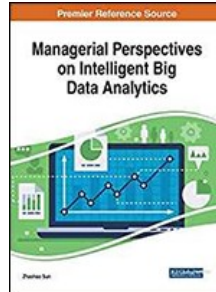


Chapters *To Go*



Managerial Perspectives on Intelligent Big Data Analytics

by Zhaohao Sun

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Chapter 14: Building an Analytics Culture to Boost a Data-Driven Entrepreneur's Business Model

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ABSTRACT

This chapter treats the movement that marks, affects, and transforms any part of business and society. It is about big data that is creating, and the value generating that companies, startups, and entrepreneurs have to derive through sophisticated methods and advanced tools. This chapter suggests that analytics can be of crucial importance for business and entrepreneurial practices if correctly aligned with business process needs and can also lead to significant improvement of their performance and quality of the decisions they make. So, the main purpose of this chapter are exploring why small business, entrepreneur, and startups have to use data analytics and how they can integrate, operationally, analytics methods to extract value and create new opportunities.

INTRODUCTION

When we consider the opportunities offered by big data universe, the power of analytics, algorithm relevance and of what may seem to be revealed by each byte of data, and then the effort involved seems to be doubled to start down into how one can develop the new business model through joining big data analytics arena. In another way, every data byte tells a story and data analytics, in particular, the statistical methods coupled with the development of IT tools ([Walwei, 2016](#)), piece together that story's reveal the underlying message ([Sedkaoui, 2018a](#)).

Many successful entrepreneurs' experiences support that, analytics as a core capability of their startups. These include *Sergey Brin* and *Larry Page* of Google, *Jeff Bezos* of Amazon.com, *Michael Bloomberg* of Bloomberg LP, *Travis Kalanick* and *Garrett Camp* of Uber, *Reed Hastings* of Netflix and more. At this stage, one must wonder '*how they do what they do?*' Somehow, the answer lies in the fact that these experiences have understood the underlying message revealed by the amount volume of data byte available today. They have seen the potential in using analytics not only to differentiate their business models but also to innovate.

With small budgets, limited staff and inexperience, entrepreneurs somehow have to find a way to boost their data-driven project orientation by realizing the potential of big data beyond a promising buzzword. They must pair a vision with a clear profit model if they want to join this arena. Nevertheless, there is a school of thought, which says that "Being entrepreneurial means that an opportunity must be pursued despite the lack of resources, and the ability to leverage external resources is one of the hallmarks of the entrepreneur" ([Stevenson & Jarillo, 1990](#); [Stokes & Wilson, 2010](#)).

The challenge, therefore, lies in the ability to extract value from the amount volume of data produced in real-time continuous streams with multiple forms and from multiple sources. In another word, to explore data and uncover secrets from it, we need to find and develop applicable to generate knowledge that can conduct any business project strategies. Therefore, understand the leadership's cognitive is necessary. It helps to determine the factors that can encourage the adoption of new methods as suggested by McAfee and Brynjolfsson (2012) and [Ross et al \(2013\)](#).

Of course, there are multiple ways an entrepreneur can become more data-driven.

By using big data technologies, by exploring the new methods to detect correlations between the quantities of available data, by developing algorithms and tools that can address the variety of data, by optimizing the Business Intelligence process, etc. This provides insights on how they can develop the new business model through the use of IT tools and by providing the ability to analyze data.

That's what this chapter will explore by highlighting the contents and focusing on how to conduct an analytical approach to help entrepreneurs in their business model creation process. Therefore, in this study the following research question will be answered: *How can small businesses drive an analytical approach to get more value out of the available data and optimize their business model in such a way that it will be more frequently used for better conduct their project?*

Through this question, we recall the context of big data, its importance in conducting decision-making, its challenges and the role it plays as a complement to create new opportunities for small enterprise in order to address the different issues.

It is the question posed above that is discussed in the remainder of this chapter, by highlighting it through three sections, a discussion, and a conclusion. The first section discusses the general theoretical background necessary to understand the importance of big data analytics.

The second section addressed to the big data analytics applications. It illustrates its power by showing its wide range of business applications and how it can be applied to generate value and create an oriented-data business model for entrepreneurship. For conduct a data-driven entrepreneur approach, the third section gives key elements to undertake in big data analytics, and how this approach can better guide the business project for innovation by giving the ability to learn from data. Then, the discussion addresses the development of a data culture within business orientations.

So, to be in the context of this book, this chapter pays a particular attention to the role of big data analytics on addressing challenges, and how small business can harness the potential of big data and how the analytics power can help them find creative solutions to the various problems.

WHERE TO START? AN OVERVIEW

As with all innovative areas, it is sometimes difficult to understand what is involved. For this, before going into the thick of the subject and talking only about how data drive entrepreneur's business model process for a small and micro enterprise, this section will cover and discuss the basic concepts that lie behind the big data analytics in order to highlight the importance of working with data. The aim is to introduce and define big data analytics as an immense potential to generate value for businesses. Here is generally what an entrepreneur needs to know to get his feet with big data analytics.

Already! What Is Big Data?

'Data revolution', 'data deluge', 'phenomenon'... words are diverse to refer to the "big data effect". Analytics use, algorithms application and uncovering the hidden patterns behind the data available today, have excited the business playground. The debates that are emerging during these few years around big data are very similar to those that took place about the "Web" in the early 1990s. After a long and active discussion phase in the literature, big data is entered a phase of use by many companies ([Sedkaoui, 2018a](#)). One of the reasons big data has become so popular is the availability of data, which has improved.

Data existing over the time, it is not new, but what makes it so important is the rapid rate and different types in which it is produced in recent times, or what brings us to turn: "*From data to Big data*". This phenomenon has radically changed the way data are collected, stored and analyzed since it introduces new issues concerning *volume* (how much?), *velocity* (at what speed?) and the *variety* (how diverse?) of data available today. Typically, these three Vs are used to characterize the key properties of big data.

- **Volume:** Refers to the size of the data.
- **Velocity:** Refers to the data provisioning rate and to the necessary time to act on them.
- **Variety:** Refers to the heterogeneity of data acquisition, data representation, and semantic interpretation.

The big data definition can vary significantly from one source to another, but its main characteristics are known. [McKinsey \(2011\)](#) offers their interpretation of what big data is, based on the described 3Vs. The popular definition of big data, which are based on these three properties, is that given by [Gartner \(2013\)](#), which define big data as:

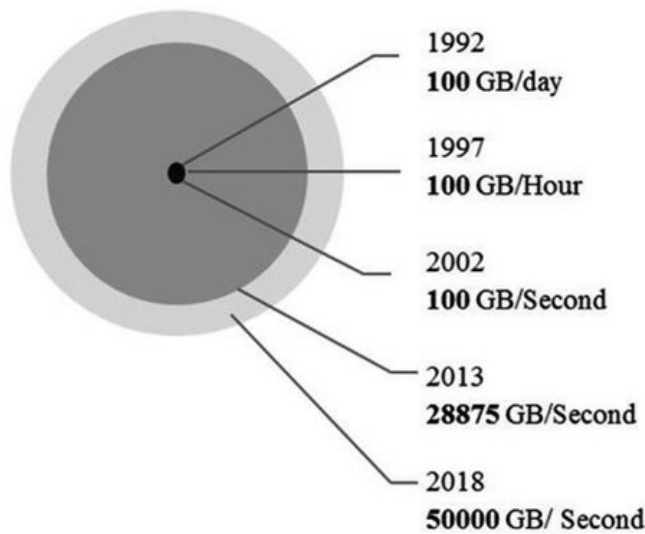
An information asset whose volume is large, velocity is high, and formats are various.

This data comes from social networks, smartphones and other mobile devices, connected objects and IoT sensors (vehicles, medical sensors, surveillance cameras, smartwatch...) ([Sedkaoui, 2018c](#)). Consulting firms (McKinsey, IDC, Gartner...) see it as a very promising market (27.7 billion \$ in 2012, the double in 2016 according to IDC). The challenge for the coming years is to know how to store, exploit and create value, yes! another 'V' of big data.

In addition, storage and processing capabilities are the other major changes in data growth. This is mainly related to the increase of the capacity of storage (see [Figure 1](#)) and the computing power.

So, it is no more about the word 'big' now, but how to handle this 'big' of structured, semi-structural and unstructured data, that cannot be managed with traditional tools, and how to deal with its diversity and velocity to generate value, because nowadays,

'all about value'. What is important is not the size or technique, but how to generate value (analyzes, correlations test, predictions, machine learning algorithms...).



Source: [Sedkaoui, 2018b](#)

Figure 1: The growth of storage capacity

Understand Data to Derive Knowledge

Nowadays it doesn't take much to convince managers or decision-makers alike of the importance of data for their business activities because most of the business activities are associated with the use, the understanding and the exploiting of data ([Sedkaoui, 2018a](#)). Many companies have realized that knowledge is power, and to get this power they have to gather its source, which is data, and make sense of it. This was illustrated by the famous "*knowledge pyramid*" (see [Ackoff, 1989](#)), described as a "*knowledge discovery*" where data lays at the base (see [Figure 3](#)). The data we produce, as well as other data we accumulate, constitutes a constant source of knowledge.

