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Big data in Morocco's transport and logistics sector

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Abstract- Big data is revolutionizing many fields of business, and logistics analytics is one of them, In this article, we aim to establish the level of use of big data in the transport and logistics sector in Morocco, we will define in a first place the concept of big data and its emergence, then we will try to illustrate the positioning of Morocco in this area, we will return after the results of a study conducted among logistics and transport operators in Morocco about the adoption of big data.

Keywords – Big Data, Logistics, Transport, Morocco

I. INTRODUCTION

The world we live in is constantly changing, and one of the fundamental drivers of this change is information. Today, information and communication technology offers us several opportunities and alternatives that shape the way we see and do things. These technologies are made up of all the devices put in place to collect, transmit, exchange, store and process information. They allow faster processing in very short intervals of time, to travel through time and space by transmitting messages almost instantaneously between distant interlocutors (servers), and to memorize a virtually unlimited accumulation of data.

Big Data basically refers to the fact that we can now collect and analyze data in ways that was simply impossible even a few years ago. There are two things that are fueling this Big Data movement: the fact we have more data on anything and our improved ability to store and analyze any data.

Everything we do in our increasingly digitized world leaves a data trail. This means the amount of data available is literally exploding.

Big Data creates a new type of digital divide. Having access and knowledge of Big Data technologies gives companies and people a competitive edge in today's data driven world.

Big data is revolutionizing many fields of business, and logistics analytics is one of them. The complex and dynamic nature of logistics, along with the reliance on many moving parts that can create bottlenecks at any point in the supply chain, make logistics a perfect use case for big data. For example, big data logistics can be used to optimize routing, to streamline factory functions, and to give transparency to the entire supply chain, for the benefit of both logistics and shipping companies alike.

In this article, we aim to establish the level of use of big data in the transport and logistics sector in Morocco, we will define in a first place the concept of big data and its emergence, then we will try to illustrate the positioning of Morocco in this area, we will return after the results of a study conducted among logistics and transport operators in Morocco about the adoption of big data.

The rest of the paper is organized as follows. We will locate and define the emergence of big data, we will detect the main attributes of big data, and then we will elucidate its main challenges, and its use in the transport and logistics industry. We will then reproduce and analyze the results of a study of 116 companies operating in the logistics and transport sector in Morocco in order to define their level of use.

II. THE EMERGENCE OF BIG DATA

A. Definition and birth of Big Data:

The definition of big data is data that contains greater variety, arriving in increasing volumes and with more velocity. This is also known as the three Vs.

Put simply, big data is larger, more complex data sets, especially from new data sources. These data sets are so voluminous that traditional data processing software just can't manage them. But these massive volumes of data can be used to address business problems you wouldn't have been able to tackle before.[1]

As inconceivable as it may seem today, the Apollo Guidance Computer guided the first spacecraft to the Moon with less than 80 kilobytes of memory. Technology has since developed at a breakneck pace, as has data generation. Global data storage capacity has doubled every three years since the 1980s. When Apollo 11 took off just over 50 years ago, the amount of digital data generated worldwide could have been stored on a standard laptop. Today, International Data Corporation estimates that this figure amounts to 44 zettabytes (44 trillion gigabytes) and will reach 163 zettabytes by 2025.[2]

In fact, the earliest records of using data to track and control businesses date back from 7.000 years ago when accounting was introduced in Mesopotamia in order to record the growth of crops and herds. In 2005 Roger Mougalas from O'Reilly Media coined the term Big Data for the first time, only a year after they created the term Web 2.0. It refers to a large set of data that is almost impossible to manage and process using traditional business intelligence tools.[3]

B. The tree Vs of Big Data: :

Volume:

The volume presents the most immediate challenge to conventional IT structures. It calls for scalable storage, and a distributed approach to querying. Many companies already have large amounts of archived data, perhaps in the form of logs, but not the capacity to process it.

