

BIG DATA: A SOURCE OF COMPETITIVE ADVANTAGE

**Bianca RUSU¹, Lăcrămioara HURLOIU¹, Iulian HURLOIU¹,
Marinela GEAMĂNU¹**

*¹ Spiru Haret University, Faculty of Economic Sciences, Bucharest, 46 G
Fabricii Street, District 6, Bucharest, Romania, Tel./Fax: +40213169793,*

*Email: se_rusub@spiruharet.ro, hlacra@yahoo.com,
iulian.hurloiu@spiruharet.ro, geamanu_marinela@yahoo.com.au*

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Abstract

In a business environment that constantly and rapidly changes, future prediction becomes more important than the simple visualization of historical or current perspectives. For effective future prediction, data analysis using statistical and predictive modelling techniques may be applied to enhance and support the organization's business strategy. Therefore, the effective use of data is becoming the basis of competition. Big data fundamentally change the way businesses compete and operate. Companies that invest in and successfully derive value from their data have a distinct advantage over their competitors. This performance gap will continue to grow as more relevant data is generated and the technologies that enable faster, easier data analysis continue to develop.

Keywords: *big data; analytics; technology; volume; variety; velocity; veracity; structured data; unstructured data.*

JEL Classification: O31, O 33

What is big data?

Evolving technology has brought data analysis out of IT backrooms, and extended the potential of using data-driven results into every facet of an

Issue 2/2022

organization. However, while advances in software and hardware have enabled the age of big data, technology is not the only consideration. Companies need to take a holistic view that recognizes that success is built upon the integration of people, process, technology and data; this means being able to incorporate data into their business routines, their strategy and their daily operations.

Organizations must understand what insights they need in order to make good strategic and operational decisions. The first part of the challenge is sorting through all of the available data to identify trends and correlations that will drive beneficial changes in business behaviour. The next step is enriching this organizational information with that from sources outside the enterprise; this will include familiar big data sources, such as those created and stored online.

The collection and aggregation of big data, and other information from outside the enterprise, enables the business to develop their own analytic capacity and capability, which for many years has only been available to a few larger organizations. Big data has the potential to transform almost every aspect of business, from research and development to sales and marketing and supply-chain management, and to provide new opportunities for growth.

Big data refers to the dynamic, large and disparate volumes of data being created by people, tools and machines; it requires new, innovative and scalable technology to collect, host and analytically process the vast amount of data gathered in order to derive real-time business insights that relate to consumers, risk, profit, performance, productivity management and enhanced shareholder value.

Big data characteristics

Big data includes information generated from social media, data from internet-enabled devices (including smartphones and tablets), machine data, video and voice recordings, and the continued preservation and logging of structured and unstructured data. It is typically characterized by the five “V’s”:

a) Volume

The amount of data being created is vast compared to traditional data sources. Volume is like the base of big data, as it is the initial size and amount of data that is collected. If the volume of data is large enough, it can be considered big data. What is considered to be big data is relative, though, and will change depending on the available computing power that's on the market. Some examples of types of data that large companies typically store include:

- Retailers: via loyalty cards being swiped at checkouts (details of all purchases made, when, where, how the customer paid, use of coupons) or via websites (every product the customer had looked at, every page had visited, every product that had ever bought etc)
 - Social media (e.g. Facebook, Twitter): friends and contacts, postings made, location when postings were made, photographs etc
 - Mobile phone companies: numbers ranged, texts send (which can be automatically scanned for key words), every location the phone has ever been whilst switched on, browsing habits or voice mails
 - Internet providers and browser providers: every site and every page visited, information about all downloads and all emails, search terms which were entered.
 - Banking systems: every receipt, payment, credit card information (amount, date, retailer, location), location of ATM machines used

b) Variety

Data comes from different sources and is being created by machines as well as people. An organization might obtain data from a number of different data sources, which may vary in value. Data can come from sources in and outside an enterprise as well. The challenge in variety concerns the standardization and distribution of all data being collected. Collected data can be unstructured or structured in nature.

Structured data: this data is stored within defined fields (numerical, text, date etc) often with defined lengths, within a defined record, in a file of similar records. Structured data requires a model of the types and format of business data that will be recorded and how the data will be stored, processed and accessed. This is called a data model. Designing the model defines and limits the data which can be collected and stored, and the processing that can be performed on it. An example of structured data is found in banking systems, which record the receipts and payments from current account: date, amount, receipt/payment, short explanations such as payee or source of the money. Structured data is easily accessible by well-established database structured query languages.

Unstructured data: refers to information that does not have a pre-defined data-model. It comes in all shapes and sizes and it is this variety and irregularity which makes it difficult to store in a way that will allow it to be analysed, searched or otherwise used. An often-quoted statistic is that 80% of business data is unstructured, residing it in word processor documents, spreadsheets, PowerPoint files, audio, video, social media interactions and map data.

Issue 2/2022

c) Velocity

Data is being generated extremely fast, a process that never stops, even while people sleep. It refers to how quickly data is generated and how quickly that data moves. This is an important aspect for companies need that need their data to flow quickly, so it's available at the right times to make the best business decisions possible. An organization that uses big data will have a large and continuous flow of data that is being created and sent to its end destination. Data could flow from sources such as machines, networks, smartphones or social media. This data needs to be digested and analysed quickly, and sometimes in near real time.