As a result, data has passed from being a modest and oft-discarded by-product of firms' operations to an active resource with the potential to increase firm performance and economic growth. But, it is important to notice that data available today is very different from data, which existed before. Data is collected from various sources. It can be in different infrastructures, such as cloud, or in different databases, such as rows, columns, or files ([Moorthy et al., 2015](#)).

To this structured data, managed in traditional IT applications (ERP, CRM ...) many other data types have been added. These types often called 'unstructured data' or 'semi-structured data', which come from various sources, such as connected objects, social media ...

In addition to these categories, it is also helpful to look at data variety from a company's perspective: internal and external data. Along with capturing data from internal sales information and sensors, companies can also track public responses on Facebook, Twitter, or other social media.

These new types of data may be intended to enrich the types existing before, and from which derive information and then producing knowledge. This idea refers to the knowledge pyramid, which illustrates the importance of data in knowledge creation that improve the decision-making process.

The most important asset of big data lies in the fact that the analysis of this data makes it possible to generate knowledge and create considerable value. However, in traditional models, key-value creation activities can be described using the value chain ([Porter, 1985](#)). The value chain concept, primarily geared to the physical world, treats data as a supporting element rather than a source of value itself ([Rayport and Sviokla, 1995](#)). But, a correct utilization of those enormous of data in the decision-making process is not easy.

So, the process of decision begins when the top manager has to choose which data to look for, even before starting to collect data. Organizations need to use a structured view of data to improve their decision-making process. To achieve this structured view, they have to collect and store data, perform an analysis, and transform the results into useful and valuable knowledge ([Sedkaoui, 2018a](#)).

In fact, the emergence of big data has the potential to influence a company. According to [Frizzo-Barker et al., \(2016\)](#), big data can change the way companies are thinking about data infrastructure, business intelligence, and analytics and information strategy.

By using big data, companies are also able to know more about their business context. McAfee & Brynjolfsson (2012) argue that big data allow companies to improve their decision-making process and therewith their performance.

Data Analytics Power

The new analytical power presents an opportunity to invent and explore new methods, which helps to detect correlations between the quantities of available data. [Cukier and Mayer-Schoenberger \(2013a; 2013b\)](#) see a paradigmatic change in the statistical handling of large data:

Using great volumes of information ... require three profound changes in how we approach data. The first is to collect and use a lot of data rather than settle for small amounts or samples as statisticians have done for well over a century. The second is to shed our preference for highly curated and pristine data and accept messiness: in an increasing number of situations, a bit of inaccuracy can be tolerated, because the benefits of using vastly more data of variable quality outweigh the costs of using smaller amounts of very exact data. Third, in many instances, we will need to give up our quest to discover the cause of things, in return for accepting correlations. With big data, instead of trying to understand precisely why an engine breaks down or why a drug's side effect disappears, researchers can instead collect and analyze massive quantities of information about such events and everything that is associated with them, looking for patterns that might help predict future occurrences. Big data helps answer what, not why, and often that's good enough.

[Manyika et al. \(2011\)](#) argued that:

... there are five broad ways in which using big data can create value. First, big data can unlock significant value by making information transparent and usable at a much higher frequency. Second, as organizations create and store more transactional data in digital form, they can collect more accurate and detailed performance information on everything from product inventories to sick days, and, therefore, expose variability and boost performance. ... Third, big data allows ever-narrower segmentation of customers and, therefore, much more precisely tailored products or services. Fourth, sophisticated analytics can substantially improve decision-making. Finally, big data can be used to improve the development of the next generation of products and services.

Literature indicates that big data can unlock plenty of new opportunities, and deliver operational and financial value ([Ohlhorst, 2013](#); [Morabito, 2015](#), [Foster et al., 2017](#); [McKinsey, 2016](#)).

Big data analytics is considered as an umbrella concept for the data analysis. With the explicit aim of generating value that helps the decision-makers in their strategies. This idea can be formalized using the following definition ([Van Barneveld's et al, 2012](#)):

Analytics is the process of developing actionable insight through discovery, modeling and analysis, and interpretation of data.

While:

The idea of *actionable insight* is applied to convey that the objective of analytics is to generate results that directly increase the understanding of those involved in the decision-making process ([Cooper, 2012](#)).

Discovery refers to the problem definition and exploratory element of analytics; the identification, collection, and management of relevant data for subsequent and/or concurrent analysis. This discovery stage integrates [Cooper \(2012\)](#) emphasis on a problem definition with what [Labrinidis and Jagadish \(2012\)](#) conceptualize as data management, which includes:

- **Problem Definition:** Identifies what data to collect, and to subsequently begin acquiring it. But, the volume of data manipulated by some companies, especially those related to the Internet, increase considerably. The increasing computerization of all types of processing implies an exponential multiplication of this volume of data, which is now in the order of Petabytes, Exabytes, and Zettabytes. [Chen et al. \(2012\)](#) highlight the multitude of techniques that allow organizations to tap into text, Web, social networks, and sensors, all of which enable the acquisition and monitoring of real-time metrics, feedback, and progress.
- **Data Collection:** The collection and combination of semi-structured and unstructured data require specific technologies, which also have to account for data volume and complexity.

- **Data Management:** Data management involves the storage, cleaning, and processing of the data.

Modeling and analysis are concerned with applying statistical models or other forms of analysis against real-world or simulated data. The middle stage of this categorization involves making sense of the acquired data, to uncover patterns, and to evaluate the resulting conclusions ([Tomar et al., 2016](#)).

Interpretation involves making sense of the analysis results of, and subsequently conveying that information in the most comprehensible form onwards to the relevant parties. In another word, making sense of different types of data and generate value from it, results in some form of finding.

The notion of making sense of big data has been expressed in many different ways, including: '*data mining*', '*knowledge extraction*', '*information discovery*', '*data pattern processing*'... Big data analytics is widely used today, due to the conjunction of many factors, such as:

- Data storage costs are constantly decreasing (see the Appendix);
- Increasing computing power;
- An explosion of the amount of information available in digital form;
- This data is largely unstructured and requires different operating techniques than conventional methods.

WHEN BIG DATA CREATE NEW BUSINESS MODELS

Considered, initially, as a way of boosting the analytical strategies of companies, big data is transformed into a way to change their business models. If Facebook, Google, Twitter, LinkedIn, Amazon, Apple, Netflix, Nike, and many other data-driven business models exist, it is thanks to the advance generated by big data and analytics. But, what analytics tools we can use? How have these models been able to draw a profile, especially for small businesses? These are what this section will discuss.

Big Data Applications: Examples

The 'data revolution' has created new business models and investment strategies allowing companies to monetize their existing data and businesses to create new big data solutions. Many companies are increasingly using big data analytics to improve their business. Netflix and Uber are two examples of successful use of the latest analytics technologies ([Sedkaoui, 2018a](#)).

Millions of Netflix subscribers generate a lot of data. To analyze this data, this company uses analytical techniques to determine what users will enjoy watching. Netflix's recommendation engine, impressive insight, works through analytics. This company has been able to build predictive models to suggest series that will delight users. It has developed other techniques for enhancing relevant recommendations, which are based on keywords. Subsequently, users receive suggestions based on these keywords, corresponding to the productions they have most appreciated.

In 2015, the message sent by Netflix to its shareholders showed that the big data strategy was paying off. In the first quarter of 2015, 4.9 million new subscribers were registered, compared with four million in the same period in 2014. Similarly, 10 billion hours of content were broadcast. Now, more than 117 million subscribers in the world with around 6 million additional subscribers per quarter worldwide (which refers to more than 8 million in the last quarter of 2017). Then, Netflix net earnings increase in the last quarter of 2017. Thanks to the intelligent use of big data analytics, the influence of Netflix continues to grow. Exported to more than 190 countries, this company continues its personalization work.

By coupling the notion of the sharing economy with big data, the Uber smartphone app connects passengers and drivers with a principle based on big data analytics (*crowdsourcing*). Anyone who is willing to offer his driver services can offer his help easily. During each trip, Uber collects and analyzes data to determine the extent of demand across geographic areas. This allows the company to allocate its resources efficiently. Uber also analyzes the public transport networks in the cities where it operates. By this way, the company can focus primarily on underserved areas.

In addition, Uber has developed algorithms to monitor real-time traffic conditions and travel times. As a result, prices can be adjusted as demand and travel times fluctuate. Then, drivers tend to drive when they are needed most. This pricing method based on big data analytics is patented by Uber. It is called "*surge pricing*". This is an implementation of the "*dynamic pricing*" already commonly used by airlines company and hotel chains to adjust the price on demand in real time through predictive analysis.