Assuming that the volumes of data are larger than those conventional relational database infrastructures can cope with, processing options break down broadly into a choice between massively parallel processing architectures — data warehouses or databases.[4]

People are more connected than ever before, and this interconnection leads to more and more data sources, resulting in an amount of data that is larger than ever before (and constantly growing). The increased volume of data requires ever increasing computing power in order to derive value (meaning) from the data. Traditional computing methods simply don't work on the volume of data accumulating today.

Velocity:

The speed and directions from which data come into the enterprise is increasing due to interconnection and advances in network technology, so it is coming in faster than we can make sense out of it . And the faster the data come in and more varied the sources, the harder it is to derive value (meaning) from the data. Traditional computing methods don't work on data coming in at today's speeds.[5]

[1] Oracle : Qu'est-ce que le big data ? : https://www.oracle.com/fr/big-data/definition-big-data.html
[2] SAP : Qu'est-ce que le Big Data ?: https://www.sap.com/france/insights/what-is-big-data.html
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Variety:

Datasets containing only structured data do not necessarily fall under Big Data, regardless of their size. Big Data typically includes structured, unstructured and semi-structured data combinations. Traditional databases and data management solutions lack the flexibility and scope to manage the complex and disparate datasets that compose Big Data.[6]

C. Big Data Challenges:[7]

The understanding of Big Data is very important. In order to determine the best strategy for a company it is essential that the data that you are counting on must be properly analyzed. Also the time span of this analysis is important because some of them need to be performed very frequent in order to determine fast any change in the business environment.

Another aspect is represented by the new technologies that are developed every day. Considering the fact that Big Data is new to the organizations nowadays, it is necessary for these organizations to learn how to use the new developed technologies as soon as they are on the market. This is an important aspect that is going to bring competitive advantage to a business.

The need for IT specialists it is also a challenge for Big Data. According to McKinsey's study on Big Data called Big Data: The next frontier for innovation, there is a need for up to 190,000 more workers with analytical expertise and 1.5 million more data literate managers only in the United States. This statistics are a proof that in order for a company to take the Big Data initiative has to either hire experts or train existing employees on the new field.

Privacy and Security are also important challenges for Big Data. Because Big Data consists in a large amount of complex data, it is very difficult for a company to sort this data on privacy levels and apply the according security. In addition many of the companies nowadays are doing business cross countries and continents and the differences in privacy laws are considerable and have to be taken into consideration when starting the Big Data initiative. In our opinion for an organization to get competitive advantage from the manipulation of Big Data it has to take very good care of all factors when implementing it. One option of developing a Big Data strategy is presented below. In addition, in order to bring full capabilities to Big Data each company has to take into consideration its own typical business characteristics.

II. THE USE OF BIG DATA IN TRANSPORT AND LOGISTICS:

A. Big Data in transport:

Between cost pressure and customer orientation, transportation companies cannot afford to lose sight of customer needs and must continue to provide them with high-quality services. The digital transformation and the utilization of big data technologies provides transportation companies the opportunity to cut costs while strengthening their customer bases by analyzing historic data.

According to Lufthansa industry solutions, Big Data could help transportation companies Optimizing operating procedures and cutting costs, in the way Big data analytics help the transportation sector to predict volumes as precisely as possible. It can also help this companies.

The introduction of big data and smart technologies has resulted in many positive changes for the transportation sector. Operational efficiency and flexibility have increased, fuel consumption has been reduced, and customer experiences have drastically improved. Big data also helps with improving safety in transportation.

Data sensors in fleet vehicles provide real-time information about their performance. They provide accurate data of vehicles' travel speeds, the time spent in transit and how long they are idle for. Sensors also monitor the health of the equipment and the entire engine. This allows for prediction of errors and timely preparations for maintenance.

[6] SAP : Qu'est-ce que le Big Data ?: https://www.sap.com/france/insights/what-is-big-data.html

[7] Database Systems Journal vol. III, no. 4/2012 :Perspectives on Big Data and Big Data Analytics page 5.

