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## Digital Transformation Trends and Innovation

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# Digital Transformation Trends and Innovation

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**Abstract.** Today, advances in technology bring changes to people's lifestyles, and challenging organizations to accompany these advances. Organizational managers and those responsible for the Information Technology (IT) department must evaluate current trends in innovation, and determine how they can boost business, creating new business models, and promoting competitiveness. The objective of these paper is presented a group of technological advances aimed at being the latest digital trends and changing previous trends by producing improvements or updates, the same ones that streamline processes in the field of business intelligence (BI). In this survey paper, current trends in the Internet of Things (IoT) are described, as well as topics related to 5G mobile communication, WiFi 6 technologies, the transformation of the user's technological experience, and Machine Learning (ML). In addition, the support in decision-making process will be analysed as these trends, both personally and at the business level.

## 1. Introduction

Digital transformation is a process that has been studied for more than ten years, since it is in the interest of both companies and individuals in general, the decentralization of a part of the value chain due to technology, and return the real power or sovereignty to the consumer, something that had been lost years ago. This transformation has succeeded in changing consumer behavior, business models, and the tools companies use to reach consumers [1].

The world has been subject to changes due to technological advances, the IoT, blockchain, artificial intelligence, cognitive intelligence, the globalization of the economy, the development of markets, telecommunications, wearable devices, the E-commerce, the digital age, process innovation and business models have evolved from concepts to realities that companies must necessarily adopt and take advantage of. Any space where there is daily, constant and increasingly innovative commercial competition requires that organizations be at the forefront and find the need to investigate all those technologies, theories and processes that have evolved over the years and apply them in each of its processes, in order to generate a more competitive and coordinated potential market, which is shown as evidence of rapid growth and technological advancement and therefore, to remain active in the industry [2].

An example of a digital transformation is the case of Netflix, a company that was born renting DVDs by email, its great strength was the analysis of data on the consumption preferences of its subscribers,



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with which it managed to generate knowledge of the business, how it works the market for digital entertainment content, and that is how today it produces its own films and series, almost all of them successful in audience, being a case study of success, but a few years ago it was not. Reed Hastings, CEO of Netflix, to adapt to the growing technological trends decided to channel his own business, first by raising the prices of DVDs by mail, and then turning it into a separate company. Along the way, he lost in a matter of days, more than 80% of the market capitalization, since then he has multiplied the value of the company by 100. Currently, Netflix's own content is even distributed digitally to its competitors [3].

With the technological advances that we have at our fingertips we can enjoy and acquire new experiences. Through sound, text or image, everything seems to be related to our mobile life. While some look for the signal that allows them to communicate, others need a charged battery to be able to play with their mobile. When the video game boom took place in the 1980s, the toy industry suffered greatly. The deaths of the dolls, the model cars, the Barbie houses were predicted. However, the storm passed and the virtual ones did not bury the traditional ones. But a new threat has emerged: toys are currently facing tablets and mobile devices as a source of entertainment and fun [4].

Understand the development of processes in all spheres of organizations, such as decision-making, the development of production processes, the collection of accounting data, the application of changes, the measurement of growth, strengths, weaknesses, the behavior of collaborators and production; are some of the spaces, activities and processes that demonstrate that growth is not only due to the constancy and good handling of the materials necessary to carry out a function or activity but this would not be possible without the intervention of technology [2].

Information technologies have evolved and have also had changes becoming a trend today, these topics will be described in summary how they have produced advances in communication between people, in generating jobs, in boosting the global economy and of how at a business level it helps decision making process. To show these competitive advantages, recent studies carried out on the digital transformation trends mentioned in this document are taken as a reference.

This article is divided into 6 sections: in section 2, the advantages of 5G mobile communication compared to previous generations and how it helps industries will be described; Section 3 highlights features of Wifi 6; in turn, section 4 describes the transformation of the technological experience of the user and the client; section 5 summarizes Machine Learning and its impact on data analysis; and finally, in section 6, the conclusions regarding the trends of technological change are presented.

