

“DIGITAL TRANSFORMATION AS A FACTOR OF CHANGE IN ECUADOR'S PRODUCTIVE MATRIX”

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Abstract

In the current context, digital transformation has become a fundamental factor for the change of the productive matrix in Ecuador. This is because the world is becoming increasingly digital and companies need to adapt to this new reality to remain competitive in the domestic and international market. However, despite the efforts of the Ecuadorian government to promote digital transformation, there are still obstacles that limit its implementation in an efficient and effective way: insufficient knowledge on the subject and its benefits for social practice. Many companies have not yet adopted digital technologies in their processes and activities. On the other hand, there are barriers such as lack of internet access in some rural areas and lack of training and education in digital skills. The objective of this study is to provide an analysis of the levels of intersectional interdependence in the context of Ecuador's productive matrix, identifying the main challenges, strengths and opportunities, so that it allows proposing recommendations for their effective integration with the digital transformation. The research methodology consisted of reviewing the existing literature on digital transformation and its integration into Ecuador's productive matrix. Information was also gathered from studies and statistical data related to the level of adoption of digital technologies in the country. The findings revealed that, although digital transformation has advanced in some sectors of the Ecuadorian economy, there is still great potential for growth in others. In addition, it was identified that the main barriers to the implementation of digital transformation are the lack of investment in technology, the lack of training and education in digital skills and the lack of awareness of the benefits of digital transformation. As a central conclusion, it can be stated that digital transformation is a key factor for the change of the productive matrix in Ecuador. However, it is necessary to overcome the barriers and challenges that exist in the implementation process. To this end, policies and programs must be established to encourage the adoption of digital technologies, communication infrastructures must be improved, and education and training in digital skills must be encouraged. This is the only way to achieve a real change in the country's productive matrix and take full advantage of the opportunities offered by the digital era.

Keywords: *Change, digitalization, Ecuador, productive matrix, digital transformation.*

INTRODUCTION

Currently, digital transformation has become a prevailing need for the development and competitiveness of countries in the global arena. Ecuador has not been oblivious to this reality and has begun to venture into the process of digitizing its economy and society. This digital transformation is closely related to the productive matrix of the country, which refers to the economic and productive structure that sustains the growth and development of a nation. In the case of Ecuador, this process has become relevant due to the need to diversify the productive matrix and seek new ways to generate value in the economy.

The digital transformation in Ecuador is in an incipient stage but with great potential for development. In this area, various initiatives have been implemented in terms of technology and digitization, seeking to improve the competitiveness of the productive sectors and promote technological innovation: a) National Program for Technological Innovation and Entrepreneurship (PINTEC): This program was implemented to promote research, development, and innovation in Ecuador. b) National Plan for Good Living (PNBV): The PNBV is an Ecuadorian government initiative that seeks to promote sustainable development and social inclusion through technology; d) Law for the Promotion of Research and Technological Development: This law, implemented in 2012, seeks to promote research and technological development in Ecuador. According to a report by the Center for Development Research and Promotion (CIPDE), this legislation has contributed to a 24% increase in private investment in research and development in the country between 2012 and 2018 (CIPDE, 2019).

However, there are still important challenges that must be addressed to achieve a true insertion of digital transformation in the productive matrix for the 849 thousand 831 Ecuadorian companies that the country has:

Insufficient technological infrastructure: According to the study "Development of the sectors of the Digital Economy in Ecuador" carried out by ECLAC (Economic Commission for Latin America and the Caribbean), there is a significant gap in the country's technological infrastructure. This lack of infrastructure, such as quality connectivity and network coverage, makes it difficult to implement digital transformation projects.

Lack of training and digital skills: The lack of adequate training limits the adoption of digital technologies and restricts the development of key sectors such as e-commerce and data-driven services.

Resistance to change and traditional business culture: According to Professor Edwin Meza, author of the book "Planning and Management of Digital Transformation in Organizations", one of the biggest challenges for digital transformation in Ecuador is resistance to change and business culture traditional. Many companies still cling to traditional methods and are afraid to adopt new technologies. This lack of adaptability delays the incorporation of digital tools into the business fabric. The report "Challenges and Opportunities for the digital economy in Ecuador" prepared by the Private Technical University of Loja points out that the lack of adequate regulation and specific public policies hinders the insertion of digital transformation in the Ecuadorian matrix.

Another of the important challenges to achieving a true insertion of digital transformation in the productive matrix is the existing digital gap in the country. According to the National Institute of Statistics and Censuses (INEC), in 2020, only 48% of Ecuadorian households had Internet access. This is mainly due to the lack of adequate infrastructure, especially in rural areas, where access to digital services is limited.

This digital divide makes it difficult for Ecuadorian companies to adopt digital technologies, which harms their productivity and competitiveness. According to a World Bank report (2021), 95% of companies in Ecuador are micro, small, and medium-sized enterprises (MIPYMES), and many of them lack access to digital technologies that allow them to improve their processes, manage their more efficiently, and reach new markets.

Another important challenge is the lack of digital culture in the country. According to data from the International Telecommunications Union, in 2019, only 52% of Ecuadorians had basic skills in the use of information and communication technologies. This limits the adoption of digital innovations by companies and the general population.