Providing real-time information such as traffic jams, as well as weather and road conditions, big data helps in maintaining high safety levels. When you add the information about delivery addresses and the locations of fueling stations, you get a system that dramatically increases efficiency.

There are numerous benefits to properly using big data. Forecasting in terms of delivery time, weather and driver characteristics is a huge benefit in itself. The ability to efficiently manage inventory is another time saver and cost saver. Being able to predict capacity availability, in real-time, brings a lot of opportunities for transportation companies.

Optimal routing and information on weather and traffic congestion makes transportation management a lot easier. Reduction in driver turnover, driver assignment, and using sentiment data analysis simplifies human resources management. The ability to predict future events helps to avoid any unpleasant surprises.[8]

According to Samsung, tomorrow, the trucks will be full of sensors to bring up vast amounts of information at the company's headquarters. Equipped with steering assistance tools, vehicles will be able to adapt their speed and engine speed to optimize their movements at a lower cost. Drivers will be equipped with communicative watches to monitor their movements and fitness. Self-diagnosis tools will help locate the wear and tear of the truck's organs and schedule technical visits at the right time. This logic will be pushed far beyond the cabin. Beyond the carriers, logistics players will also have to get up to speed by integrating the multiplicity of available modes of transport to optimize their costs. To do this, they will need tools capable of defining, at an M moment, the best "transportation mix" - road, rail, air, sea - for a given commodity. The data is available, remains to organize their sharing and a common exchange format. Companies are already preparing the ground for this major transition.[9]

B. Big Data in logistics:

Companies are learning to turn large-scale quantities of data into competitive advantage. Their precise forecasting of market demand, radical customization of services, and entirely new business models demonstrate exploitation of their previously untapped data.

As today's best practices touch many vertical markets, it is reasonable to predict that Big Data will also become a disruptive trend in the logistics industry. However, the application of Big Data analytics is not immediately obvious in this sector. The particularities of the logistics business must be thoroughly examined first in order to discover valuable use cases.

A kick-start for discussion of how to apply Big Data is to look at creating and consuming information. In the logistics industry, Big Data analytics can provide competitive advantage because of five distinct properties. These five properties highlight where Big Data can be most effectively applied in the logistics industry:[10]

Optimization to the core: Optimization of service properties like delivery time, resource utilization, and geographical coverage is an inherent challenge of logistics, large-scale logistics operations require data to run efficiently. The earlier this information is available and the more precise the information is, the better the optimization results will become , advanced predictive techniques and real-time processing promise to provide a new quality in capacity forecast and resource control.

Tangible goods, tangible customers : The delivery of tangible goods requires a direct customer interaction at pickup and delivery , on a global scale, millions of customer touch points a day create an opportunity for market intelligence, product feedback or even demographics, big Data concepts provide versatile analytic means in order to generate valuable insight on consumer sentiment and product quality.

In sync with customer business : Modern logistics solutions seamlessly integrate into production and distribution processes in various industries, the tight level of integration with customer operations let logistics providers feel the heartbeat of individual businesses, vertical markets, or regions, the application of analytic methodology to this comprehensive knowledge reveals supply chain risks and provides resilience against disruptions.

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[8] Robins consulting : WHY BIG DATA IS SO IMPORTANT TO THE TRANSPORTATION INDUSTRY : https://www.robinsconsulting.com/why-big-data-is-so-important/#:~:text=Big%20data%20helps%20them%20foresee,provide%20all%20the%20necessary%20data.

[9] Samsung : Le Transport routier dans l'ère du Big Data. : https://www.samsung.com/fr/business/insights/news/big-data-and-road-transport/

[10] DHL : BIG DATA IN LOGISTICS, A DHL perspective on how to move beyond the hype page 15.

A network of information: The transport and delivery network is a high-resolution data source, apart from using data for optimizing the network itself, network data may provide valuable insight on the global flow of goods, the power and diversity of Big Data analytics moves the level of observation to a microeconomic viewpoint.

