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SHORT COMMUNICATION

Digital transformation in SMEs: challenges and potential in the data age

Transformación digital en PyMEs: desafíos y potencial en la era del dato

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ABSTRACT

The study investigated the degree of knowledge and use of Big Data and Artificial Intelligence (AI) tools in small and medium-sized enterprises (SMEs) in the province of Córdoba. It analysed how the fourth industrial revolution transformed business models through the integration of new technologies, highlighting that the speed of adoption was decisive. It was observed that many SMEs mistakenly assumed that these tools were reserved for large companies, without considering the hidden value in the data they already generated. The work identified that Big Data allowed massive information to be processed in real time, improving customer service, logistics, and personalisation of services, as was the case of companies such as Netflix, Amazon and Tesla. The analysis revealed that while 75 % of SMEs considered technology incorporation important, only 32 % really understood AI and 34 % were aware of Big Data. The main barriers included lack of investment and the need for training of human talent. Finally, it was concluded that SMEs had to understand that the strategic use of data did not depend on the size of the company, but on their ability to connect and leverage the available information, which represented a decisive opportunity for their sustainability and competitiveness.

Keywords: Big Data; Artificial Intelligence; SMEs; Digital Transformation; Competitiveness.

RESUMEN

El estudio investigó el grado de conocimiento y uso de herramientas de Big Data e Inteligencia Artificial (IA) en las pequeñas y medianas empresas (PyMEs) de la provincia de Córdoba. Analizó cómo la cuarta revolución industrial transformó los modelos de negocios mediante la integración de nuevas tecnologías, destacando que la velocidad de adopción fue determinante. Se observó que muchas PyMEs asumieron erróneamente que estas herramientas estaban reservadas para grandes empresas, sin considerar el valor oculto en los datos que ya generaban. El trabajo identificó que el Big Data permitió procesar información masiva en tiempo real, mejorando la atención al cliente, la logística, y la personalización de servicios, como fue el caso de empresas como Netflix, Amazon y Tesla. Por su parte, la IA posibilitó simular razonamientos humanos, tomar decisiones y aprender de errores, incrementando así la eficiencia en diversos sectores. El análisis reveló que, si bien el 75 % de las PyMEs consideró importante la incorporación tecnológica, solo un 32 % comprendió realmente la IA y un 34 % tuvo conocimiento sobre Big Data. Las barreras principales incluyeron la falta de inversión y la necesidad de capacitación del talento humano. Finalmente, se concluyó que las PyMEs debieron comprender que el uso estratégico de los datos no dependía del tamaño de la empresa, sino de su capacidad para conectar y aprovechar la información disponible, lo cual representó una oportunidad decisiva para su sostenibilidad y competitividad.

Palabras clave: Big Data; Inteligencia Artificial; PyMEs; Transformación Digital; Competitividad.

BACKGROUND

The present research work seeks to know the degree of knowledge and implementation of Big Data and Artificial Intelligence (AI) tools in small and medium enterprises.

There are times when technological findings underpin changes that, like the effect of a butterfly's flapping wings, transform reality in a very short time and affect humanity in countless aspects. Entrepreneurs take technological advances, apply them creatively, present new businesses, and take them to the market, where their usefulness and possibilities are enhanced. At the same time, these advances adapt to the needs of consumers, become naturalized and reach the point where a way of life is inconceivable without this technology. In this way, they transform the way we relate, mobilize and communicate. They also imply the need for new types of jobs and the expiration of traditional ones.

Now, beyond the similarities that this industrial revolution has with the previous ones, it should be considered that the impact of the present one is so great and encompassing that, as pointed out by [1] in previous revolutions the changes were mostly social and about opportunities, but this new revolution is different, especially if we consider the speed with which new ideas and technologies spread around the world and cause companies in all types of industries to reconsider their way of doing business.