From the aspects raised, the lack of a clear strategy for the implementation of digital transformation as a factor of change in the productive matrix in Ecuador is evident. This undoubtedly generates conflicts and contradictions in the digital transformation process, hindering its effective integration into the productive matrix of the country. The objective of this study is to offer an analysis of the levels of intersectoral interdependence in the context of the productive matrix of Ecuador, identifying the main challenges, strengths, and opportunities, so that this allows to propose recommendations, for its effective integration with the digital transformation. The central idea to work on in this study is that digital transformation is a key factor to promote change in the productive matrix in Ecuador, however,

The importance of the analysis of the subject lies in the fact that digital transformation is crucial for the productive matrix of Ecuador due to its ability to promote diversification and sophistication of production. In particular, digital transformation can play an important role in the development of strategic sectors such as tourism, agriculture, manufacturing, and services. In tourism, for example, the use of digital technologies can facilitate the promotion and

marketing of destinations, improve the tourist experience through the implementation of virtual reality or augmented reality solutions, and optimize resource management through the use of big data and predictive analytics.

In the agricultural sector, digitization can help improve efficiency in the supply chain, optimize the use of resources such as water and fertilizers, and facilitate access to international markets through electronic commerce. Likewise, in the manufacturing industry, the implementation of digital technologies such as automation, additive manufacturing (3D printing), and the Internet of Things can allow the production of more sophisticated and personalized goods, as well as the optimization of manufacturing processes. Finally, in the services sector, digitization can contribute to the creation of new business models and the offer of innovative services. For example, the development of digital platforms can facilitate the provision of services through the Internet, such as telemedicine,

Methodology

This examination is presented from the methodology of qualitative research, focused on understanding the elements that enable the implementation of digital transformation in the productive matrix of Ecuador. The selection of the sample is carried out in a non-random manner, based on specific criteria such as the relevance of the subject and the availability of information. The collection and analysis of data includes the review of reports, books, and articles, with a sample of 9 cases, whose data analysis allowed the understanding of the digital transformation, in the productive matrix from Ecuador. Finally, the interpretation of the results of the evaluation, and assessment of the literature, allowed the identification of strategies to face the challenges of digital transformation.

Productive matrix and digital transformation: two terms that complement each other

The productive matrix and digital transformation are two concepts that significantly complement each other in the current economic environment. To understand this statement, it is important to first understand each of these terms. The productive matrix refers to the structure and diversification of the production of goods and services in a country or region, to promote economic growth and reduce dependence on traditional sectors, or on a product. More specifically, it describes the combination of sectors or industries in which a country's economy is centered and how the productive resources are distributed in each of them (Querol, & Rodríguez, 2005 De Solminihaç, 2013). The fact is that the productive matrix is a key element for the economic development and territorial competitiveness of a country and its regions. The diversification of the productive matrix promotes the generation of added value and job creation.

The importance of the productive matrix lies in the need to diversify a country's economy, reducing dependence on a single sector and promoting the growth of other emerging sectors. This entails advantages such as job creation, the development of new markets and business opportunities, increased economic competitiveness, and reduced vulnerability to external shocks. By diversifying the productive matrix, countries can take advantage of their comparative advantages in different sectors, which allows them to increase their capacity to generate wealth and improve the well-being of their population. A diversified productive matrix promotes innovation and technology since different sectors require different levels of knowledge and skills.

The implementation of digital transformation in the productive matrix is crucial to achieving greater efficiency, competitiveness, and sustainability in the different economic sectors. This is because digitalization makes it possible to improve process management, optimize the supply chain, automate repetitive tasks, and analyze large volumes of data, among other benefits. Digital transformation implies the integration of digital technologies in all aspects of an organization or society to improve efficiency, competitiveness, and innovation. It is the process by which organizations adopt digital technologies to improve their operational efficiency, offer new products and services, and establish new ways of interacting with their customers. This process requires

First, digital transformation has a significant impact on the productive matrix by allowing the creation of new sectors and the optimization of existing ones. According to data from the Inter-American Development Bank (IDB), the adoption of digital technologies can increase productivity by 40%, demonstrating their potential to boost economic growth. In addition, digitization facilitates the connection between different sectors, fostering collaboration and generating synergies. For example, the integration of digital technologies in agriculture (digital agriculture) has allowed improving efficiency, reducing costs and increasing production in this sector, while also creating opportunities for the development of specialized technological solutions.

Secondly, digital transformation contributes to the diversification of the productive matrix by promoting the appearance of new industries and services based on technology. A clear example is the information and communication technology (ICT) sector, which has experienced significant growth. According to the report of the Economic Commission for Latin America and the Caribbean (ECLAC) (2022) on the digital economy in the region, exports of ICT services have tripled in the last ten years, which demonstrates the potential of this sector to diversify the productive matrix and generate employment. On the other hand, digital transformation facilitates the incorporation of advanced technologies, such as artificial intelligence, the Internet of Things, and robotics, in different economic sectors.