Global coverage, local presence : A fleet of vehicles moving across the country to automatically collect local information along the transport routes, processing this huge stream of data originating from a large delivery fleet creates a valuable zoom display for demographic, environmental, and traffic statistics.

III. THE USE OF BIG DATA IN TRANSPORT AND LOGISTICS:

In a study started in March 2021 with 116 companies operating in the transport and logistics sector in Morocco, we tried to decipher the level of adoption of big data in those companies we choose a multiple choice survey, based on the Likert scale developed by Rensis Likert. The repair of 116 companies studied by type is:

- Carrier: 38 answers.
- 3PL: 51 answers.
- Logistician: 19 answers.
- Customs broker: 8 answers.
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A. The use of digital solutions internally and externally :

Table -1 Survey result:

Affirmation	***Totally agree***	***Agree***	***Neutral***	***Desagree***	***Totally desagree***
In my company, we rely on the use of digital solutions to produce, manage and spread data internally and externally.	52	47	9	6	2

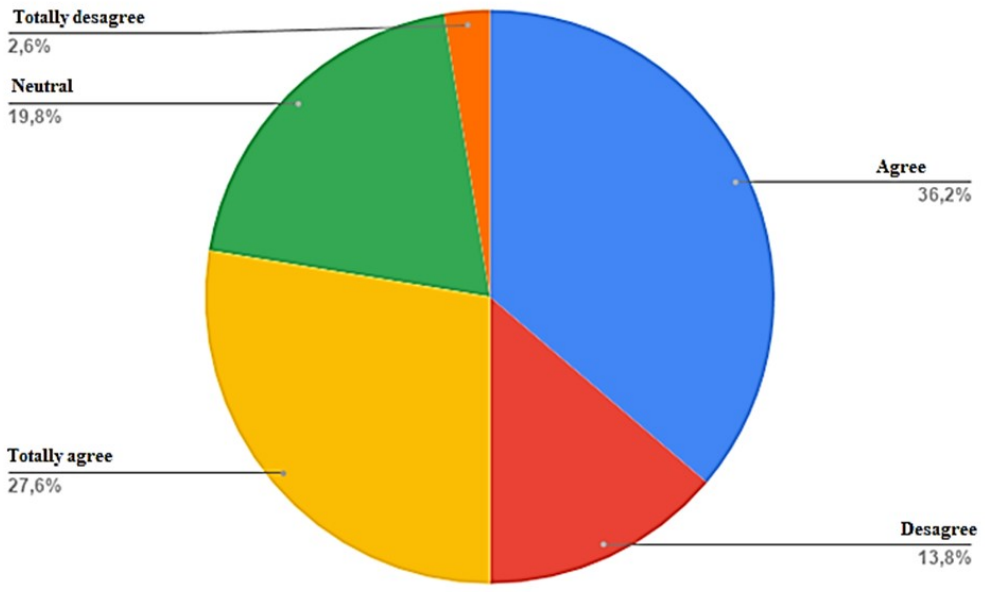

Figure 1. Scale of use of digital solutions internally and externally in pourcentage

The first affirmation shared with the audience allowed us to situate the level of use of digital tools in intra-company and inter-company communication. The goal of computerized or digital logistics is to provide the right information, in the right format, in the right place at the right time for the right people in a customer demand approach.

The excellence of logistic information in today's agile industrial scenario has become a tactical and strategic concern. Another indicator other than those shown in the diagram below that we can remember when canvassing, is the absence of partial or total disagreement for the logistician and transitory types auditioned, while the type carriers show a disagreement percentage of 13.2% and a total disagreement of 5.3%, while 3PL companies shows only a disagreement of 2%.

