Integration of big data in small and medium organizations: Business intelligence and cloud computing

J A Camargo-Perez¹, A M Puentes-Velasquez¹, and A L Sanchez-Perilla¹
¹ Grupo de Investigación en Tecnología y Desarrollo en Ingenierías, Universidad Francisco de Paula Santander, Seccional Ocaña, Colombia
E-mail: jacamargop@ufpso.edu.co, ampuentesv@ufpso.edu.co

Abstract. Although it is well known, organizations are becoming increasingly concerned about how they make use of information and thus obtain the greatest benefit from it for competitive purposes and continuous improvement in a globalized world of constant change, large volumes of data produced by organizations turn out to be a key element in decision-making for productive purposes, the multinationals already do it, why not integrate it into small and medium-sized companies? Today small and medium enterprises are still making decisions based on intuition, which do not take into account the information, intuition in most cases does not work as a good guide for decision making, in small and medium enterprises bosses or owners of these manage their companies more by the experience acquired through the years that often do not take into account the technological advances that are being developed to improve their processes.

1. Introduction
When thinking of Big data, it is necessary to know that currently the information age lives in, with a mobile phone in every pocket, a laptop in every backpack and large technology systems operating daily sending data and data every second, it is clear that the world has more data than ever, but that's not all, because every day grows even more. A clear example of this is the sloan digital sky survey telescope built in 2000 in New Mexico. During the first few weeks this telescope collected more information that had accumulated throughout the history of astronomy, but this is just a small example of the great flood that we suffer today. Thanks to this Big data it is revolutionizing the world, organizations, people and technology [1].

One of the most comprehensive approaches to big data is provided by Gartner: They are information assets characterized by high volume, velocity and variety, which demand innovative and efficient processing solutions for improving knowledge and decision making in organizations [1].

The XXI century has brought many changes, and companies or organizations should be aware that these changes can affect them directly or indirectly, in terms of technology development and applications of them in organizational processes, companies must adapt to these to survive in time, otherwise they will be destined to failure.

The globalization of world economies is a major challenge for the local industry and the manufacturing sector is pushing its next transformation: predictive manufacture. To be more competitive, manufacturers must adopt emerging technologies such as advanced analysis and cyber-physical systems-based approaches to improve their efficiency and productivity. With an aggressive push towards "Internet of things", data have become more affordable and malleable, contributing to big
data environment. This phenomenon requires focus and the right tools to turn data into useful information [2].

Small and medium enterprises (SMEs) are characterized by making decisions based on incomplete information and predictions; however, the incorporation of quality data could significantly improve their levels of innovation and competitiveness. Particularly in Argentina, SMEs represent 96% of the country's enterprises and generate 60% of jobs created by the private sector. Although these indicators have experienced loss of productivity before the big company during 2004 and 2014, which could be improved with innovation and technology [3].

2. State of the art
With the boom of the internet that is positioned in the 90s has been emerging new technological discoveries that have made mankind depends on these to carry out their daily activities, in recent years the amount of data generated by humanity has exceeded data generated in history, following this arises the need for storage space that corresponds to the needs of each user and a way to analyze these data accurate, fast and reliable for making decisions in the object study of such data [4].

Benefit large multinationals make use of technologies to contribute to its growth, this is translated into the power to compete with other companies using strategies for coping with globalization; large companies are very important in the economy, but the fact is that small and medium-sized organizations are the main driver.

Managers and/or executives need to make effective decisions transforming raw data into valuable information as shown in the organizational knowing cycle (sense making, decision making, knowledge creation). Empirical research showed that the display data is a facilitator of this process, particularly given their graphical representations which facilitate interpretation, the exchange and transfer data. Moreover, in a competitive and dynamic environment in which businesses operate under study, the impact of these tools is in saving costs and time and this allows identification of errors [5].

2.1. Big data

Big data is a large-sized and complex dataset, which cannot be managed using traditional data processing tools [6]. Big data analysis enables analysts, researchers and commercial users to make better, faster decisions using data that were previously inaccessible or unusable. By using advanced analysis techniques such as text analysis, machine learning, predictive analytics, data mining, statistics and natural language processing, companies can analyze data sources to obtain new knowledge to make better and faster decisions. Continuing with we will reflect the 4 main features present in big data: Volume, Velocity variety and value.

2.1.1. Volume. The volume refers to the large amount of data used for analysis, it is probably the best known and prominent feature.

