocean Sciences (Special Publications)*. American Geophysical Union, 2022.
19. B. Marr, *Data Strategy: How to Profit from a World of Big Data, Analytics and Artificial Intelligence*. Kogan Page, 2nd edition, 2021.



Figure 1 Data is everywhere in an interconnected world [1].

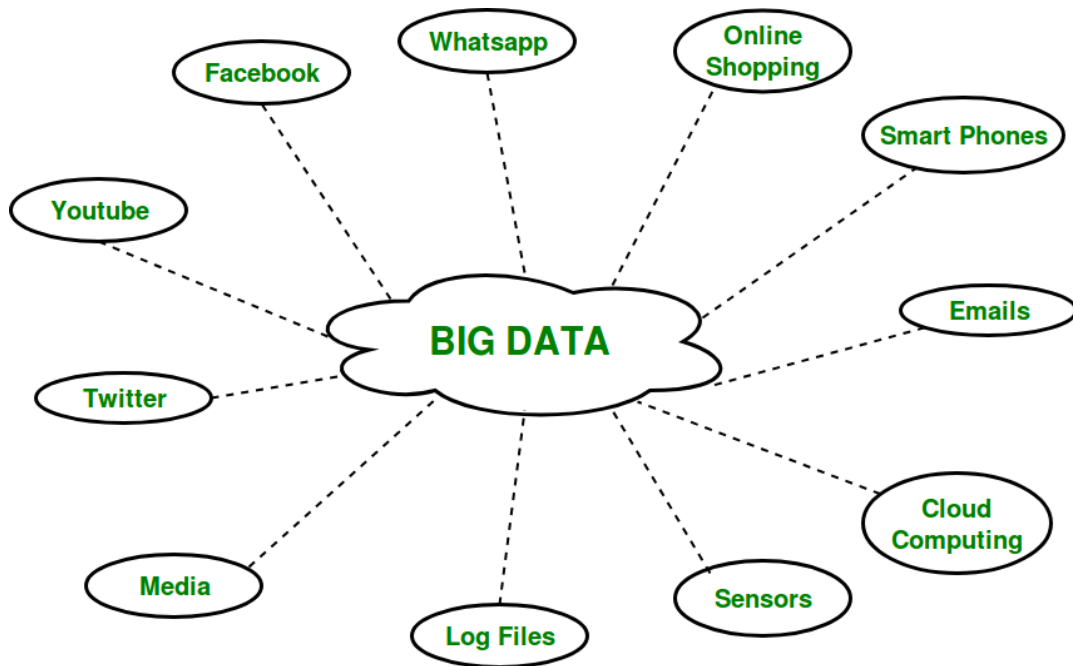


Figure 2 Big data comes from various sources [3].

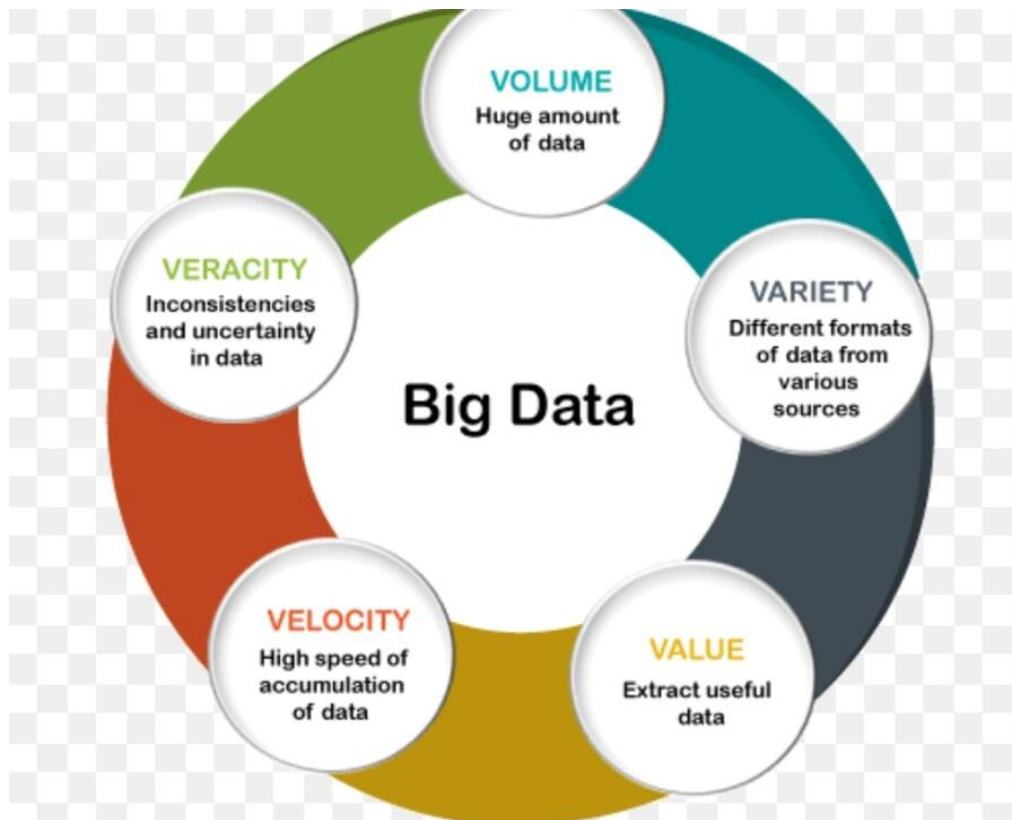


Figure 3 The 5V's of big data [7].



Figure 4 The use of data in several areas [9].



Figure 5 Big data around the world [14].