These technologies not only improve the efficiency and quality of products and services but also drive innovation and the creation of new business models. For example, Airbnb is an online platform that allows people to rent accommodation in

different parts of the world. Its implementation revolutionized the hotel industry in the United States, by directly connecting homeowners with tourists through its platform. Traditionally, hotels were the only option for travelers looking for accommodation; this platform revolutionized this concept by allowing people to rent private spaces quickly and easily. This disruption has led to a change in booking patterns and has challenged the hotels' dominance in the market. According to a Statista report, in 2020,

The implementation of Industry 4.0 has also been relevant in the manufacturing sector. This has facilitated the automation of processes, the optimization of the supply chain, the massive customization of products, and the improvement of inventory management. According to a McKinsey report, (2016) companies that embrace digital transformation can increase their productivity by 20-30%.

Digital transformation facilitates the internationalization of companies, allowing them to reach new markets more quickly and efficiently. According to the United Nations Conference on Trade and Development (UNCTAD) (2020), digital exports represent approximately 30% of world trade. Another relevant fact is how the implementation of digital technologies in sectors such as health and education can significantly improve people's quality of life. For example, telemedicine has made it possible to expand access to medical services in rural or hard-to-reach areas.

Digital transformation can play a crucial role in resolving intersectoral imbalances in the productive matrix by optimizing processes, improving efficiency, and fostering innovation in various economic sectors:

In the manufacturing sector, the implementation of technologies such as the Internet of Things (IoT) and artificial intelligence (AI) in production chains can improve efficiency and reduce manufacturing costs. According to a report by the consulting firm McKinsey (2015), the adoption of IoT in the manufacturing sector could generate an economic value of up to 4 trillion dollars per year by the year 2025.

In the agricultural sector, the use of digital technologies, such as sensors, drones, and data analysis, can increase productivity and profitability. A study carried out by the University of California (2018), estimates that the use of drones with infrared sensors to monitor crops can increase production by 10-20% and reduce costs by up to 85%. In the case of the services sector: Digital transformation in the services sector can drive innovation and improve the customer experience. For example, the implementation of digital platforms in the tourism sector can facilitate the booking of flights, hotels, and activities, which in turn increases competitiveness and economic growth. According to a report by the World Tourism Organization, it is expected that by 2025, 57% of all travel reservations will be made online.

These examples illustrate how digital transformation can address cross-sector imbalances by boosting productivity, reducing costs, and fostering innovation across different economic sectors. However, it is important to highlight that each situation may vary and it is necessary to adapt digital solutions to the specific needs of each sector and region.

Productive matrix of Ecuador by sectors: levels of interdependence

In general, terms, Ecuador's economy is made up of three main sectors: primary, secondary, and tertiary. According to the National Institute of Statistics and Censuses of Ecuador (INEC), the main economic sectors are:

Primary sector: This sector includes activities related to agriculture, livestock, fishing, and mining. According to the INEC National Accounts Report, in 2020, the primary sector represented 7% of Ecuador's Gross Domestic Product (GDP). In 2021, the primary sector represented around 6.0% of Ecuador's GDP.

Secondary sector: This sector encompasses industrial and manufacturing activities, including the production of manufactured goods, construction, and electricity generation. According to INEC, in 2020, the secondary sector represented 25% of Ecuador's GDP. In 2021, the secondary sector represented around 25.0% of Ecuador's GDP.

Tertiary sector: The tertiary sector includes the provision of services, such as trade, transport, tourism, banking and finance, education, health, and communications. It is the sector with the greatest weight in the Ecuadorian economy. According to INEC, in 2020, the tertiary sector represented around 66% of Ecuador's GDP. In 2021, the tertiary sector represented around 68.0% of Ecuador's GDP.

Level of intersectoral interdependence

The level of interdependence between the economic sectors in Ecuador is high. According to a report by the Central Bank of Ecuador (2021), the primary, secondary, and tertiary sectors are interconnected in various ways. First, the primary sector is a supplier of raw materials and food for the secondary sector. For example, agriculture provides the agricultural products necessary for the production of processed foods in the food industry. Similarly, mining supplies the minerals and metals that are used in the manufacture of manufactured goods.

On the other hand, the secondary sector is a consumer of inputs from the primary sector. For example, the construction industry uses wood, cement, and other materials from agriculture and mining. In addition, the secondary sector also requires services from the tertiary sector, such as transport and logistics, to distribute its products. Likewise, the tertiary

sector depends on the other two sectors. On the one hand, the tertiary sector requires goods and services from the secondary sector to carry out its activities. For example, the tourism sector needs infrastructure built by the secondary sector. On the other hand, the tertiary sector also depends on the primary sector to obtain agricultural and fishing products that are used in services such as food and hospitality.

According to an analysis carried out by the Central Bank of Ecuador (2021), it can be seen that there is a high interdependence between the sectors of the economy. For example, agriculture, which belongs to the primary sector, needs inputs from the secondary sector, such as agricultural machinery, fertilizers, and pesticides. In turn, the manufacturing industry depends on agricultural production to obtain raw materials, as in the case of the food industry which requires agricultural products for processing. Another example of interdependence is found in the tertiary sector. The tourism sector depends on both the primary sector and the secondary sector. On the one hand, it needs transport services to mobilize tourists and accommodation services that depend on construction. On the other hand,

This interdependence is also reflected in economic indicators. According to INEC, in 2020, the secondary sector, which includes industry and construction, represented 25% of GDP, while the tertiary sector, which includes commerce, transport, and tourism, among others, represented around 66% of GDP. In the case of Ecuador, the strengths of intersectoral interdependence can be observed in several aspects. First, there is a great diversity of sectors in the Ecuadorian economy, such as agriculture, manufacturing, commerce, and tourism, among others. This diversification allows the different sectors to benefit from each other since they depend on the inputs and services provided by other sectors.