Other companies, which are considered as leaders in this field, have developed their strategy basing on big data analytics. The e-commerce giant Amazon recommends products to customers based on their browsing and purchasing habits. Jeff

Bezos's company goes further with an artificial intelligence (AI) program based on an algorithm able to design a garment. It is a sort of a fashion creative AI in a way.

In 2016, Amazon represents a larger market than most of the major players in the US market combined.

This is impressive, how Amazon gets this success? It is obviously the data. Since its creation in 1994, the company has adopted a culture largely driven by data. Thanks to the knowledge given by the data, the customer gets the right product at the right time, and is satisfied with the image of the logo of Amazon: 'a smile'.

The "ad-tech" companies, such as RocketFuel apply statistical and optimization techniques to determine which banner ads to display. Thus, devices, such as "Fitbit" used for recording and monitoring our physical activities, and their integration with other applications, allow individuals to obtain information on calories burned and food consumed. This allows a creation of new models, which sell this information to insurance companies to better calculate risks ([Sedkaoui, 2017](#)).

Many other companies use data analytics. This is the case of NASA, Domino's Pizza or the NFL. Globally, the success of many enterprises ([Marr, 2016](#)) is based on the same power: value creation from data.

Data-Driven Business Models (DDMB)

Continuous and rapid changes, the digital revolution, new entrants, innovation... are all factors that force companies to continually adapt this changing environment that some people call 'VUCA', or: 'volatile', 'uncertain', 'complex' and 'ambiguous'. To survive in this environment, companies must be agile in terms of supply, market, internal organization, income model, etc. Differentiation with competitors is no longer about products or services, but how companies create, deliver and capture value. In other words, the differentiation is about the creation of a new 'Business Model'.

Since the mid-90s and with the advent of Internet startups, the term business model is probably among the most used in the business world, even though it has no clear definition. The concept refers to the way companies do business. Or, how they compete and make profits by using their competencies ([De Mauro et al., 2016](#)) and resources to sell goods and services in the market ([Zhu & McKelvey, 2013](#)). [Drucker \(1994\)](#) defined the business model as:

what an organization is paid for, what an organization considers being meaningful results (how to make a difference) and where an organization must excel in order to maintain leadership.

By its ability to make the apparent complexity of an organization's business model intelligible, attractive and operational, the model, which is the result of the Swiss's researcher/entrepreneur work (A. Osterwalder), has quickly and widely established itself in the business world. In just a few years, this model becomes the absolute reference in the business model. It is the modelization of the main elements of entrepreneurial activities. It refers to the process through which these activities deliver and capture value. This layout facilitates the description; the definition and the analysis of the interactions of the different parts of the model (see [Figure 2](#)).

This model facilitates the global vision of the interactions between the bricks constituting the activity and makes it possible to ask the right questions. What is the promise of the offer, what solution does it bring to the customer's expectation, and besides, to what type of client is activity's value proposition addressed, and how will it be done? Etc.

But, when an entrepreneur starts making more tactical decisions, to develop his business project, data always are helpful. The examples cited before illustrate this best. These companies have carried out a series of successive business model innovations, oriented towards the 'data' and the 'Analytics'.

Being 'data-driven' means making decisions based on data. Traditionally, decision-makers and CEOs make decisions based on the goal they have set. Data-driven companies focus on collecting and efficiently analyzing data and make decisions on that basis. For example, Amazon's decisions are data-based (even the color of the walls was decided by data). Whenever they have an idea, they analyze the data to validate it. Data is a key success factor and companies that successfully use it, will gain in competitiveness.

DDBM puts data at the center of value creation. This importance can be illustrated in different ways, such as analysis, observation of customer behavior, understanding of customer experience, improvement of existing products and services, strategic decision-making, and data marketing. For the last case, data may be the main building block of the company's offer.

Thus, in this category, we will find companies that offer data, whether financial (Bloomberg, Reuters ...), economic (Dun & Bradstreet...), or from the social networks (Gnip, DataSift, etc.). This data is aggregated from different sources, generated directly by the company, processed and enriched by various analyzes and highlighted by data access and visualization platforms. As for revenue models, these can be based on a direct sale of data, a license, a subscription or a free provision

financed by advertising.

More precisely, among the different big data opportunities, it is possible to identify three broad areas (business model based on big data), in which it creates value and has an impact on companies:

- **Data as a Service:** This first business model is intended for companies that generate a large amount of data, but do not have the means at their disposal to collect or make them in forms that can be analyzed. Many public institutions use this model. Municipalities, for example, generate transportation data, and companies can seize it for their own users.

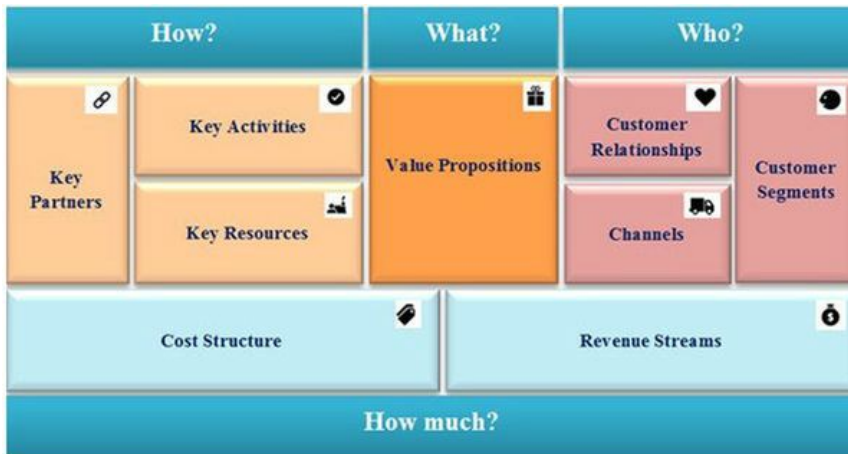


Figure 2: Business Canvas

- **Information as a Service:** In this case, the product provided is directly the information obtained from the analysis of the data. Companies that allow their users to monitor their physical activity, such as the number of steps taken during the day, corresponding to this model. Fitbit users, for example, produce the data and they pay for their visualization in graphical form.
- **Recommendation as a Service:** This model is the most lucrative. In this scenario, the product provided is directly a specific recommendation addressed to users of the service to guide their consumption choices. Services like Mint.com offer their users to view their accounts and spending on their different credit cards to get a unified view of their budget. In exchange, Mint allows financial institutions to offer their products in the form of personalized recommendations.

But beyond these well-known business models for which data creates value, there is another category where the data serve as a value creator, notably through the exploitation of big data, without necessarily being present directly in the offer.

In this category we find all companies relying on the use of big data to derive value. For example, we can mention GAFAM or Uber, which uses data related to the location of its clients, its drivers, trips, traffic to determine the price, or Netflix, which uses the collected data about the use of its streaming service to identify themes and concepts of new series, 'House of Cards' is a great example of success.

Globally, the range of different types of DDBM is very wide. Interest in these types of model is recent, there is no current model accurate and shared by all listing the different types of DDBM. Among the most interesting, we can mention:

- The model of [Hartmann, Zaki, Feldmann, and Neely \(2014\)](#);
- The taxonomy of [Engelbrecht, Gerlach, and Widjaja \(2016\)](#).

If big data allows companies to optimize their existing activities, this concept also creates real opportunities to identify and build new ones for small and even micro enterprises.

Key Elements to Conduct a Big Data Project

After defining the target, and taking into account the various business constraints, entrepreneurs will be able to decide the context of their project structure. For example, if they want to develop a detection system of unsubscribing a subscriber to an online service, it will be necessary to define the notion of "the interest" of a subscriber to this online service. As such, they can formulate the following hypothesis: (i) if the customer connects at increasingly spaced intervals, it means that his interest in the online service is weakening; (ii) if the connection sessions to the service become shorter, they can deduce that client begins to lose interest in the online service, etc.

This initial phase focuses on understanding the objectives and requirements of the big data project from a business perspective, and then converting that knowledge into a definition of the data analytics problem. This is to say define the scope of impact and if entrepreneurs are not yet aware to define the goal, they can start with a PoC (Proof of Concept) by using an iterative method, refine their goal as they go along with the results and directions they get from this PoC.

Therefore, to advance in the big data universe and turn data into knowledge entrepreneurs need to define the following key infrastructure elements ([Sedkaoui, 2018b](#)):

- **Data Collection:** Depending on the business hypothesis that entrepreneurs would have made on the problem, they will look within for the relevant data that can support the hypothesis.
- **Data Storage:** When entrepreneurs start processing a large amount of data for storage and analysis, or if that data is destined to become a key part of their strategy, they need something else. A distributed system like Hadoop, or cloud-based, might be better suited. In fact, a cloud is an attractive option for most businesses. It is flexible and entrepreneurs do not need physical systems. It also reduces the need for security tools to protect the data. In addition, it is a lot cheaper than investing in dedicated systems and data warehouses.
- **Data Analysis:** Before being able to process data, it will be necessary to prepare that data to make it ready for analysis (this includes remove missing value and outliers). The goal of the data analysis phase is to build a model (solution) able to 'predict' the result of a given problem. But, data analysis is based on technology, which can be grouped corresponding to three types of needs and levels, as summarized in [Table 1](#).