## 2. 5G Mobile Communication

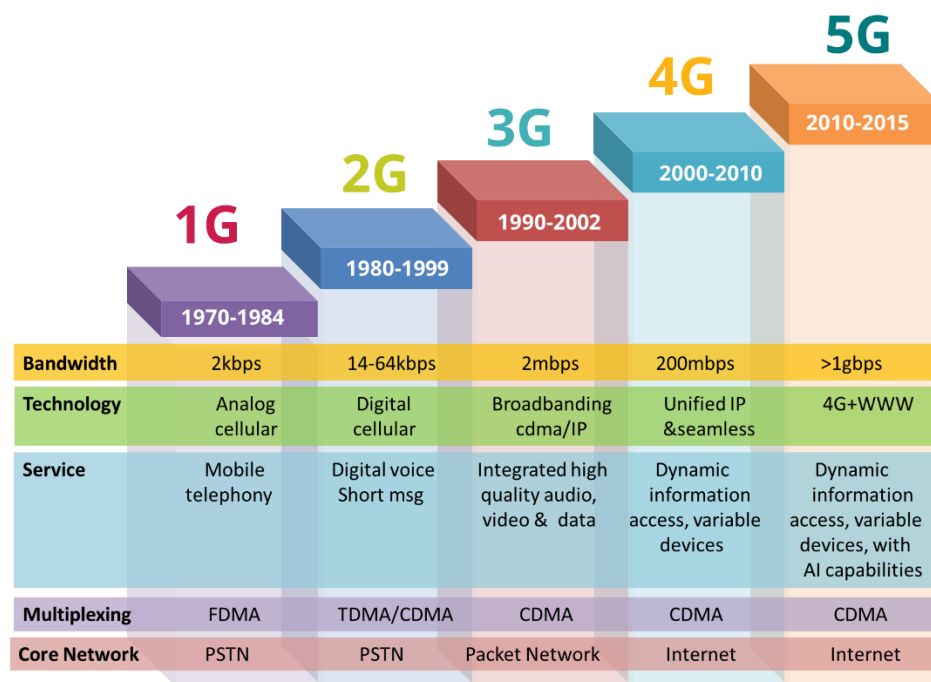
With the passing of the generations of mobile communication, the most recent one offers more benefits than the previous one (Figure 1), which allows progress, and creates a gap between generations. Mobile communication at the 5G level has allowed us to show the world how smart cities have progressed with the use of the IoT, virtual reality, augmented reality and more technological advances [5].

The technological application of 5G not only constitutes the new prototype of wireless transport of 5G Technology, but it will be the essential technological component in the digital transformation of society and the economy in the most advanced countries during the next decade [6]. The main enabling solutions for this digital transformation, the Internet of things and big data, robotics, virtual reality or super definition, will be supported on 5G [7].

The new ability to differentiate services without having to build different physical networks increases the possibility of services aimed at particular economic or industrial sectors. Therefore, 5G has the potential to change business models for network operators relative to today's market, where network operators have offered largely standardized services and differentiation has been limited to pricing plans [8].

The 5G Mobile Network is also known as the connection of the future since it is one of those that promises to change the speed that the network works, this based on the use of frequencies which allows transport with a very high data transmission capacity, likewise reduces the period that the latency of the time in which the data is transmitted, to all this the growth of new and future

technologies is also affected by cyberattacks since there are a large number of applications or data that are weak to security level [9]. Refer figure 1.



**Figure 1.** Evolution of Mobile Generations

High-speed and high-capacity mobile broadband facilitates mobile speeds of over 100 Mbits with peaks of 1 Gbits, allowing, for example, to offer ultra-high definition content or virtual reality experiences, thanks to the speed and the capacity of technology mobile devices constitute a great boost to what is the new era of technology [10].

Ultra-reliable and low-interference communications, around 1 ms compared to 20-30 ms typical of 4G networks. This condition could be more appropriate for applications that have specific requirements in this area, such as vehicles connected to the internet or autonomous vehicles, telemedicine services, security systems and real-time control, and others such as smart manufacturing in industry 4.0 [7].

4G technology already offers us real speeds of several hundred megabytes in both directions of communication, but 5G technology allows latency to be reduced to a single millisecond, something totally necessary for autonomous driving and can be managed and manipulated by various wireless connectors of any type of network and that can save many lives, due to the immediacy of communications. In addition, one of the most outstanding characteristics of this type of technology is its use towards the internet of things.