For example, the agricultural sector can benefit from technological advances and chemicals provided by the manufacturing industry sector to improve the productivity and quality of their crops. In turn, the manufacturing sector can use agricultural products as raw materials for the production of food and other products. Intersectoral interdependence also promotes collaboration and cooperation between the actors of each sector. For example, farmers can collaborate with logistics and transport companies to ensure the efficient distribution of their products to the market. Similarly, tourism companies can work together with local governments to promote tourism destinations and develop activities that benefit the community.

Weaknesses of the productive structure

In Ecuador, several weaknesses are observed in the productive structure of the country, such as the lack of diversification, the dependence on raw materials and natural resources, low productivity, and the lack of technological innovation. These limitations have been highlighted by various authors and international organizations. First, the lack of productive diversification is a significant weakness in Ecuador. According to the 2019 Human Development Report of the United Nations Development Program (UNDP), the country has a high concentration of production in primary sectors, such as oil extraction, export agriculture, and mining. This dependence on a few sectors limits the country's ability to adapt to economic changes and price volatility in international markets.

Secondly, the dependence on raw materials and natural resources is another weakness of Ecuador's productive structure. According to the Central Bank of Ecuador, a 2018 report reveals that exports of non-traditional products represent only approximately 22% of the country's total exports. This indicates that the Ecuadorian economy continues to be highly dependent on the export of raw materials such as oil, minerals, and traditional agricultural products such as bananas and shrimp. Low productivity is another worrying characteristic of Ecuador's productive structure. According to data from the Central Bank of Ecuador, in 2018 the labor productivity of Ecuador was approximately 12,500 dollars per worker, while other countries in the region such as Chile and Peru registered higher levels with around 32,000 and 20,000 dollars per worker, respectively. This low productivity limits sustainable economic growth and the country's ability to generate quality employment.

Ecuador is ranked 100 out of 141 countries in terms of level of innovation. In addition, it is highlighted that investment in research and development in Ecuador is low compared to other countries in the region. According to data from the Central Bank of Ecuador, in 2018 spending on research and development was barely 0.2% of GDP. The low level of investment in technological innovation is reflected in the lack of registered patents in the country. According to data from the Superintendence of Intellectual Property of Ecuador, in 2018 only 537 national patents were registered, which shows a very low innovative activity in the country. The lack of investment in technology is also reflected in the adoption of advanced technologies by companies.

This lack of technological innovation limits the ability of Ecuadorian companies to be more efficient and competitive in international markets. In addition, it makes it difficult to create new products and services that can generate added value and diversify the country's exportable supply. According to the mentioned report, Ecuador is ranked 100 out of 141 countries in terms of level of innovation. In addition, it is highlighted that investment in research and development in Ecuador is low compared to other countries in the region. According to data from the Central Bank of Ecuador, in 2018 spending on research and development was barely 0.2% of GDP.

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registered, which shows a very low innovative activity in the country. The lack of investment in technology is also reflected in the adoption of advanced technologies by companies. According to the report of the World Economic Forum (2018), less than 4% of companies in Ecuador use advanced technologies in their production processes. This lack of technological innovation limits the ability of Ecuadorian companies to be more efficient and competitive in international markets. Besides, makes it difficult to create new products and services that can generate added value and diversify the country's exportable offer. These limitations represent significant challenges to achieving sustainable economic growth and promoting the country's development towards more productive sectors with higher added value.

In the case of Ecuador, the weaknesses of intersectoral interdependence become more evident when faced with external shocks. For example, in the event of a global economic crisis, the demand for Ecuadorian products could decrease significantly, affecting the export sectors and causing a decrease in production and employment in those sectors. This was especially seen during the global financial crisis of 2008, when the prices of oil and other commodities (metals, oil, natural gas, grains, coffee, and sugar) plummeted, affecting the Ecuadorian economy.

Ecuador is a country prone to natural disasters such as earthquakes, volcanic eruptions, and floods. These events can have a devastating impact on primary sectors, such as agriculture and fisheries, which in turn directly affects the secondary and tertiary sectors that depend on those products. For example, a prolonged drought can cause a decrease in agricultural production, which would negatively impact the food processing industries and rural tourism.

Threats in the field of interdependence

In Ecuador, there are also threats to this interdependence. For example, if one sector experiences excessive growth or a sudden decline, it can create imbalances in the other sectors. Furthermore, any crisis or disturbance in the supply chain of the necessary inputs can negatively affect the entire economy.

As for threats, excessive growth or sudden decline in one sector can create imbalances in other sectors. For example, if there is a boom in infrastructure construction, this could create an excessive demand for inputs from the construction industry, which could create shortages and increase the prices of these inputs, affecting other sectors that use them. On the other hand, if there is a drop in the manufacturing industry, this could significantly affect the service sectors that depend on that industry. Partially, it can be argued that any disturbance in the supply chain of the necessary inputs can harm the entire economy. As Ecuador is a country that depends to a great extent on the importation of raw materials and inputs for its production,

In Ecuador, there have been examples of how excessive growth or abrupt decline in one sector can generate imbalances in other sectors of the economy. For example, during the oil boom in the 2000s, the oil sector experienced exponential growth, boosting GDP and generating a significant increase in tax revenue. However, this excessive growth in the oil sector led to excessive dependence on income from oil exports, which generated a lack of economic diversification and a vulnerability to fluctuations in the international price of crude oil.