As an example, in healthcare, there are many medical devices made today to monitor patients and collect data. From in-hospital medical equipment to wearable devices, collected data needs to be sent to its destination and analysed quickly.

d) Veracity

Big data is sourced from many different places, as a result the quality (veracity) of the data it needs to be tested. Gathered data could have missing pieces, may be inaccurate or may not be able to provide real, valuable insight. Veracity, overall, refers to the level of trust there is in the collected data. Data can sometimes become messy and difficult to use. A large amount of data can cause more confusion than insights if it's incomplete.

For example, concerning the medical field, if data about what drugs a patient is taking is incomplete, then the patient's life may be endangered.

e) Value

The last V in the 5 V's of big data is value. This refers to the value that big data can provide, and it relates directly to what organizations can do with that collected data. Being able to pull value from big data is a requirement, as the value of big data increases significantly depending on the insights that can be gained from them. Organizations can use the same big data tools to gather and analyse the data, but how they derive value from that data should be unique to them.

Big data and analytics

Big data poses both opportunities and challenges for businesses. In order to extract value from big data, it must be processed and analysed in a timely manner, and the results need to be available in such a way as to be able to effect positive change or influence business decisions. The effectiveness also relies on an organization having the right combination of people, process and technology.

The processing of big data is generally known as big data analytics and includes: data mining (analysing data to identify patterns and establish relationships such as associations, sequences and correlations), predictive analytics (a type of data mining which aims to predict future events), text analytics (scanning text such as emails and word processing documents to extract useful information), statistical analytics (used to identify trends, correlations and changes in behaviour).

By definition, analytics is the discovery and communication of meaningful patterns in data. For a business, analytics should be viewed as the extensive use of data, statistical and quantitative analysis, using explanatory and predictive models to drive fact-based business management decisions and actions.

Analytics helps to optimize key processes, functions and roles. It can be leveraged to aggregate both internal and external data. It enables organizations to meet stakeholder reporting demands, manage massive data volumes, create market advantages, manage risk, improve controls and, ultimately, enhance organizational performance by turning information into intelligence.

The benefits and risks of big data

While there is no doubt that the big data revolution has created substantial benefits to businesses and consumers alike, there are commensurate risks that go along with using big data. The need to secure sensitive data, to protect private information and to manage data quality, exists whether data sets are big or small. However, the specific properties of big data (volume, variety, velocity, veracity, value) create new types of risks that necessitate a comprehensive strategy to enable a company to utilize big data while avoiding the pitfalls. This should be done in a prioritized fashion so that companies can start to realize the benefits of big data in step with managing the risks.

Big data overcomes traditional restraints in a cost-effective manner and opens opportunities to ingest, store and process data from new sources such as external social media data, market data, communications, interaction with customers via digital channels. By some estimates, more than 80% of the data within organizations is unstructured and unfit for traditional processing. Using big data will enable the processing of this unstructured data and increased system intelligence which can be used to improve performance in sales, increase understanding of customer needs, reinforce the internal risk management function, support marketing initiatives and enhance fraud monitoring.

Big data capability allows organizations to integrate multiple data sources with relatively low effort in a short timeframe. Combined with a lower cost of storage per

Issue 2/2022

gigabyte, this enables organizations to build, for example, a holistic view of customers by shifting customer data from various separate business departments into a single infrastructure, and then to run consolidated analytics and reporting on it.

Big data technologies release organizations from the traditional accuracy vs. cost challenge by enabling them to store data at the lowest level of detail, keeping all data history under reasonable costs and with less effort.

However, big data poses a variety of risk issues. Risks often include those associated with storage and retention of large volumes of data, data ownership and quality, information security, reputational risks and various regulatory requirements including privacy issues. The main risks of using big data include:

- Cost: It is expensive to establish the hardware and analytical software needed, though these costs are continually falling.
- Regulation: Some countries and cultures worry about the amount of information that is being collected and have passed laws governing its collection, storage and use. Breaking a law can have serious reputational and punitive consequences.
- Loss and theft of data: Apart from the consequences arising from regulatory breaches as mentioned above, companies might find themselves open to civil legal action if data were stolen and individuals suffered as a consequence.
- Incorrect data (veracity): If the data held is incorrect or out of date incorrect conclusions are likely. Even if the data is correct, some correlations might be spurious leading to false positive results.

Effectively managing these risks will require companies to revisit governance structures and frameworks in order to allow for the effective and timely identification and assessment of risks in order to make informed risk/reward decisions.

Conclusion

By applying analysis of big data to pressing business issues, companies are reshaping their operations and accelerating their business results. As its potential becomes more evident, big data will transform every aspect of the organisation, from strategy and business model design to marketing, product development, operations and more.

Over time, organisations will become far more data-driven in how they make decisions, develop products and services, and interact with customers, employees and stakeholders at all levels. Companies that move quickly to capitalise on the potential of big data will often gain ‘first mover’ advantage, enabling them to innovate in ways that are difficult to replicate.

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