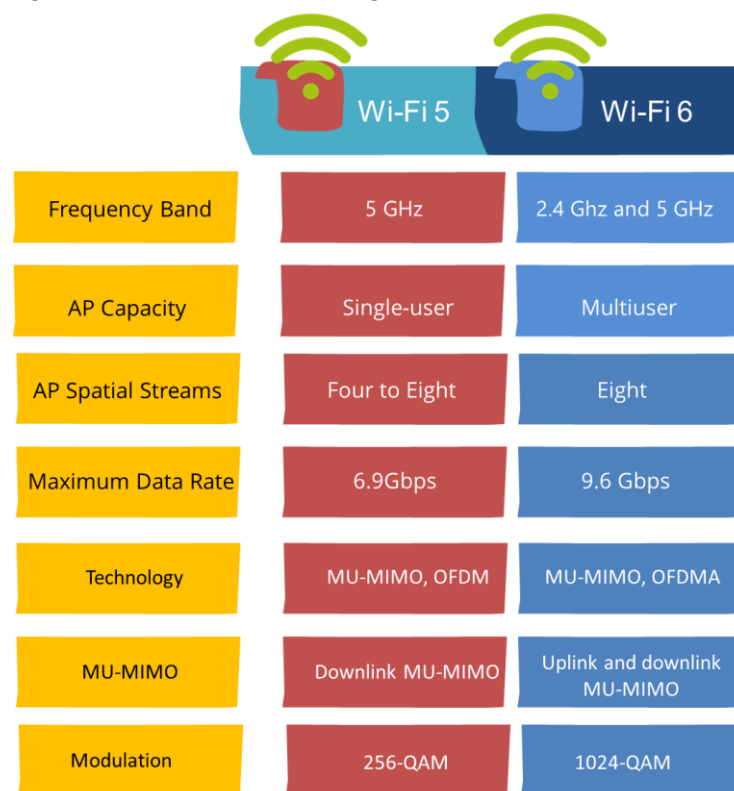
Recent technological changes require massive transmissions as well as machine-to-machine (M2M) transmissions, which will increase the capacity to manage a large number of simultaneous connections, which will allow the massive deployment of sensors, the IoT, and the growth of Big Data services. This makes the platform much broader for the consumer, which implies that this type of technology is growing rapidly and with great benefits for the needs of users [5].

### 3. Wi-Fi 6

IEEE 802.11ax also known as Wi-Fi 6, is the latest standard and the sixth generation of WLANs for Wi-Fi wireless technologies, which operates in 2.4Ghz and 5Ghz spectrum bands, unlike its predecessor standard 802.11ac, it provides higher performance in congested environments, higher speed and energy efficiency up to four times more than its previous version [11].

This Wi-Fi technology has outstanding characteristics in contrast to its previous versions of the IEEE 802.11 wireless standard, regarding speed, performance, among others. Although the prominent feature of this technology is OFDMA, it is a terminology used in cellular networks, but new to Wi-Fi. This particularity allows the data channels to make subdivisions so that several devices are connected to the network avoiding collisions and saturation, some additional characteristics are described below, since here the duration of the OFDM symbols is quadrupled [12].

Over time it is more common for other WLAN technologies to use Wi-Fi 6 IEEE 802.11ax together with advanced cellular wireless technologies, such as LTE or LTE-A or the upcoming 5G, as well as being related to the IoT since there would be a viable communication (Figure 2), due to the speed of up to 5 Gbps, throughput and data transmission, it would make its impulse to these existing technologies faster. According to observers, and based on surveys of certain industries, the introduction of the next generation wireless network will have a significant impact on businesses and users in the coming years; more connected devices and longer battery life on phones due to smart device downtime management is ideal [13]. Refer figure 2.



	Wi-Fi 5	Wi-Fi 6
Frequency Band	5 GHz	2.4 Ghz and 5 GHz
AP Capacity	Single-user	Multiusers
AP Spatial Streams	Four to Eight	Eight
Maximum Data Rate	6.9Gbps	9.6 Gbps
Technology	MU-MIMO, OFDM	MU-MIMO, OFDMA
MU-MIMO	Downlink MU-MIMO	Uplink and downlink MU-MIMO
Modulation	256-QAM	1024-QAM

**Figure 2.** Wi-Fi 5 versus Wi-Fi 6.

#### 4. Transformation in the User Experience

Companies have the opportunity to apply the best customer attraction and retention strategies through multiple channels and digital tools that offer a unique experience at each touch point of the customer journey to empowered consumers thanks to unlimited access to information [14]. Electronic business or e-Business is defined as a concept in development that describes the process of exchanging or buying and selling products, services and information through computer networks that involve the Internet [15].