B. Sensitivity of logistics and transport team members to digitalization :

Table -2 Survey result:

Affirmation	***Totally agree***	***Agree***	***Neutral***	***Desagree***	***Totally desagree***
In my company, the members of the logistics and transport team have a strong sensitivity to digitalization.	***32***	***42***	***23***	***16***	***3***

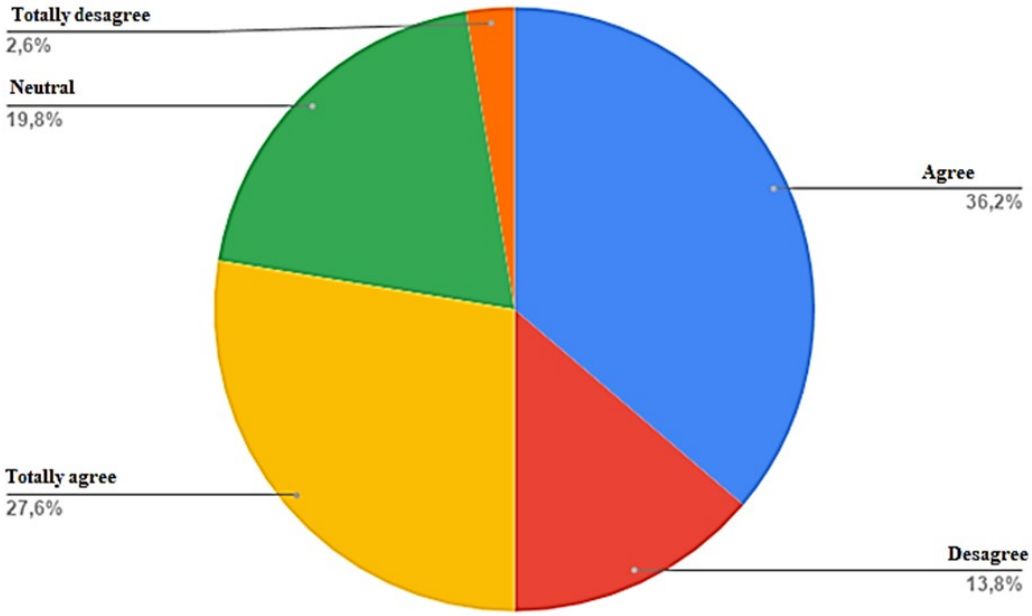

Figure 2. Scale of sensitivity of logistics and transport team members to digitalization

The second point is to know the strength of companies' ability to react to the excitements due to digitalization: changing processes, using new resources... In the audience studied, the logistician type has the highest percentage of absolute agreement at 42.1%. Neutrality is important because it reaches almost 20% of the total audience of all types, rates vary from 26.3% among logisticians, 25% among customs brokers, and 18.4% among carriers, while the lowest neutrality rate is shown among 3PL firms with 17.6%.

C. Level of use of Big Data :

Table -3 Survey result:

Technology	*Not started*	*Developing*	*Basic*	*Intermediary*	*Advanced*
Big Data	***40***	***14***	***31***	***19***	***12***