The fourth industrial revolution requires us to think laterally, bringing together previously narrowly defined industries and disciplines. Biologists must now also be programmers and statisticians if they are to exploit the potential of genomic science. Financial firms, from banks to investment funds, are now hiring quantitative specialists who can study large volumes of data in search of information about customer behavior and investment opportunities. This revolution will generate millions of new jobs for those with the right skills and training.[1]

One of the central issues occupying large companies is the management of immense volumes of data: big data. This is a tool that involves the processing of a gigantic flow of information, but with characteristics that differentiate it from common database systems. To understand the operation and importance of the tool, 4 "Vs" are determined: volume, velocity, variety and veracity. These are the pillars on which this technology is based, which changes the way of approaching and managing strategies and business models, relying on information that, if well used, transforms the approach to the customer and manages to break, for example, with the coldness and depersonalization that until very recently involved dealing with the virtual customer, the way of treating diseases by processing information in real time of each patient, the way in which logistically the stock is managed and many other uses in various industries.[2]

The other central theme is based on automation and is called artificial intelligence. This tool through the use of mathematics and logic, allows a computer system to simulate the reasoning that people follow to learn from new information and make decisions. This artificially intelligent computer system makes predictions or performs actions based on patterns in the available data and can learn from its mistakes to be more accurate. An advanced artificial intelligence processes new information extremely quickly and accurately, making it very useful for complex scenarios such as driverless cars, image recognition programs and virtual assistants.[3] This has two main intentions, the first is technological: that uses computers to do profitable things and resorts to methods very different from those of the human mind, the second is scientific: that employs ideas and models of AI that contribute and address issues about humans and other living beings.

Now, the fundamental thing is to know what happens with the strategy and value creation of that information for companies in search of competitiveness, since this technology, well managed, collaborates with the exponential multiplication of the possibilities of value generation and competitive advantage of companies. By focusing on the reformulation of the value chain, increasing process security, making decisions based on real and updated data at the time, an advantage related to the personalization of service is achieved to provide a better quality of experience to consumers.[4] In this sense, Dr. María Teresa Ballestar de las Heras in her study on consumer behavior and big data, points out, "One of the most relevant aspects of big data analysis is its ability to transform the available data, through statistical and computational methods, into information that is valuable to generate competitive advantage to the company and added value to the customer."

However, generating competitive advantage does not depend only on access to complex sources of information, but also on having a structure that takes advantage of it and manages to transform it. Hill and Jones, in their understanding of strategy and business, explain that: "To create a successful business model, managers must 1) formulate business strategies that enable their company to attract customers from other companies in the industry (their competitors) and 2) implement these business strategies, which also involves the use of functional strategies to increase responsiveness to customers, as well as efficiency, innovation and quality".

Historically in many organizations, data is siloed in departmental silos, inaccessible to those without data analytics expertise. This creates a barrier to innovation and can limit a company's ability to adapt quickly to market changes. Data democratization seeks to break down these barriers by providing easy and secure access to data for all employees, regardless of their role or hierarchical level. When data is democratized, employees and users can make more informed decisions in their respective areas of responsibility. There is no longer a

need to rely on static, outdated reports generated by a small group of analysts. Instead, "real-time" data is available to all, enabling greater agility and responsiveness to business challenges.[5]

The processing of internal information with practical effects on market insight is, let's not forget, revolutionary. It is estimated that in a short time there will be more than 3,2 billion hyperconnected users, a colossal mass of data that, with optimal management, can yield lucrative results for companies, whether large, medium or small.[6]

Thanks to Big Data, Netflix has grown from a DVD-by-mail rental company to a world leader in the entertainment industry. Netflix collects and analyzes all kinds of consumption data from its users. From what they search for and how they tag each content to where, when and how they consume each content. Undoubtedly, the important thing is how they leverage this data analytics to improve their services. Once the data has been collected and studied, Netflix employs the use of artificial intelligence to make content suggestions tailored to each user. To do so, it uses the aforementioned metrics and formulates a selection of content according to the tastes and interests of each profile. Netflix is able to determine how many hours per month a subscriber must use the service to avoid the possibility of unsubscribing. So, as soon as it realizes that the average usage quota is lower than the ratio it has identified, it takes steps to increase it.[7]