Digital transformation is composed of three key areas: user experience; operational processes; and business model (Figure 3). The executives use those areas to digitally transform their companies, improving the customer experience, operational processes and business models [16]. Refer figure 3.





**Figure 3.** Construction Areas of Digital Transformation.

Most organizations leverage the resources and expertise of third-party solution providers and partners, at least for some components of their digital strategy. However, as digital transformation affects all areas of the business, decision makers look to their suppliers to act as ongoing strategic partners rather than just implementers of leading-edge solutions [16][17].

The exponential evolution of technology in recent years and its application in the field of the economy is leading to an unprecedented digital transformation in the areas of infrastructure, solutions, services and users. Its particular application through the use of Big Data, cloud computing, or robotized advice and attention to customers, as well as the next irruption of blockchain technology applications (Blockchain).

The user interface, although it plays an important role, does not produce relevant effects if it is not managed in conjunction with the user experience. And a good experience cannot be guaranteed without thinking about the user and their needs. The frustration that the user may feel if they have to think hard when using a tool or the confusion when wondering how to use it can result in the user giving up completely [18].

In addition, consumers reward those brands that are familiar to them and that launch messages, and brand promises with which they can identify. In a world in which trust in public institutions and politics is decreasing, people want private companies to also be responsible and become aware of Corporate Social Responsibility [14].

New generation users, are looking for digital services that empower their experiences in a simple way, without the need for downloads, contracts or complex programming. To stay competitive, companies must seek to personalize user experiences, and for this they have used technologies such as Big Data and Artificial Intelligence [19].

## 5. Machine Learning and Data Analysis

Intelligence is the ability to intuit, reason, predict, to solve a problem through information obtained through the analysis of the context in which we find ourselves, the process of complex opinions and experience. When all this capacity is transposed to a machine, which is supported by data to have an immediacy as close as possible to a precise result, and also carry out the necessary reconciliations to said processes to improve them; then we are talking about artificial intelligence. That is, it seeks the creation of machines that can imitate intelligent behaviors. Machine Learning is a subset belonging to artificial intelligence that, through its machine learning algorithms, seeks to provide machines with learning capacity by generalizing knowledge from a set of experiences. It is the ability to collect data and use it to act based on long and short-term predictions,

The advancement of population and technology produces an increase in data, and classifying or analyzing this information can be very laborious and takes a long time, but all these processes have been changing thanks to the development of Machine Learning or automatic learning. This procedure promises to have improvements thanks to self-learning through algorithms that can learn and make predictions on said data from sample inputs known as Dataset [20].

Every day a daily life is shared more and more with artificial agents every day more intelligent, autonomous and even social, interacting in a more integral and humanized way, seeing human labor replaced in different labor fields, and in Companies by means of Software or Business Intelligence tools. All these techniques can be observed in artificial intelligence, which is Machine Learning, Deep Learning, which have an indispensable purpose since one depends on the other in most of the processes.