2.1.2. Speed. This feature reflects the speed at which data flows.

2.1.3. Variety. It refers to the variety of different types of data that can be analyzed.

2.2. Business intelligence

Business intelligence (BI) is often used as a general term for systems of decision support (DSS) large-scale organizations. BI is currently the largest area of investment in information technology organizations and has been rated as the leading technology priority for CIOs around the world for many years. Patterns of major use in decision support are related to the type of decision that should be supported and the type of manager who makes the decision [7].

BI is "both a process and a product" The process consists of methods that organizations use to develop useful information or intelligence that can help organizations survive and thrive. The product is information that will enable organizations to predict the behavior of their "competitors, suppliers,
customers, technologies, acquisitions, markets, products and services and the general business environment" with some degree of certainty [8].

Globalization has forced organizations to penetrate ever with the use of new technologies and markets have become increasingly competitive despite the decision made from the most important asset of companies has become a weapon of continuous improvement.

Business intelligence today is being increasingly adopted by organizations because of the need for senior management to have information and its importance at the strategic level in decision-making [9]. Predictive analysis is used today from the use of specialized software which can generate certainty when making decisions, decisions are taken in reality but not in intuition.

Traditional BI systems offer tools for structuring and storing data in a data warehouse, in which the data are modeled with a multidimensional model that represents the axis of analysis. Key performance indicators can be calculated from this model and restored the user in a static control panel [10].

2.3. Cloud computing
Cloud computing is a state of the art technology that offers computing resources to organizations and educational institutions through the Internet. Cloud computing services such as google apps, the Microsoft education cloud, amazon web services and the IBM cloud academy help universities facilitate teaching, learning, researching and other development activities [11].

Cloud computing is a term that has a place in any field whether educational, business, political, economic, because it is flexible and scalable to meet any need and for storage, sending and receiving information, and communication among others.

Cloud computing introduces new capabilities for organizations such as cost efficiency, scalability, access to global markets, ease of use, flexibility and rapid adaptation capacity to environmental changes. Cloud computing provides an important role in innovation and organizational agility. Despite the great opportunities that this technology offers the organization, in many organizations, especially in developing countries, the adoption and migration rate is low. A major problem is that in previous studies of cloud computing adoption, limited aspects have been taken into account [12].

The adoption of cloud computing is worrying as many organizations are still unaware of this type of technological tools, either due to their lack of knowledge, resistance to change or fear that in order to apply these technologies they need big investments.

3. Methodology
This research is based on a qualitative method, since the objective is more oriented to describe and interpret than to measure, from this perspective, the first part of this study is defined as documentary since it consists of a description of the trends current data management technology and storage for the purpose of supporting companies, in order to achieve the objectives of the research, it began with a review of the literature on big data, business intelligence and cloud computing. The Scopus, Science Direct, Dialnet, IEEE Computer Society and Google Academic databases were consulted.

4. Integration of big data in small and medium organizations
The use of Big data techniques is already extended and matured at the business level, it is common knowledge that large companies profit by using this type of techniques in their data analysis to support decision-making and try to better understand their consumer and their environment [13].

An SME does not have the capacity to address a traditional Big data project, but there are many companies that are presenting services based on big data that can be useful to SMEs. The cost of these services is affordable by many SMEs and they should only worry about what type of service they need and what information is relevant to their business [14].

The best solution for an approach to data analytics for SMEs are cloud services because they are services that do not require large investments, most of them no initial outlay, and rates that do not involve a large expense for the company. These services include proposals made by large companies such as IBM and its Watson Analytics product, as well as services offered by small and medium-sized
companies that specialize in data processing and use big data to offer their services to other companies [14].

4.1. Big data services for Small and medium enterprises
There are multiple platforms in the cloud available to small and medium enterprises which can be acquired at low cost, obtaining excellent results, among the most important, some platforms that offer these services are:

4.1.1. Google analytics. Is a web analytics tool provided by google as a means for customers to track user events and demographics. The primary aim of this tool is to track how users interact with the webpage as a whole and how that interaction relates to other pages [15].

4.1.2. International business machines watson analytics. Natural language understanding, a cloud-based service provided by watson, offers a suite of natural language processing (NLP) capabilities that allow the user to extract key metadata from the text, including entities, relations, concepts, sentiment, and emotion [16].

4.1.3. Kompyte. It is designed to know the online strategies of the competitors in real time and respond to them in an easy, fast and affordable way for any company or business.

4.1.4. Sumall. It is a website that allows companies to take control of their own data. SumAll is a business information management service that tracks and consolidates information about the business. The great challenge for SMEs to benefit from big data analysis techniques is to know the different tools and methods that best suit the business, the potential of their employees and, above all, their data and the type of study who want to perform [13].