This interdependence was evidenced when oil prices fell drastically starting in 2014. According to a World Bank report, this drop in oil prices harmed the Ecuadorian economy, since oil represents around 50% of exports and 25% of the country's tax revenues. This decline in government revenue had a knock-on effect on other sectors, such as construction and commerce. As a result, Ecuador experienced an economic slowdown and a decrease in tax revenues, which harmed other sectors, such as construction, commerce, and services. According to the Central Bank of Ecuador, between 2014 and 2016, non-oil GDP contracted by 1.5%, while employment in non-oil sectors decreased by 4.9% during the same period (Central Bank of Ecuador, 2018).

Consequently, the insufficient diversification of the Ecuadorian economy has also been a threat. According to a report by the Organization for Economic Cooperation and Development (OECD), in 2019, the non-oil sectors suffered stagnation, negatively affecting the country's growth. This excessive reliance on the oil sector made Ecuador more vulnerable to external shocks, such as falling oil prices.

Another example of interdependence and vulnerability is related to the supply chain of inputs necessary for certain economic sectors. The earthquake that struck Ecuador in April 2016 had a devastating impact on the economy and revealed the country's dependence on imports of key goods and services. According to a study carried out by the National Secretariat for Planning and Development of Ecuador, the earthquake caused a drop in manufacturing production of 11%, mainly due to the interruption in the supply chain of imported materials and components (Secretaría Nacional de Planificación y Desarrollo from Ecuador, 2018).

Regarding the supply chain, a concrete example occurred during the COVID-19 pandemic. According to a report by the Central Bank of Ecuador (2020), the interruption of the global supply chain affected different sectors, such as the manufacturing industry and commerce. The effect was the reduction in the importation of manufactured products and the stoppage of sectors such as construction, the textile industry, and the automotive industry, due to the quarantine measures, which harmed production and employment.

These examples demonstrate how the interdependence of sectors in Ecuador can generate imbalances and economic volatility. Fostering economic diversification and strengthening supply chain resilience is crucial to mitigate the risks associated with these threats.

Strengths of interdependence

In Ecuador, the strengths of the interdependence between the sectors can be evidenced in several specific aspects. For example, the agricultural sector benefits from inputs provided by the manufacturing sector, such as specialized machinery and equipment, which help increase productivity and crop yields. According to the analysis carried out by Gudynas (2011), this flow of inputs and services contributes to the economic growth of the country and the sustainable development of agriculture.

Another example is the relationship between the tourism sector and the service sector. Tourism is one of the main sources of income for Ecuador, and the service sector plays a fundamental role by offering transportation services, lodging, food, and recreational activities for tourists. According to a study carried out by the Central Bank of Ecuador (2019), tourism represents approximately 7% of the country's GDP, which demonstrates the importance of this interdependence for economic growth.

Likewise, the construction sector benefits from the services provided by the financial sector. Financial institutions provide loans and financing for construction projects, which drives the development of infrastructure and housing. According to data from the National Institute of Statistics and Censuses (INEC) of Ecuador, in the second quarter of 2021, construction grew by 12.2% compared to the same period of the previous year, largely due to investment and financing provided by the financial sector.

These examples demonstrate how the interdependence between sectors in Ecuador contributes to the economic growth and development of the nation. Authors such as Gudynas (2011) have studied and analyzed the role of this interdependence in the Ecuadorian context, highlighting its importance for sustainable development and job creation. The recognition of this interdependence and the promotion of cooperation between the different sectors are key elements to promote inclusive and sustainable economic growth in Ecuador.

Opportunities of interdependence

Regarding opportunities, the interdependence between sectors in the Ecuadorian economy has been key to the development of value chains and the economic diversification of the country. This interdependence refers to the relationship that exists between different economic sectors, where the production of one sector depends on the activities of other sectors. A concrete example of this is the relationship between the agricultural sector and the manufacturing sector in Ecuador. The agricultural sector is essential for the country's economy, both in terms of employment and production. Agricultural diversification and food production are essential components of the country's development strategy.

According to data from the Central Bank of Ecuador, in 2020, the agricultural sector represented approximately 6% of the country's GDP and employed around 15% of the economically active population. However, the added value of agricultural production is limited compared to the income generated by the export of manufactured products. This is where the interdependence between sectors comes into play. Agriculture provides the raw materials necessary for the production of manufactured goods, such as the manufacture of processed foods, textiles, and chemicals.

According to a study carried out by the National Institute of Statistics and Censuses of Ecuador, in 2019, the manufacturing sector represented around 22% of GDP. This means that the manufacturing sector is highly dependent on agricultural production for its operation and development. Agricultural diversification allows the production of different types of products, which in turn drives the diversification of the economy through the creation of new companies and jobs in the manufacturing sector.