If an entrepreneur is embarking on data analysis, he can start by adopting the first family of tools. The transition from 'beginner' stage to 'standard' or 'expert' (advanced tools) will be done gradually, as the entrepreneur's needs are more specific or the databases grow. The most important thing is to know what an entrepreneur wants to do with this data because that ultimately determines the choice of the technology ([Sedkaoui, 2018b](#)).

For entrepreneurs, it is not necessary to proceed directly to the installation of the tools that will integrate the entire value creation chain. It is quite possible to go first with an open source solution, like the Hadoop, Map Reduce, or SaaS, often cheaper, and once the activity has arrived at maturity in big data context, then the entrepreneur can move to more integrated solutions, such as SAS. This kind of software provider also offers flexible solutions that can adapt to the specific needs of its structure.

To begin, it is good to have notions of statistical models and machine learning algorithms. [Table 2](#) classifies the most used algorithms.

- **Data Security:** To optimize the business performance, entrepreneurs must take into account the various threats that affect the data. Developing an accurate view of data and hierarchy allows them to better secure information and provides some agility to better adapt the myriad of rules and regulations that they need to comply with.
- **Data Visualization:** The data visualization intervenes throughout a project on the data to support understanding ([Shafer, 2017](#)). Data visualization allows the final phases to render, explain and highlight the results. The main types of data visualization include dashboards, commercial data visualization platforms, but also simple charts and tables that allow entrepreneurs to communicate ideas quickly. Most small businesses looking to improve their decision-making can rely on simple graphics and visualization tools like word clouds or even Excel.

Table 1: Big data technology level

Level	Use case	Tools: Example
Tools for beginners	If entrepreneurs are starting to analyze data	Google Analytics, Google Tag Manager (GTM), Regex101, Excel.
Standard tools	If entrepreneurs have more budgets	Optimizely, Dataiku DSS, Crazyegg, Mixpanel ...
Technology for experts	If there is a team dedicated to data analysis and the entrepreneur want to exploit data with very specific needs.	Hadoop, MapReduce, Spark, SQL, Python ...

Table 2: Algorithms and their cases of uses

	Algorithm	Learning mode	Problem to be treated
Simple	Simple regression	Supervised	Regression
	Multiple regression	Supervised	Regression
	Naïve Bayes	Supervised	Classification
	Logistic regression	Supervised	Classification
	Hierarchical Classification	Unsupervised	Clustering

Table 2: Algorithms and their cases of uses

	Algorithm	Learning mode	Problem to be treated
	K-means	Unsupervised	Clustering
Complex	Decision tree	Supervised	Classification – Regression
	Random forest	Supervised	Classification – Regression
	Bootstrapping	Supervised	Classification – Regression
	SVM	Supervised	Classification – Regression
	Neural Networks	Supervised	Classification – Regression
	KNN	Supervised	Classification – Regression

To better launch a big data project, there are two approaches illustrated in [Figure 3](#):

The bottom-up approach (data-driven approach) goes from the technique to the organization. Entrepreneurs, based on this approach, will first validate the technical choices through a PoC and a case of use that they consider relevant. However, the top-down approach will first impact the organization of the company in order to prepare it to launch big data projects.

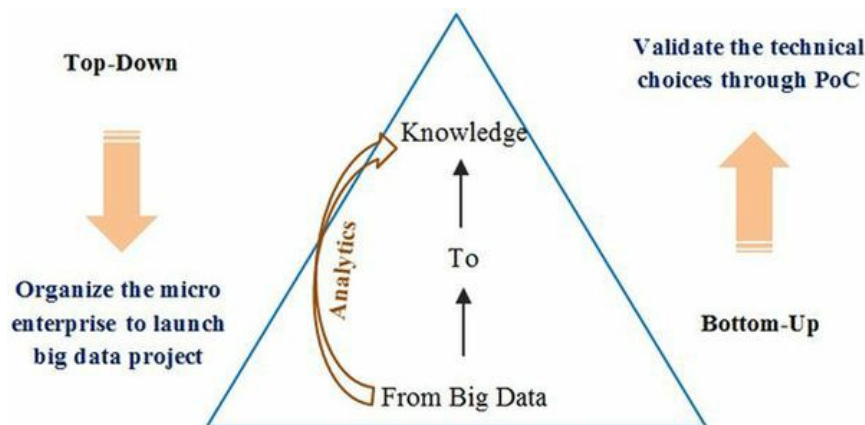


Figure 3: Bottom-up and Top-down approaches

FOR AN ENTREPRENEUR MADE IN DATA

The importance of big data analytics (the *why?*), as with every major innovation, the biggest confusion lies in the exact scope (*what?*), and its implementation (*how?* And *for whom?*). In this context, small businesses or entrepreneurs must open their eyes to data's boundless opportunities. If an entrepreneur wants to be a data-driven, in order to lead his business project idea, so he must adopt a 'data-driven approach'. Better conduct a data-driven approach lies in having a clear analytical objective. In another word, the more the objectives are clear, the more focused and rewarding the analytical approach will be. We can never say it enough: *"there is no good wind for those who don't know where they are going"*. This section shows that there are plenty of things that must be done to become a data-driven innovation or an entrepreneur made in data, in general.

First of All, Learn to Ask Relevant Questions

The data entrepreneur in any field is not necessary a data scientist, developer or statistician, but he is the one who makes data at the center of his business conducting. The data entrepreneur must seek the information where it is not. For that, the most popular way is probably to ask a lot of questions and see what sticks. But it can't be just any questions; it has to be significant questions.

Two essential components are needed to question whether data analytics can or cannot add value to the entrepreneurial project: *"well-defined problem"* and *"data"*.

- The Definition of the Problem Statement:** Everything in big data analytics begins with a clear problem statement. Determining what type of problem an entrepreneur is facing with, in his business context or ecosystem, will allow the business idea to correctly choose the technique that can be used. The success of an analytics approach cannot be possible without the clarification of what an entrepreneur wants to achieve and what is need to be changed to embrace the advancement that big data entails. This is not just valid in a big data context but in all areas. Small enterprises must clearly define what they want before undertaking anything. This means knowing what they are trying to achieve, what is needed, and why and what level of accuracy is acceptable and actionable. The problem we are trying to solve, by modeling the situation, corresponds to the specific task to be accomplished.

- **Data:** What should be done here is exploring all possible paths to recover the data in order to identify all the variables that affect, directly or indirectly, the phenomenon that interests the project. In another word, how make new opportunities from this data? Which data to select for the analysis? And how apply efficiently analytical techniques to generate value? This kind of question helps the entrepreneur to be able to think critically, in order to improve solutions for business challenges and allow him to understand that, big data opportunities are not in the volume of data but in the digital transformation of business processes. Data is literally the nerve of the era of big data. The data are mostly available but often scattered in several computer tools. An important procedure is to understand the data that will be collected and then analyzed. The idea is that the more we have a good understanding of our data, the better we will be able to use them wisely. This aims to precisely determine where we should look for the data, which data to be analyzed and identify the quality of the data available but also link the data and their meaning from a business perspective.

The growing complexity of the data and business analytics sector and its accelerating dynamics urge entrepreneurs to think and act in an entrepreneurial way. That means understanding what can be done with that available data before exploring it. This includes some basic knowledge about the methods that will be used and the complexities involved. It seems obvious because data is the main raw material of an efficient data analysis process. So, if an entrepreneur doesn't understand the nature of the data related to the problem he is trying to solve, consider that he will not be able to solve it.

So, to understand the context of the target problem, the entrepreneur must play, in some ways, the role of a 'detective'. This can allow him to discover and understand different element related to it and determine the tools he needs to better operate in his ecosystem and derive solutions that allow him to improve innovation. It is, therefore, essential to have at least basic notions of statistics and mathematics to determine the right analysis technique according to the nature of each data.

That means also a significant part of identifying the technologies that will be most relevant for managing the flow of data. For data analytics, preference is given mainly to computer languages, which are standardized for data analysis and information extraction. To meet these information-sharing developments, we need tools across the board to help. We need infrastructure and technologies that accommodate ultrafast data capture and processing. Another key element lies in identifying: Which technology to adopt? Why should entrepreneurs adopt this technology? How about the costs? Etc. Taking into account the growing advanced analytics tools.

Also, it is not only a technological issue that's mater but also, how can you, as an entrepreneur who wants to drive the project idea based on data analysis, transform data to patters. Do you think that to apply analytics techniques or to create a project-oriented on data and analytics you need to have a good command of the different analytics application and how it works? Do you really think that you need to know what is happening behind the analytics scenes?