Data analytics consists about extracting information from the available data, because of this the most important thing is to have data and the more reliable the better. Therefore, the SME must register and store the data of its operations in order to analyze them together with the data that can be obtained from external sources such as social networks, sensors, etc. It is useless to keep track of the reputation of the company and its products on social networks or changes in sales trends if there is not a registration of the actions that may have caused the changes in these parameters. If it is not possible to relate the causes to the effects it is hard to extract a valid knowledge that allows to improve the processes and relationships with clients and avoid making mistakes that it has made previously. This is a costly task and not present in the current culture of many SMEs, but what can not be measured can hardly be analyzed and without analysis there is no possibility of extracting knowledge, so management should be supported in tools that facilitate this task [14].

To obtain real value of the business in big data, it is essential to use the appropriate tools to manage a wide and varied mass of data and have the ability to analyze them within the context of the companies.

5. Findings
The use of big data, business intelligence and cloud computing is not limited simply to large organizations that produce millions of data, nowadays it is possible to integrate and adapt technologies to the needs of SMEs, according to the review carried out, robust technologies offered by technology giants like IBM Watson Analytics that automates predictive analytics and facilitates the creation of dashboards and infographics at the service of any type of company.

6. Conclusions
Within the review carried out, it was concluded that small and medium-sized companies do not have the capacity to face and deal with a big data project that is handled in a traditional manner, but there are countless companies that provide services framed in big data, offering cloud tools that provide new opportunities for continuous improvement in SMEs.
These services in Big data are a reliable way to use BI contributing to continuous improvement and scalability in a globalized and increasingly connected world that make the economy a wide area in which it is possible to walk safely from the use of the new tools.

Finally, that which can not be measured will be difficult to analyze and without this analysis the idea of carrying out the extraction of knowledge is complex, in this sense it is embarrassing to be able to carry out an analysis of information in organizations that have not adopted yet technological tools and that base their decisions on uncertainty.

References
[1] López García D 2013 Análisis de las posibilidades de uso de Big Data en las organizaciones (España: Universidad de Cantabria)
[2] Lee J, Lapira E, Bagheri B and Kao H 2013 Recent advances and trends in predictive manufacturing systems in big data environment Manufacturing Letters 1 38–41
[3] Tovar C 2017 investigación sobre la aplicación de business intelligence en la gestión de las pymes de Argentina (Buenos Aires: Fundación Universidad de Palermo)
[4] Duquino Sabogal M O 2018 big data a través del cloud computing en los negocios (Bogota: Universidad Libre de Colombia)
[5] Cremona L, Ravarini A and Brocke J Vom 2019 Visualizing big data: The impact on sense-making and decision-making Organizing for the Digital World 28 23–31
[6] Abdel-Basset M, Mohamed M, Smarandache f, Chang V 2018 Neutrosophic association rule mining algorithm for big data Analysis Symmetry 10(4) 106
[7] Arnott D, Lizama F and Song Y 2017 Patterns of business intelligence systems use in organizations Decision Support System 97 58–68
[8] Caseiro N and Coelho A 2018 The influence of Business Intelligence capacity, network learning and innovativeness on startups performance Journal of Innovation & Knowledge 4(3) 139-145
[9] Garcete A, Benítez R, Pinto-Roa D and Vázquez A 2017 Técnica de pronóstico de la demanda basada en business intelligence y machine learning Simposio Argentino Sobre Tecnologia y Sociedad (STS)-JAIIO 46 (Cordoba) vol. 46 (Argentina: Universidad Nacional de la Plata)
[10] Auffaure M A, Chiky R, Curé O, Khrouf H and Kepeklian G 2016 From Business Intelligence to semantic data stream management Future Generation Computer System 63 100–107
[11] Almazroa A A, Shen H and Mohammed F 2019 The impact of trust on the adoption of cloud computing services by university students Recent Trends in Data Science and Soft Computing IRICT 2018 (Kuala Lumpur) vol. 843 (Switzerland: Springer) pp 902–911
[12] Bazi R, Hassanzadeh H, Moeini A, 2017 A comprehensive framework for cloud computing migration using meta-synthesis approach Journal of Systems and Software 128 87-105
[13] Puerta Sánchez M 2017 Trabajo fin de grado estudio de las posibilidades del uso de técnicas de análisis de big data para pymes (España: Universidad de Jaén)
[14] Sirera Martínez A 2015 Estudio sobre uso de Big Data en pymes (España: Universitat Oberta de Catalunya)
[15] Dyer A 2018 Sight. js: Data analytics in splunk (EEUU: Woncester Polytechnic Institute)
[16] Vasarhelyi M A 2018 Embracing textual data analytics in auditing with deep learning The International Journal of Digital Accounting Research 18 49-67