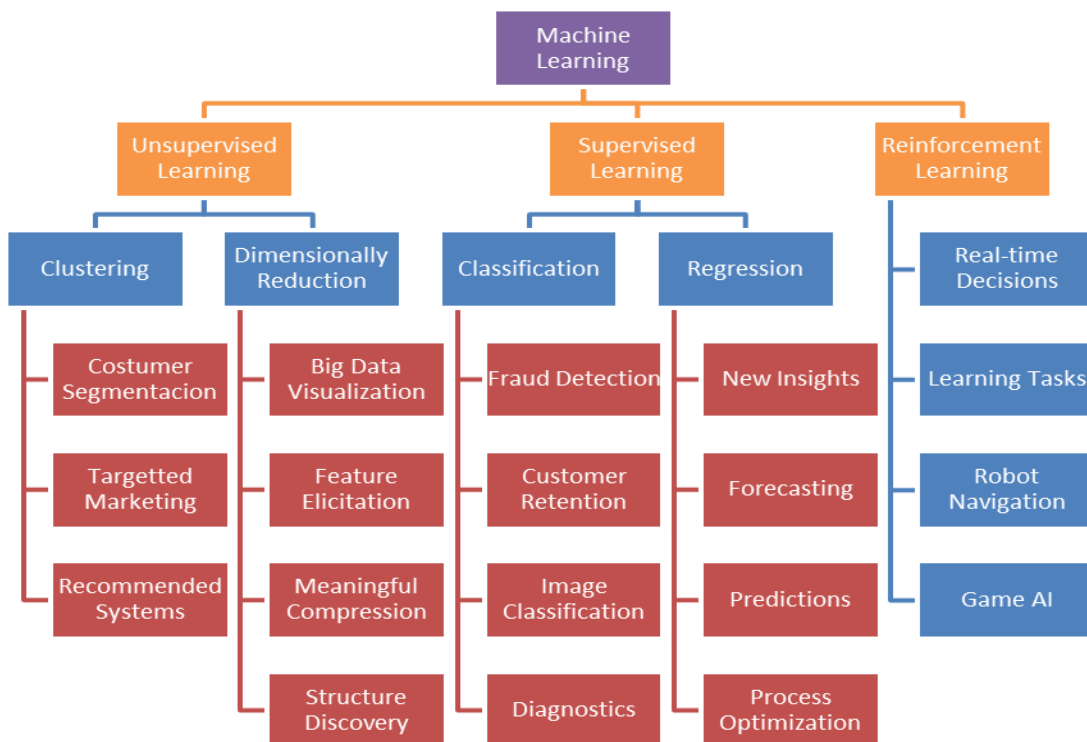
In the usual field, we can accentuate some examples such as the case of the retail trade, as is the case of supermarkets, analyzing the prediction of the best-selling products and those required by customers, being of help to them for a greater production of the product. Another example is predicting the value of a home through supervised learning of new profitable price data that allows predictions for new instances of purchase with price estimation, product recommendations, and fraud detection. These two examples have in common that they can be machine learning results for making decisions about a good or service sold or produced, being different tasks but the approach is the same [21].

The Machine Learning implementation process begins with the definition of the objectives, and according to the required characteristics goes through 7 steps (Figure 4). In the 1<sup>st</sup> step data collection or datafication is realized. After in 2<sup>nd</sup> step, the data are prepared, standardized, deduplicated, verified and preprocessed. In the case of the 3<sup>rd</sup> step, the right model is selected. Due to the large number of existing models that can be used with different purposes, the selected model must meet the business objective. The objective of 4<sup>th</sup> step is training the model, and that is the most important part of machine learning. Training data are used, with the aim of incrementally improving the model's predictions. The 5<sup>th</sup> step, machine learning tests are performed together with unused control data, to see how it will work. In the 6<sup>th</sup> step, once the model has been evaluated, it is time to test the parameters originally defined, so that you can improve the AI. Finally, after completing all the previous steps, in the 7<sup>th</sup> step and time to answer the questions based on the predictions [22]. Refer figure 4.



**Figure 4.** Steps to Machine Learning

There are different uses and algorithms depending on the field in which it is required (Figure 5); implementing types of automatic learning to different algorithms aimed at health, education, business level, robotics area, marketing, big data among others where the use of prediction is requested, being ML in the current era, one of the most used techniques for computer machine learning, this being a powerful tool for decision-making for those who use it [23][24][25].



**Figure 5.** Types of Machine Learning Algorithms



## 6. Conclusions

Technology is on the cusp to go further in increasing the capacity of companies and the main trends generate significant opportunities to compete in the business world, they are emerging step by step as a key and strategic factor for companies, These new technologies and operating systems are designed or created to improve the lifestyle of human beings and their own well-being, they have a profound impact on people and the spaces they inhabit, they change their way of life and relationships. Companies are challenged to acquire the mentality of being digital, while in technology companies, adopting the latest trends is aligned with the company itself, as well as its CEOs, since they are adopting them with more frequency to improve their business processes and resources. 5G technology allows latency to be reduced to a single millisecond, something totally necessary for autonomous driving and can be managed and manipulated by various wireless connectors of any type of network and that can save many lives, due to the immediacy of communications. In addition, one of the most outstanding characteristics of this type of technology is its use towards the internet of things. Wi-Fi 6 wireless standard may provide benefits in the future since it is still to be implemented worldwide in a short time as it is recognized in the market, its improvements are significant at the level of transmission speeds and it avoids collisions or saturations in the networks. Intelligence is the ability to intuit, reason, predict, to solve a problem through information obtained through the analysis of the context in which we find ourselves, the process of complex opinions and experience. Nowadays artificial intelligence can be applied through ML in multiple fields such as medicine, marketing, finance, video games, advertising, among other; being currently one of the branches of technology most used globally since through these they help streamline processes as much as possible and allow correct decision-making.

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