As a matter of fact, it will be important if you mastery the different analytics tools, but how the algorithm works is not the user's business. It is like when you drive a car without having any idea about its mechanisms because knowledge is different from know-how. That brings us to say that understand data analytics is good but know how to use it is better!

The key lies in an entrepreneur's ability to appreciate the quality and defects of different algorithms. So, he should rather be interested in questions and issues related to the reliability of the results, their value, and their effect on the business context ... It must be considered that there is no perfect model, but models that adapt better to situations. In addition, knowing some analytics methods can be a real asset (decision tree, K-means...). Since these different techniques can be directly implemented using the software (SAS, R, Python ...) it is not necessary to know how their algorithms work.

The important thing is to understand how they work in general terms and to know which method is most relevant depending on the situation. Select the right method for available data is a very important point.

Big data is opening up a number of new areas for businesses. Products that make data more accessible, that allow analysis and insight development without requiring them to be a statistician, engineer or data analyst are one major opportunity area ([Feinleib, 2014](#)).

Asking interesting questions develop your inherent curiosity about data that you are working on. Knowing a little something about everything equips you to understand the context and have the ability to get out the value from data. The key is thinking broadly about how to transform data into a form, which would help to find valuable tendencies and interrelationships.

The following types of questions seem particularly interesting:

- What things might an entrepreneur be able to learn from the data?
- How can he ever hope to understand something he cannot see?
- Which techniques and methods, does he think will prove more accurate?

- How to avoid mistakes and get the best models?
- How can he learn lessons by analyzing available data, and what is he going to do with it?
- How to best use the results of these analyzes?
- What impacts does he expect on the choices to be made?

This kind of questions allow the entrepreneur or small and micro social enterprise to think like a data scientist or be a data scientist, in some ways, to better conduct his project based on data and analytics, that means think about the 'meaningful' of data, so its practice.

Challenges to Take Into Account

As large data sets are currently available from a wealth of different sources, companies are looking to use these resources to promote innovation, customer loyalty and increase operational efficiency. At the same time, they are contested for their end uses, which require a greater capacity to collect, analyze and manage the growing amount of data but also ensure its security. It is to highlight that not merely the existence of large amounts of data that is creating new challenges. Data exploration and analysis turned into a difficult problem in many sectors in the span of big data.

With large and complex data, computation becomes difficult to be handled by the traditional data processing applications which trigger the development of big data applications ([Muhtaroglu et al. 2013](#)). If big data are combined with predictive analytics, it produces a challenge for many industries. The combination results in the exploration of these four areas ([Inukollu et al. 2014](#)):

- Calculate the risks on large portfolios
- Detect, prevent, and re-audit financial fraud
- Improve delinquent collections
- Execute high-value marketing campaigns

There are many technical challenges that must be addressed to realize the full potential of big data. [Warren et al. \(2015\)](#) state that many companies are unable to apply big data techniques due to limiting factors, such as lack of data, irrelevant or untrustworthy data, or insufficient expertise. The main challenges associated with the development and deployment of big data analytics are:

- **The Heterogeneity of Data Streams:** Dealing with semantic interoperability of diverse data streams requires techniques beyond the homogenization of data formats ([Soldatos. 2017](#)). Big data streams tend to be multi-modal and heterogeneous in terms of their formats, semantics, and velocities. Hence, data analytics expose typically variety and veracity. Big data technologies provide the means for dealing with this heterogeneity in the scope of operationalized applications.
- **Data Quality:** The nature of data available can be classified as noisy and incomplete, which creates uncertainty in the scope of the data analytics process. Statistical and probabilistic approaches must be, therefore, employed in order to take into account the noisy nature of data. Also, data can be typically associated with different reliability, which should be considered in the scope of their integration in an analytical approach.
- **The Real-Time Nature of Big Datasets:** Big data feature high velocities and for several applications must be processed nearly in real-time. Hence, data analytics can greatly benefit from data streaming platforms, which are part of the big data ecosystem. IT advent, Internet and several connected objects provide typically high-velocity data, which however can be in several cases controlled by focusing only on changes in data patterns and reports, rather than dealing with all the observations that stem from connected objects.
- **The Time and Location Dependencies of Big Data:** IoT data come with temporal and spatial information, which is directly associated with their business value in the analytics application context. Hence, data analytics methods must in several cases process data in a timely fashion and from proper locations. Cloud computing techniques (including edge computing architectures) can greatly facilitate the timely processing of data from several locations in the scope of large scale deployments. Note also that the temporal dimensions of big data can serve as a basis for dynamically selecting and filtering streams towards analytics tools for certain timelines and locations.
- **Privacy and Security Sensitivity:** Today, we face new issues in securing and protecting data, which result in new challenging research directions. Some of those challenges arise from increasing privacy concerns with respect to the use of such huge amount of data, and from the need for reconciling privacy with the use of data ([Bertino and Ferrari, 2018](#);

[Sedkaoui, 2018b](#)). Big data are typically associated with stringent security requirements and privacy sensitivities, especially in the case of IoT applications that involve the collection and processing of personal data. Hence, advanced analytics need to be supported by privacy preservation techniques, such as the anonymization of personal data, as well as techniques for encrypted and secure data storage.

- **Data Bias:** As in the majority of data mining problems, big datasets can lead to biased processing and hence a thorough understanding and scrutiny of both training and test datasets are required prior to their operationalized deployment. Note that the specification and deployment of IoT analytics systems entail techniques similar to those deployed in classical data mining problems, including the understanding and the preparation of data, the testing of the analytics techniques and ultimately the development and deployment of a system that yields the desired performance and efficiency.

Being an entrepreneur is a challenge itself and small businesses must recognize the importance of investing in big data analytics, given its important role as a value generator. But, it may be difficult to practice this kind of analytical techniques coupled with advanced IT tools because it is difficult to secure the funding for several types of needs.

In another word, they are not prepared to fully use the unprecedented amounts of data that they are able to collect for their unique target populations or the business issues they address. Due to capacity constraints, a large part of this challenge lays in the complexity of data collection, data analysis, data security, and how to turn that data into usable information by identifying patterns, exploiting new algorithms, tools and new solutions (value).

Each type of data offers specific benefits and creates specific challenges as we work to extract value. Small enterprises or entrepreneurs, in big data fields, are required to deal with these several issues to be able to seize the full potential of big data. The rise of big data and analytics needs are enabling a new generation of entrepreneurs to embrace opportunities and solve challenges in many fields, a business value included.

Undertake in the Big Data Analytics Domain

Big data is considered a new form of capital in today's marketplace ([Mayer-Schönberger & Cukier, 2013a](#); [Satell, 2014](#)), many firms fail to exploit its benefits (Mithas, Lee, Earley, & Murugesan, 2013). For entrepreneurs, it is known that they are unlikely to analyze data on the same scale as large companies like Google, Facebook, Walmart, Twitter, Netflix, Amazon, IBM, and others, due to their limited sources, skills, and IT tools. Yes! It is possible that they are engaging with the free big data tools provided by companies like Google, without forgetting the increase in the prominence of social networks and the fact that engaging with social media which can help generates exposure and traffic for entrepreneurs at a much lower cost than traditional marketing approaches ([Schaupp and Belanger, 2014](#)). But, it is to highlight that they are unlikely to have large stores and sophisticated tools to capture, prepare, analyze and manage generated data.

The application of analytics for small and micro enterprises can be divided into three main categories, namely descriptive, predictive and prescriptive analytics.

Descriptive analytics involves using advanced techniques to locate relevant data and identify remarkable patterns in order to better describe and understand what is going on with the subjects in the dataset. Data mining, the computational process of discovering patterns in large datasets involving methods at the intersection of AI, machine learning (ML), statistics and database systems, is accommodated in this category ([Sumathi and Sivanandam, 2006](#)).

Descriptive models can give a clear explanation why event behaved, how why certain occurred, but all this already is past perfect. So, entrepreneurs can have a clear vision, based on the past, in the future, on what is more important and how they can function. This appeals predictive models which are seen as a subset of data science ([Waller and Fawcett, 2013](#); [Hazen et al, 2014](#)).

[Liu and Yang \(2017\)](#) formalize the way in which a predictive model is made self-organizing via big data. It makes use of available data (several types, created in real-time ...), statistical methods, and various algorithms of ML in order to identify the likelihood of future insights based on the past. The built model predicts by answering the question: What is likely to happen?

Predictive analytics use data, statistical algorithms, and ML to predict the likelihood of business trends and financial performance, based on their past behaviors. They bring together several technologies and disciplines, such as statistical analysis, data mining, predictive modeling and ML technology to predict the future of businesses.