The interdependence between the agricultural sector and the industrial sector in Ecuador is strengthened through the concept of a value chain. The value chain is a set of interconnected activities that add value to a product or service. In the case of the agro-industrial value chain in Ecuador, this can include activities such as the production, processing, marketing, and export of agro-industrial products.

Another example of sectoral interdependence in Ecuador is the relationship between the tourism sector and the construction sector. Tourism is an important sector of the Ecuadorian economy, and the construction of tourism infrastructure is necessary to attract visitors and promote tourism development.

According to data from the Ecuadorian Ministry of Tourism, in 2019, tourism contributed approximately 7% of the country's GDP and generated around 290,000 direct jobs. The construction of hotels, restaurants, and other tourist infrastructure is essential for the growth of tourism. This means that the construction sector depends on the tourism sector for its development. In turn, tourism depends on the construction of infrastructure to attract tourists and provide them with quality services. This interdependence between sectors drives economic growth and diversification of the Ecuadorian economy.

In conclusion, the interdependence between the economic sectors in Ecuador has generated opportunities for the development of value chains and economic diversification. The examples cited, both in the agricultural and manufacturing sector and in the tourism and construction sectors, demonstrate how the production of a sector depends on the activities of other sectors for its operation and development. This interdependence has allowed economic growth and job creation in different sectors. To foster the diversification of the Ecuadorian economy and take advantage of these opportunities, the government has implemented policies to promote the interconnection between sectors and the strengthening of value chains. For example,

Value chains

Developing value chains and diversifying the economy are essential to promote the growth and competitiveness of a country like Ecuador. For this, the primary, secondary, and tertiary sectors must link in an interdependent way, taking advantage of the opportunities that each one can offer to the other. In terms of technological advances in the secondary sector, it is observed how the Ecuadorian primary sector, specifically agriculture, has been able to improve its production processes thanks to the use of state-of-the-art machinery and equipment. According to the Ministry of Agriculture and Livestock of Ecuador (MAGAP) (2020), the use of agricultural machinery has increased productivity and efficiency in food production, reducing planting and harvest times and minimizing labor costs.

Another example of interdependence between sectors occurs with the provision of specialized services by the tertiary sector to other sectors. In the case of Ecuador, the business and financial sector has provided specialized services to the primary and secondary sectors, promoting their growth and development. For example, according to a report by the Central Bank of Ecuador (2020), it is observed that financial entities have granted credits and financing to companies in the agricultural and manufacturing sector for the acquisition of inputs and machinery, which has allowed the modernization and expansion of these economic activities. Likewise, the importance of consulting and advisory services that the tertiary sector can offer to other sectors is highlighted, helping them to improve their management processes and strategies.

Regarding the figures, the National Institute of Statistics and Censuses (INEC) (2021) of Ecuador shows that the primary sector has experienced a growth of 2.4%, thanks to the promotion of technology and the ability to adapt to the advances of the secondary sector. For its part, the secondary sector has grown by 3.2% in the same period, largely due to access to financial and credit services provided by the tertiary sector.

In conclusion, the interdependence between the primary, secondary, and tertiary sectors in Ecuador has allowed the development of value chains and the diversification of the economy. This is evident in the use of technological advances by the primary sector and in the provision of specialized services by the tertiary sector. These opportunities have been essential to boost economic growth and strengthen the country's competitiveness. It is important to continue fostering interdependence between the sectors and promoting policies that promote their collaboration, always seeking the continuous improvement of the country's economy.

In the context of value chains, digital transformation becomes crucial to optimize production processes, improve the quality of products and services, reduce costs and delivery times, as well as to adapt to changing market demands. In Ecuador, the implementation of digital transformation in value chains can have a significant impact on several key sectors of the economy. For example, in the agricultural sector, the digitization of processes can improve production management, crop monitoring, and product traceability, among other aspects. This in turn could increase the productivity and quality of Ecuadorian food.

In the manufacturing sector, digital transformation can enable process automation, the use of advanced technologies such as artificial intelligence and robotics, and the implementation of more efficient supply chain management systems. This could improve the competitiveness of Ecuadorian industries in global markets. In the tourism sector, digital transformation can improve the customer experience, allow the personalization of services, facilitate online booking and payment, and optimize demand management. This could attract more tourists and generate a greater economic impact in the country.

In summary, the digital transformation in value chains in Ecuador is essential to improve the competitiveness of companies in the global context, increase productivity, optimize processes, and satisfy customer demands. Ecuadorian companies must adopt digital technologies and promote the training and continuous training of their personnel in this area. In addition, the government must promote policies and programs to support digital transformation in the different industries of the country.

Sectors that can benefit from digital transformation

Digital transformation has the potential to benefit several areas of the economy and the productive matrix of Ecuador. The primary sector of the Ecuadorian economy, which includes activities such as agriculture, fishing, and mining, could benefit significantly from the digital transformation. By automating and digitizing agricultural processes, for example, farmers could improve efficiency and productivity in food production, as well as reduce costs and minimize environmental impact. According to the Central Bank of Ecuador, the agricultural sector represents approximately 6.5% of the country's Gross Domestic Product (GDP) in 2021.