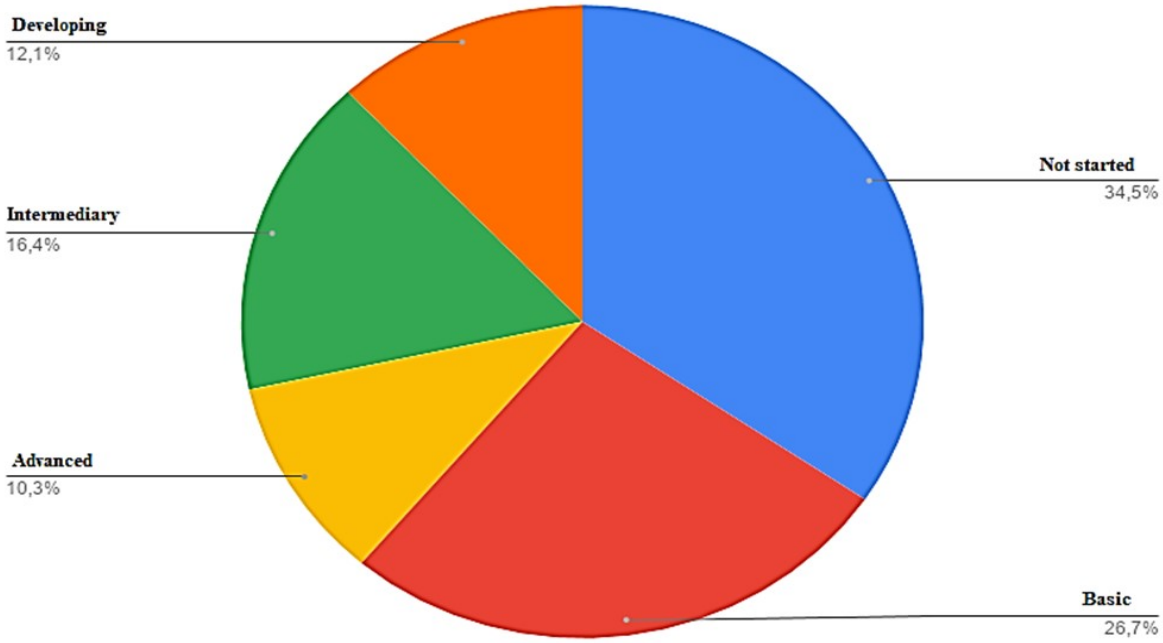

Figure 3. Scale of sensitivity of Big Data

The table below traces the choice of response by level of use of technologies on which a big data approach is based dedicated to a logistics environment. The levels of usage shared with the audience were as follows: not started, developing, basic, intermediate, and advanced. For each level of use, we gave a score:

Table 4 – Level of use scoring

Level of use	**Score**
Not started	0 point
Developing	1 point
Basic	2 points
Intermediate	3 points
Advanced	4 points

The maximum score for each adoption level is as follows:

Table 5 – maximum score per level

Level of use	Maximum score
Not started	116 x 0 = 0
developing	116 x 1 = 116
Basic	116 x 2 = 232
Intermediate	116 x 3 = 348
Advanced	116 x 4 = 464

We got this result on the basis of the answers:

Table 6 – scoring results

Level of use	Score
Not started	40 x 0= 0
developing	14 x 1 = 14
Basic	31 x 2 = 62
Intermediate	19 x 3 = 57
Advanced	12 x 4 = 48

Total score is: 181 points

The score positions big data in a global approach between a level of adoption in development and a basic level of adoption, we can relate that Big Data in the transport and logistics sector in Morocco after the census of 116 companies operating in this sector is basic up to 78.02%

IV.CONCLUSION

With the rise of Internet and Wi-Fi networks, the banalization of mobile devices, the boom of social networks, the opening to the public of certain "Open Data" databases or the development of major international scientific projects, the phenomenon of "Big Data" is growing. The large volumes of data generated daily represent such an economic, industrial and scientific challenge that countries and companies are increasingly investing in Big Data. Several global surveys have shown that companies that rely on data analytics to develop their strategy increase productivity levels, improve their planning and forecasting processes, and increase knowledge and control of their business. In this article we presented the fundamental concepts of Big Data.

These concepts first include some elements of defining the phenomenon and its challenges. Then we reported the level of use of BIG data in Morocco which turns out to be basic. Remember that in 2021, Morocco sees big for data centers. Indeed, the Mohammed VI Polytechnic University of Benguerir proceeded in February 2021 to the inauguration of its new Data Center housing the most powerful "supercomputing" in Africa (African Supercomputing Center). This is a very important step for the Kingdom in this area that will enable UM6P to put itself at the service of the national digital ecosystem in order to help the digital sovereignty of the Kingdom and to develop new digital services 100% Moroccan. Located in the heart of the green city of Benguerir and spread over an area of 2,000 m2, his

Data Center will elevate the capacity of scientific experimentation and thus allow greater control of the massive data collected.11

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