Table 3: Data analytics categories

Category	Question	Objective	Example
<i>Descriptive</i>	What happened?	Know the relative position of a client according to predefined criteria	Time clients spent on the Website.
<i>Predictive</i>	What is going to happen?	Anticipate the future, considering what we	Identify factors that can explain and predict the client'

Table 3: Data analytics categories

Category	Question	Objective	Example
		know from the past	behavior
<i>Prescriptive</i>	What must be done to make this happen?	Achieve a predefined or estimated business objective	Recommendation systems that provide recommendations on products or services...

With the increasing number of data, computing power and the development of AI software and simple analytical tools uses, many companies can now use predictive analytics. For example, it is possible to anticipate the consequences of a decision or the reactions of customers. Predictive analytics is the act of predicting future events and behaviors present in previously unseen data, using a model built from similar past data (Nyce, 2007; Shmueli, 2011). It has a wide range of applications in different fields, such as finance, education, healthcare, law and more (Sas, 2017; Sedkaoui, 2018a).

In this case, it should be mentioned that the amount of data available is not the problem; the richness of the data, however, is often questionable. This is most certainly required when people want to perform prescriptive analytics. When executed right, this application of mathematical and computational algorithms enables decision-makers to not only look into the future of their own processes and opportunities, but it even presents the best course of action to take for gaining advantages.

The requirements for an accurate and reliable prescriptive analytics outcome are hybrid data, integrated predictions, and prescriptions, taking into account side effects, adaptive ML algorithms and a clear feedback mechanism. Based on the different types of algorithms described in Table 2, the following application cases, which revolve around daily business activities, can explain how to use data analysis.

- **Regression Analysis for Prediction:** This technique can be used to study changes, habits, customer satisfaction levels and other factors related to parameters, such as the budget for an advertising campaign... Once entrepreneurs change any of these settings, they will have a pretty close idea of what will happen to their user audience.
- **Cluster Analysis to Identify Target Groups:** Cluster analysis makes it possible to identify a group of users (in databases) according to common characteristics. These characteristics can be age, geographical location, occupation, and so on. This is a data analysis technique that is used in marketing to segment the database and to send, for example, some promotion to the right target for a particular product or service (young, retirees, etc.). The combinations of variables are infinite and make the cluster analysis more or less selective depending on the search requirements.
- **Classification Analysis to Identify Spam:** The analytics technique that allows recognizing patterns (recurring patterns) within a database. It is an effective way to make a business strategy more efficient, eliminate redundancy and create optimized sub-archives.
- **Neural Networks to Automate Learning:** This is one of the newest data analytics applications, based on the used machine use for the business actions, and thus the computer that manages the database learns to identify a certain pattern within which are present elements having precise relations between them. The result of this learning is the recognition and memorization of patterns that may be useful, not necessarily immediately but in the future, to decide if the goal is achieved and how. This algorithm can help the entrepreneur to know more precisely about the composition of the target of a product or service for example.

It should be mentioned, that data processing and analysis, in the present day, are brought together under the notion of "Business Intelligence" (BI), due especially to computers' increased processing capabilities.

Small businesses have to expand their efforts to move their small business from using only traditional BI that addresses descriptive analysis (what happened) to advanced analytics, which complements by answering the "why", "what" and "how" as illustrated in Figure 4. Ultimately, 'data science' is inevitable as it can help extract various kinds of knowledge from data.

Clearly, the use of big data analytics and IT tools including clouds will provide numerous opportunities to build an entrepreneur approach that will effectively and efficiently cater to the needs of the various entities. Therefore, it is necessary to include enough resources and finance to support the analytics' uses by entrepreneurs to create value. This investment is essential to reap the full benefits of big data and realize all the envisioned features and capabilities. To help optimize the work and minimize costs of such projects it is recommended to include some of the following activities in the process:

- Understanding first what they can do with big data before they consider adopting it.
- Developing analytics tools to help predict and view possible changes and forecast potential problems. This will help avoid or at least reduce some of the risks involved and also help reduce costs.
- Benefitting from other social enterprises experiences to follow successful models and avoid problematic approaches.

- Benefitting from experts and researchers to research new possibilities for more advanced analytics that suite the project idea and objectives.
- Combining big data with open data. This can help to reach better decisions and optimize various functions.

Therefore, the efforts should concentrate on creating a roadmap for success that covers several stages:

1. Set up the entrepreneur's business issues direction, in the data analytics context, by identifying its mission, vision and strategic and operational objectives.
2. Establish policies, principles, resources and expertise guidelines to control ICT and big data usage.
3. Evaluate and analyze the current situations and the necessary changes and additions to reach the desired result.
4. Identify priorities and use them to determine the most important components and techniques that would offer the greatest business effects with the smallest investment.
5. Realize new innovation opportunities for further development by monitoring current analytics developments and their effects and the arising issues and new requirements.

DISCUSSION: DEVELOP A DATA-DRIVEN CULTURE WITHIN ENTREPRENEURIAL ORIENTATION

Entrepreneurial orientation is defined by [Rauch et al. \(2009\)](#) as "*policies and practices that provide a basis for entrepreneurial decisions and actions*". Entrepreneurial orientation is another strategic orientation that has been linked to firm performance ([Lumpkin & Dess, 1996](#); [Wiklund, 1999](#); [Zahra & Covin, 1995](#)). The most commonly used dimensions of entrepreneurial orientation in the literature are: 'innovativeness', 'risk-taking' and 'proactiveness'.

The two dimensions of entrepreneurial orientation which point to the link between an entrepreneur and big data capabilities are:

- **Innovativeness:** Describes the willingness of the business to introduce novelty technological leadership in developing new processes ([Lumpkin and Dess, 2001](#)). Achieving business mission through innovativeness refers to the ability to solve related problems or in effect to create business value. This supports a contention that it will be a key indicator as to whether entrepreneurs will adopt big data analytics.
- **Proactiveness:** Is a forward-looking perspective that suggests that companies with high level of entrepreneurial orientation will be looking to be the first to market capture a particular segment and act in advance in anticipation of future demands ([Lumpkin and Dess, 2001](#)). Proactive companies can make use of big data analytics to improve their understanding of their customer and their sector, with the condition that they have access to the right sources of information. It is, therefore, an important element to consider when looking at big data adoption in small enterprises. For example, by retaining the environment, this reflects the tangible and intangible results of breaking patterns, changes in the system, and new discoveries towards process improvement.

The literature suggests that entrepreneurial orientation is a useful lens through which to consider the use of big data analytics in small businesses. And the contention made by [McAfee and Brynjolfson \(2012\)](#) and [Ross et al \(2013\)](#) suggests that a culture of evidence-based decision-making is required for the successful adoption of big data in companies.

There are two ways to transforms data into a valuable contribution to a company ([Sedkaoui, 2016](#)):

- Transforming data into information is one of the stages of data value production, which is exploited in order to obtain useful information and to successfully carry out company strategies. This automatically involves database information in company decision-making processes;
- Transforming data into products or processes adds value to companies. This is produced when data analysis must be implemented in the physical world.

It is clear that the ability of entrepreneurs to adopt big data analytics may be understood by looking at their role in the determination of the entrepreneurial culture and how they are deploying their resources to engage with and make use of analytics tools and methods in their field. For them, it is essential to have data, increasingly, many on the environment in which it operates or will operate.

In order to succeed in an analytical approach and boost a big data project, it is necessary to prepare it in advance. To do this, three essential questions must be asked: why, what and how.

- **Why:** The first question to ask is "why?". In most cases, this question will inevitably occur during the initial briefing with a consultant or client. Many big data projects are launched only because the term big data is in vogue. Many executives board the wagon and begin to approve massive investments of time and money to develop a data platform. Most of the time, this strategy is based entirely on the motive that "everyone is doing it". An in-depth analysis of the goal that an entrepreneur wants to achieve, by accessing this data, as well as an assessment of the investments and expertise that the project needs, are required but too often overlooked in the context of the deployment of a big data strategy.
- **What:** In all sectors, companies are now considering turning the corner on big data and analytics. They recognize in the data a largely untapped source of value creation and an exclusive factor of differentiation. But, many don't know which approach to tackle. What the entrepreneur is trying to do? Does the project want to create an innovative market, or find a new channel that requires information on client interest and future profitability?