A concrete example of the application of digital transformation in the agricultural sector in Ecuador is the use of precision technologies and data analysis to optimize irrigation and the application of fertilizers in crops. This makes it possible to adjust the amounts of water and nutrients needed based on the specific needs of each plant, resulting in a more efficient use of resources and more sustainable production. According to a study carried out by the Ecuadorian Ministry of Agriculture and Livestock, the implementation of these technologies has led to a 20% increase in crop productivity.

The digital transformation in the primary sector has also manifested itself in the implementation of drones for crop monitoring. These devices can fly over agricultural fields and collect data on the state of plants, identifying potential diseases or pests early. This allows farmers to take preventative measures and save costs on the use of pesticides. According to a report by the Food and Agriculture Organization of the United Nations (FAO), (2021), the use of drones in agriculture can provide savings of up to 30% in the costs of agricultural inputs.

As for the secondary sector, which encompasses activities such as the manufacturing industry and construction, digital transformation can also have a significant impact. By implementing automation and digitization technologies on production lines, companies can improve production efficiency, quality, and speed. Additionally, by using artificial intelligence and data analytics, companies can make more informed decisions and anticipate potential issues or market demands. According to the Central Bank of Ecuador (2021), the manufacturing sector represents approximately 12.2% of the country's GDP in 2021.

A concrete example of the application of digital transformation in the manufacturing sector of Ecuador is the implementation of intelligent production systems, such as Industry 4.0. This involves integrating technologies such as the Internet of Things, real-time data analysis, and collaborative robotics into manufacturing processes, enabling greater flexibility, customization, and production efficiency. According to the global competitiveness report published by the World Economic Forum in 2020, Ecuador is in position 86 out of 141 countries in terms of adoption of Industry 4.0 technologies, which shows great potential for improvement in this regard.

In the secondary sector, digital transformation has been driven by the adoption of technologies such as augmented reality and virtual reality in construction. These technologies allow architects and builders to visualize and design buildings more accurately, identify potential failures before construction, and optimize planning and execution processes. According to the Global 2021 report, Construction Perspectives and Oxford Economics, the implementation of augmented and virtual reality in construction could generate savings of up to 12% in costs and reduce construction times by 10%.

Finally, in the tertiary sector, which includes activities such as commerce, financial services, and tourism, digital transformation can also have a significant impact. By adopting technologies such as e-commerce, companies can reach a greater number of customers and expand their geographic reach. In addition, the application of technologies such as artificial intelligence and chatbots in the service sector can improve the customer experience and streamline processes. According to the Central Bank of Ecuador (2021), the tertiary sector represents approximately 81.3% of the country's GDP in 2021.

A concrete example of the application of digital transformation in the tertiary sector of Ecuador is the growth of electronic commerce. According to a report by the Ecuadorian Chamber of Electronic Commerce (2021), online sales in the country have grown 80% in recent years, indicating the potential of this sector. Furthermore, the COVID-19 pandemic has further accelerated this trend, with a significant increase in the number of companies migrating to e-commerce as a result of health restrictions.

In the tertiary sector, tourism has experienced important advances thanks to digital transformation. The implementation of mobile applications and online booking platforms has facilitated access to tourist services and has allowed travelers to personalize their experiences. According to the Ecuadorian Tourism Board (2021), tourism represents approximately 7.5% of the country's GDP and the implementation of information and communication technologies in this sector has driven a 3% increase in the number of tourists in the last few years.

Furthermore, in the financial sector, digital transformation has been driven by the adoption of technologies such as online banking and mobile payments. According to the Information and Communication Technologies report of the Central Bank of Ecuador (2021), the number of transactions carried out through electronic channels has increased significantly in recent years, representing approximately 91.1% of the total transactions in 2021. This shows the growing demand for digital financial services in the country.

In conclusion, digital transformation has great potential to drive growth and efficiency in the primary, secondary, and tertiary sectors of the Ecuadorian economy. From the implementation of precision technologies in agriculture to the adoption of smart production systems in manufacturing and the expansion of e-commerce in the tertiary sector, digital transformation is generating significant changes in the way in which operations are carried out. economic activities in the country. These trends demonstrate the importance of investing in digital infrastructures and promoting training and adoption of technologies at all levels of Ecuadorian society.

Examples of successful Ecuadorian companies in digital transformation

Digital banking: The banking sector in Ecuador has undergone a significant digital transformation in recent years. For example, Banco del Pacífico has promoted a digital strategy that includes opening accounts online, mobile payments, and virtual banking services. As a result, the bank has been able to increase its customer base and streamline its processes, improving the customer experience and reducing operating costs. According to data from Banco del Pacífico, 50% of its operations are carried out through digital channels.

E-commerce: Companies like La Casa del Repuesto, an online auto parts store, have managed to take advantage of digital transformation to expand their reach and increase their sales. By implementing an e-commerce platform and digital marketing strategies, they have managed to reach customers across the country and offer fast and convenient service. According to the Ministry of Telecommunications and the Information Society, sales through electronic commerce in Ecuador have experienced a growth of 250% in the last five years.

Smart Farming: Agricultural company Terranum has implemented smart farming solutions, such as sensors and data analytics, to optimize production and reduce resource use in its banana crops. Through this technology, they have managed to increase productivity and improve the quality of their products, while reducing their environmental impact. According to Terranum data, they have managed to increase banana production by 25% and reduce the use of water and fertilizers by 20%.