Amazon, through Big Data, the collection and analysis of all available information (more than 152 million accounts), has managed not only to capture more purchases but also to build customer loyalty by attracting them with their own tastes. Its algorithms are able to get into the market trends and therefore empower consumers to find the products they are looking for and those related to them. Each experience within the platform is unique to each user based on their shopping history, interactions, searches and tastes. The technological breakthrough does not only reach Amazon's online platform but also the retail sector, i.e. traditional physical commerce. Amazon Go eliminates the need to wait in line or go to checkout, all this is achieved through a set of sensors distributed throughout the store that automatically detect whether the user takes or returns a product, and adds or subtracts it from a virtual shopping cart. The consumer simply enters, identifies himself, buys or returns a product, and walks out the door. The store will be equipped with multiple cameras, microphones and sensors that capture every detail and are processed in a Deep Learning system. One of the many practical applications of Big Data, and that allows to accurately analyze consumption patterns. With the important detail that all users accessing Amazon Go are previously identified.[8]

Tesla is a company that has stood out for its innovation and futuristic vision in the automotive field. One of the technologies that has helped Tesla consolidate its leadership in the industry is artificial intelligence (AI). One of the most well-known uses is autonomous driving. Tesla uses a combination of cameras, radar and sensors to gather information about the vehicle's environment and enable the vehicle to drive itself in certain situations. The AI processes this information in real time to make decisions and adjust the vehicle's driving.[9]

The Observatory of Productivity and Competitiveness (OPyC) of CAECE University presented the third edition of the "Digital Intensity Index" (IID). This Index, which is presented every six months, measures the degree of digitalization of non-tech companies in Argentina. Approximately 22 % exploit Big Data tools. This was a big difference compared to the first IID measurement, where only 12 % made use of these tools to learn about the business or enhance it. The index was based on 400 samples of which 80 % are SMEs.

Many SMEs believe that new technologies associated with data, such as Big Data, are only for large companies, something that is too big for them. However, starting to connect all the information contained in their data is vital to boost their growth, and on this will depend on making the right decisions. It's less about size and more about how data is extracted, connected and used. Starting to use a methodology in which data is the protagonist is essential, not only for growth, but also for survival. All companies, no matter how small, manage data on a daily basis: from their newsletters, suppliers, customers, technical service, payment systems, social networks, mobility, order lifecycle, internal reports, etc. And in them there is a very valuable source of knowledge about your business.[8]

Growing is a challenge for any company, but for SMEs the effort is redoubled if the goal is to do it in a sustainable way. And even more so in the context of Argentina's economic volatility.[5]

A recent study conducted by Microsoft Argentina with the collaboration of the Argentine Confederation of Medium-sized Enterprises (CAME) obtained results on the changes in business objectives and processes brought about by digital transformation and perceptions of economic recovery. The pandemic showed that no business is 100 % resilient, however, SMEs that incorporated digital technology proved to be better prepared and able to transform when faced with structural changes. The main needs to advance digital transformation are: the ability to invest in technology (46 %) and retrain existing human talent (46 %). In addition, managing and leveraging data and information for decision making is a critical factor for 42 % of SMEs, particularly among larger ones. Fifty percent of SMEs say that their main challenge in the short and medium term is the ability to adapt to the new reality. Cybersecurity is a concern for SMEs, particularly among the larger ones. As for the use of more advanced tools, knowledge of artificial intelligence technologies is scarce, only 32 % of SMEs have knowledge about them, while 34 % have knowledge about big data & analytics. 75 % of SMEs consider that the

adoption of new technologies is quite important for the reactivation of their company in the short and medium term. The larger the company, the greater the knowledge.[3]

It is easy to recognize the importance and benefits associated with the implementation of this technology, but are they aware of the advantages they provide? Are the organizations prepared? If we consider the variety of areas of impact of this new technology and the reality that this 4th industrial revolution implies, it is imperative that organizations in our country adapt and incorporate naturally, and as an essential part of their existence, the new technology with its correct, effective and efficient administration. However, will the organizations know how to adapt themselves to take advantage of these new resources? This is how the central research question is presented: SMEs in the province of Cordoba.

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None.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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