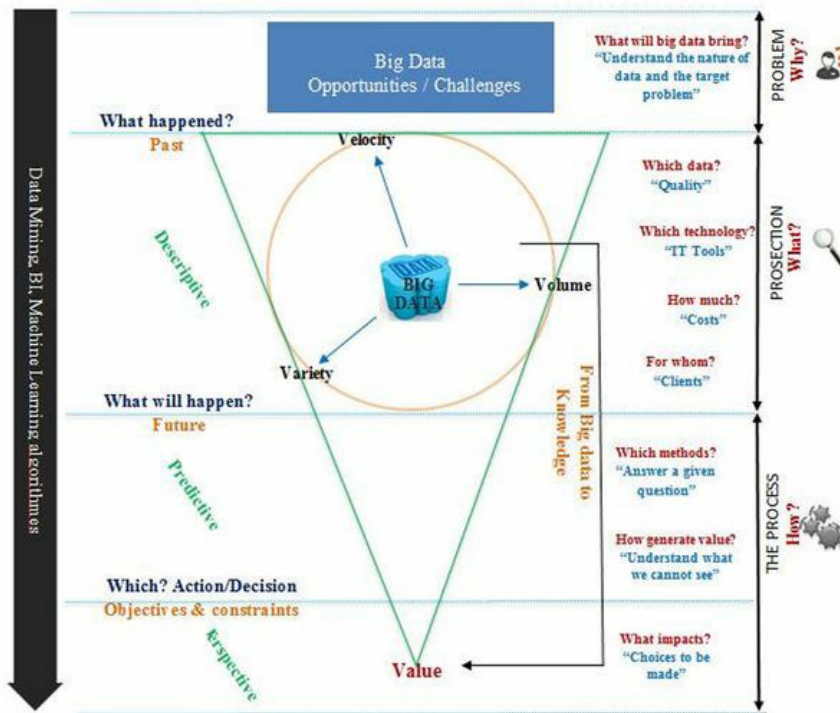


Figure 4: Data-driven approach

- **How:** While companies do see the great potential that big data analytics can bring to improve their business performance, the reality is that many are struggling to generate value from available data. [Gartner \(2016\)](#) study shows that many big data projects remain blocked and that only 15% have been deployed in production. Examining such failures, it appears that the main factor is in fact not related to the technical dimension, but rather to the processes and human aspects that prove to be as important. Conduct a data-driven project means also to be able, in particular, to answer questions, such as: How can we be sure that big data could help us to create business value? Who should be involved and when? What are the key steps that need to be attentive? Is the project on the right track to succeed? Etc. It is, therefore, essential for data-driven orientation, to ensure:
 - **For the Data:** Quality, security, structure ...;
 - **For the Process:** Well-defined organization, a data-driven culture, its direction ...;
 - **For Tools:** IT infrastructure, storage, data visualization capability, performance monitoring.

In order to extract value from big data, it must be processed and analyzed 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. It is important to ensure that the project is progressing towards the intended result (see [Figure 4](#)). To promote the business innovation process based on data analytics, specific attention will be paid to small enterprises, entrepreneurs, and startups that want engaging in this field. This is important because, it helps to understand their, roles, their needs, the challenges they are dealing with, the business value they can generate, and their position in the innovation ecosystem. Thus, it is needed to address the existing need for theoretical and methodological frameworks, which build on the different elements that iterate in the construction of business innovation and account for its complexity and contextual dimensions ([Cajaiba-Santana, 2014](#)).

Big data offers great opportunities but requires significant upstream preparation. To guarantee the success of a project, it is

necessary to ask the key questions, find the right answers, and make the most of it. In order to decode the profit of big data, enterprises must continue to innovate and offer a broad popularization of the business changes linked to the advent of the company's digitization. Entrepreneurship is not a new concept by any means, but the way in which entrepreneurs function actually has undergone an astonishing transformation over the last decade.

An entrepreneurial leader has a reputation for being more agile and better at exploiting niche markets than its larger companies. Furthermore, despite constrained resources, they would seem to be ideally suited to take advantage of the opportunities that big data analytics would help identify.

Entrepreneurial in the age of big data, must rely on varied analytical approaches to thought and action to create and implement solutions that are socially, environmentally, and economically sustainable.

Being a data-driven entrepreneur means being at the heart of data valuing and intervene at all stages of the data chain: problem definition, data collection, preparation, modeling and solution creation. An entrepreneur made in data must know how to present and prioritize the results to be used. So, excellent communication skills are needed.

Also, formulate some business questions to develop a method is important, such as: Which sources they use? What data to collect? Why this data? To do what? What answers to expect? How much, should data be processed? Should we do analysis in real time or periodically?

If we take the example of Uber, often cited as a success of big data, the firm does not just capture huge amounts of data from the mobile application used by its drivers and clients. His triumph is based primarily on his ability to collect relevant data to connect clients and service providers. Who needs a car, and where? It is by focusing on these two data that Uber has managed to make taxis obsolete. Uber's case needed to know exactly where the potential clients were to automate the decision-making process when sending the drivers.

For the General Electric case and its software Predix Industrial Internet, the company seeks to know exactly when a machine will fail. The decisions related to the maintenance visit can thus be automated, and the mess related to outages has been removed. For insurers looking to reduce costs, it would be useful to know when a diabetic patient's blood sugar level is dangerously low, to automate intervention decisions and reduce the mess associated with mismanagement of a patient disease.

In Bhopal, India, the Panna Tiger Reserve is using drones (unmanned aerial vehicles) to safeguard against tiger poachers. The data collected has allowed them to improve the efficacy of their efforts and to prove the impact of their activities, thus encouraging greater support and funding for their initiatives.

Also, the Daniel Project, another successful example of using big data analytics, Intel's collaboration with Not Impossible Labs to 3D-print prosthetic arms for a 14-year old war victim. Intel's data competencies contributed significantly to the technological solution. The video of this initiative, shared on social media, captured the hearts and imaginations of consumers across the world and earned Intel more than a half-billion online impressions, an impressive quantification of the intrinsic value of social branding Pascaud (2015).

It is the case of several other examples that highlight the potential of big data for value creation and innovation. For this, small businesses and entrepreneurs must define the important steps to be taken towards this direction. If an entrepreneur knows how and where to look for the right data (smart data), if he can do this by analyzing a lot of information, everything is for the best. But, if he gets there by creating an application directly, it is even better.

It is clear that it is necessary to have a thorough reflection to see the essential elements that constitute the springs of the business activity. New analytics approach in big data age, combines predictive and prescriptive analytics to predict what will happen and how to make it happen. Analytics uses and applications improve the efficiency of the decision-making process and generate value. The difficulty of transforming big data into value or knowledge is related to its complexity, which is growing with the increase of its quantity its velocity and diversification of its types and sources ([Sedkaoui, 2017](#)).

Leveraging leading tools and techniques help to manage and extract relevant data from big data. Advanced analytics can range from historical reporting, through to real-time decision support for organizations based on future predictions.

As this chapter has mentioned it before, the future belongs to those who make their relentless approach to tracking data and making adjustments based on their findings. Because data has many things to tell but one must know how to make them talk, by considering algorithms (data analytics techniques) as a recipe, data as ingredients, while the computer (IT tools) is like a mixer that supports a lot of the difficult tasks of an algorithm. It revolves around data, as the digital revolution is continuing, and gives birth to a new concept, a concept made in data in the entrepreneurial world: "the data entrepreneur".

CONCLUSION

Since the seminal work of Schumpeter ([Schumpeter, 1934](#)), entrepreneurship has been regarded as a positive driving force for regional economic growth and development ([Birch, 1987](#); [Storey & Johnson, 1987](#); [Reynolds, 1987](#); [Acs & Armington, 2004](#)). [Low and MacMillan \(1988\)](#) emphasized that entrepreneurship is a process that can be undertaken in a variety of contexts. From this point of view, many studies have indeed stressed that contextual conditions, such as education, culture, social support systems, technology, and the presence of human capital, business context and expertise play an important role in the changing conditions for entrepreneurship ([Fischer & Nijkamp, 2009](#)).

At the same time, entrepreneurship is becoming more systematic and institutionalized than ever before. Entrepreneurs must develop a new entrepreneurial culture, adjusted to society and based on knowledge, innovation, and involvement of new methods and strategies in entrepreneurial projects. To enable the development of the entrepreneurship field its agenda needs comprehensive adjustments and refocusing on new areas and other factors shaping entrepreneurial ecosystems.

According to Peter Drucker (1970) and [K. Knight \(1967\)](#), Entrepreneurship is about taking a risk.

1. It is the process of creating new values that did not previously exist.
2. It is the practice of starting a new organization, especially new businesses.
3. It involves the creation of new wealth through the implementation of new concepts.

Entrepreneurship is an ancient concept that is both simple and complex at the same time. However, during the few last decades, there are new areas where entrepreneurship is becoming increasingly important. If we look on the history of our society, we will see that it is characterized by the stages of evolutionary change, such as "Agricultural Age", "Industrial Age", "Information Age", and "Technology or Knowledge Age".

At each stage of the development, people have existed, lived and worked together in order to advance the level of technology, improve living conditions, increase the economy, etc. During each age, the entrepreneur is facing many challenges. So, entrepreneurship is not a new concept, what is really 'new' is the way a business project is viewing and attacking by entrepreneurs in the last decade.

Now, many start-up companies are using data as the core enabler for their business and for many it is the fundamental value of their business behind the service they provide.

Big data marks a major turning point in the use of data and is a powerful vehicle for growth and profitability. A comprehensive understanding of a company's data, its potential, and the analytics methods can be a new vector for performance. Big data is a broad term generally referring to very large data collections that impose complications on analytics tools for harnessing and managing such.

Well-chosen and well-implemented methods for data collection and analysis are essential for better understand data. The rise of big data reflects the growing awareness of the 'power' behind data, and of the need to enhance gathering, exploitation, sharing and analyzing that data ([Sedkaoui & Monino, 2016](#)). Analytics applications will ensure the proper exploitation of the proliferating volumes of data for a variety of business purposes, involving not only production of simple data-driven insights on operations, but also a prediction of future trends and events.

Big data analytics has become an essential requisite to run most businesses. Though startups and young entrepreneurs, in many fields, might not spend much on big data but definitely need to research, study and follow the trend to take their ventures to heights. Integrating big data analytics can generate many advantages for the entrepreneurs, such as ([Sedkaoui, 2018a](#)):

- **Supporting Decision:** As mentioned before, entrepreneurs can make use of the vast amount of data relevant to their particular business. Therefore, they would need to filter the data according to their specific needs and derive meaning from the data that fits them the best. This will not only widen their understanding of their own domain but will also facilitate better decision making, which in turn will improve operational efficiencies.
- **Cost Reduction:** It has been found that big data can be extremely instrumental in augmenting the existing architectures of companies. Additionally, when more accurate decisions are taken, the possibility of incurring losses also gets alleviated. Therefore, with the correct use of analytics startups and entrepreneurs can be successful in cutting down their operational costs, which is typically one of the biggest challenges for every fresh venture.
- **Customer Insights:** The growth of any company depends on how to keep the preferences, likes, tastes ... of their customers into account to design their products and services. Big data analytics can help companies to gain access to the required and relevant information. For example, social media presents a great tool to acquire and assimilate enormous

volumes of customer insights and can be used effectively to collect data for this purpose.

- **Open Data Use:** Over the last year there has been an increase in the perceived use of open data by entrepreneurs to build new products and services. Open data, in addition to its potential economic, and creation of new activities also fall within a philosophical choice or ethics. They encrypt collective human behavior, and, therefore, also belong to those we measured these behaviors. The culture of this phenomenon builds on the availability of data to a communication orientation.

So, small businesses are now facing one of the most exciting and critical opportunities: the ability to analyze and value big data for business value creation. These data and the algorithms that can handle them, especially those of artificial intelligence - capable of self-learning - are of great interest to large companies in the technology sector. Their applications are indeed as numerous as they are crucial. For example, it becomes possible to quickly analyze large amounts of medical data, as IBM did with its Watson system. Or, companies have the opportunity to improve their products and make them evolve towards more interactivity as well as towards a more intuitive use, like "smartwatches" at Apple or personal assistants, such as Alexa and Echo at Amazon.

Every entrepreneur will be concerned by the arrival of new powerful tools able to master this previously unstructured data. Analytics widens small enterprises scope as an entity, giving them the ability of doing things they never thought were possible, for example, it offers timely insights, to allow them in making better decisions, about innovation opportunities, it also helps them in asking the right questions and supports them with extracting the right answers as well.

Whether if they understand the potential of big data or not, or if they want to embrace the analytical IT tools or not, build a career in data science or not. One thing is confirmed and cannot be avoided: big data analytics can fundamentally change the way the activities operate. In this context, an entrepreneur can see new opportunities, manage and increase opportunities, by putting the efforts in the right direction, and rationally using his time and energy.

The data revolution continues... And eventually, we will all become interesting by being "an entrepreneur made in data". And, if the *Harvard Business Review* has called the data scientist as "the sexy new job of the 21st century"; then data-driven entrepreneur, who can understand data and have a strong creative streak in order to ask the right questions to get significant value from data, will be the *fashionable* and the *chic* entrepreneur of the century in several domains. So, for entrepreneurs, or for those who want to undertake in the any business sector, for those who have a critical vision towards how generate value or the 'power' from data, prepare yourself to the data revolution age: the age where many underlying messages can be transformed into opportunities in order to help in addressing business challenges.

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KEY TERMS AND DEFINITIONS

Algorithm:

A set of computational rules to be followed to solve a mathematical problem. More recently, the term has been adopted to refer to a process to be followed, often by a computer.

Analytics:

Has emerged as a catch-all term for a variety of different business intelligence (BI) and application-related initiatives. For some, it is the process of analyzing information from a particular domain, such as Website analytics. For others, it is applying the breadth of BI capabilities to a specific content area (for example, sales, service, supply chain, and so on). In particular, BI vendors use the "analytics" moniker to differentiate their products from the competition. Increasingly, "analytics" is used to describe statistical and mathematical data analysis that clusters, segments, scores and predicts what scenarios are most likely to happen. Whatever the use cases, "analytics" has moved deeper into the business vernacular. Analytics has garnered a burgeoning interest from business and IT professionals looking to exploit huge mounds of internally generated and externally available data.

Artificial Intelligence:

The theory and development of computer systems able to perform tasks that traditionally have required human

intelligence.

Big Data:

A generic term that designates the massive volume of data that is generated by the increasing use of digital tools and information systems. The term big data is used when the amount of data that an organization has to manage reaches a critical volume that requires new technological approaches in terms of storage, processing, and usage. Volume, velocity, and variety are usually the three criteria used to qualify a database as "big data."

Data Analysis:

This is a class of statistical methods that make it possible to process a very large volume of data and identify the most interesting aspects of its structure. Some methods help to extract relations between different sets of data, and thus, draw statistical information that makes it possible to describe the most important information contained in the data in the most succinct manner possible. Other techniques make it possible to group data in order to identify its common denominators clearly, and thereby understand them better.

Entrepreneur:

Entrepreneurship is not only an outcome of the ecosystem but also an important input factor since entrepreneurs drive the ecosystem by creating it and keeping it healthy. Drucker believes that what entrepreneurs have in common is not personality traits but a commitment to innovation. For innovation, the entrepreneur must have not only talent, ingenuity, and knowledge but he must also be hardworking, focused and purposeful.

Entrepreneurial:

A process, in which opportunities for creating new goods and services are explored, evaluated, and exploited.

Entrepreneurial Activity:

Entrepreneurial activity, as an output of the entrepreneurial ecosystem, is considered the process by which individuals create opportunities for innovation. This innovation will eventually lead to a new value in society and this is, therefore, the ultimate outcome of an entrepreneurial ecosystem while entrepreneurial activity is a more intermediary output of the system. This entrepreneurial activity has many manifestations, such as innovative start-ups, high-growth start-ups, and entrepreneurial employees.

Knowledge:

It is a type of know-how that makes it possible to transform information into instructions. Knowledge can either be obtained through transmission from those who possess it, or by extraction from experience.

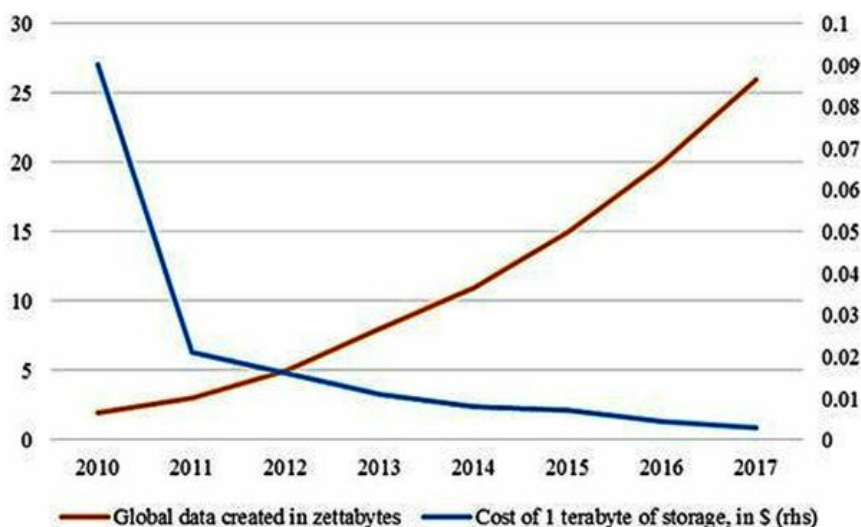
Machine Learning:

A method of designing a sequence of actions to solve a problem that optimizes automatically through experience and with limited or no human intervention.

Startups:

The first thing that is associated with entrepreneurship is startups. It is necessary to establish its definition in order for it to be used later on in this study. A startup is a human institution designed to create a new product or service under conditions of extreme uncertainty. A startup is also considered as an organization formed to search for a repeatable and scalable business model. The term scalable suggests that the aim of every startup is to grow (and, consequently, to stop being a startup) and into mature to a fully functional company: to an SME.

APPENDIX: COSTS OF STORAGE AND DATA AVAILABILITY (2009-2017)



Source: Reinsel, Gantz and Rydning (2017); Klein (2017)

Figure 5: Costs of storage and data