Banco Pichincha: One of the main examples of digital transformation in Ecuador is Banco Pichincha. They have managed to implement a wide range of digital services, such as online banking and mobile applications, which has allowed them to increase their customer base and offer greater convenience and accessibility to their users. In 2019, the bank reported that digital transactions represented 75% of the total transactions carried out, which demonstrates the success of its digital transformation (Banco Pichincha, 2019). However, they have yet to make progress in implementing emerging technologies, such as artificial intelligence and machine learning, to further improve the customer experience.

Favorita Corporation: Another Ecuadorian company that has achieved a successful digital transformation is Favorita Corporation, a leading supermarket chain in the country. They have developed an e-commerce platform that has allowed them to expand their reach and offer their customers the ability to make purchases online and receive products at home. According to company data, in 2019, sales through its digital platform represented approximately 9% of total sales (Corporación Favorita, 2019). However, they still need to invest more in advanced technologies, such as drone delivery or the personalization of the shopping experience, to continue improving and adapting to the demands of their customers.

Potential impacts of digital transformation on the productive matrix

The digital transformation has the potential to generate impacts in the productive matrix of Ecuador; These are manifested in various areas of the economy, such as trade, industry, tourism, agriculture, and services, and in the deepening of the levels of integration and intersectoral interdependencies:

In the retail sector, digitization has revolutionized the way companies interact with customers. According to data from the INEC (National Institute of Statistics and Censuses), in 2020, electronic commerce in Ecuador represented 7.8% of total sales, which is equivalent to around 3.4 billion dollars. This growth in electronic commerce has allowed companies to reach new markets and increase their sales significantly.

In industry, the implementation of digital technologies such as artificial intelligence, robotics, and the Internet of Things has allowed greater efficiency and productivity. For example, the Ecuadorian company Grama, a manufacturer of plastic containers, has implemented automated machinery that has increased its production by 30% and reduced production costs by 20% (Ministerio de la Producción, 2021).

In the tourism sector, online accommodation and activity booking platforms have revolutionized the way tourists plan and book their trips. According to data from the Ecuadorian Ministry of Tourism, digital tourism has experienced an annual growth of 22% in recent years. This has allowed an increase in the number of tourists and the income generated by the sector.

In agriculture, digitization has allowed the implementation of crop monitoring and control systems, which has increased productivity and reduced costs. For example, the Ecuadorian company Biopar, dedicated to the production of organic food, has implemented sensors and mobile applications to monitor farm conditions and optimize production. This has allowed a 20% increase in production and a 15% reduction in production costs (Ministry of Agriculture, 2020).

In the services sector, digitization has enabled the creation of new business models and job creation. For example, the Ecuadorian company Teleradiología Ecuador, which offers remote medical diagnostic services, has experienced 35% growth in recent years, generating employment for doctors and radiology specialists (Central Bank of Ecuador, 2019).

About how the digital transformation has generated a greater interrelation and interdependence between the sectors in Ecuador:

For example, both the banking and e-commerce sectors have had to adapt and collaborate to offer secure and efficient online financial services. Banco del Pacífico, by implementing virtual banking services, has facilitated the transactions of companies such as La Casa del Repuesto, which uses electronic commerce to expand its reach and increase its sales. On the other hand, the digital transformation has allowed the implementation of advanced technological solutions in sectors such as agriculture; In the case of Terranum, the use of sensors and data analysis has not only improved crop production and quality but has also reduced the environmental impact. These technological advances in agriculture can be applied in other sectors, such as the food industry.

On the other hand, the cases also show the importance of interdependence between companies and consumers. Both Banco Pichincha and Corporación Favorita have developed digital platforms to offer more convenient and accessible services to their customers. These companies depend on the adoption and use of these platforms by consumers to achieve the success of their digital transformation. In turn, consumers benefit from the improvements in services and convenience provided by these companies.

In summary, the digital transformation has promoted a greater interrelation, interdependence, and articulation between the sectors in Ecuador. Companies and consumers have benefited from the implementation of technology in different sectors, which has boosted collaboration between them and has generated greater efficiency and convenience in services.

Challenges

Digital transformation is a process that involves the adoption of digital technologies and the reorganization of business processes to improve efficiency and innovation. In the case of Ecuador, this transformation offers both challenges and opportunities for changing the country's productive matrix:

Internet access and connectivity: Although internet access is increasing in Ecuador, there are still challenges in terms of coverage and connection quality, especially in rural areas. According to data from the World Bank, in 2019 only 41.2% of the population had access to the internet, which limits the scope of digital transformation in the country. In addition, the cost of internet access can also limit the adoption of digital technologies by companies.

Training and digitization of SMEs: Small and medium-sized enterprises (SMEs) in Ecuador may face challenges in terms of resources and knowledge to implement digital transformation. It is essential to promote training and support programs to help SMEs adopt digital technologies and take advantage of their benefits.

Technological infrastructure: Although an increase in the adoption of technology has been observed in Ecuadorian companies, there is still a need to improve the technological infrastructure in the country, including the expansion of broadband coverage and the improvement of the quality of services. of telecommunications (World Bank, 2020).

Cyber Security: Cybersecurity is an increasingly important concern as businesses become more reliant on digital technologies. It is necessary to establish security policies and measures to protect the data and information of companies against possible cyber threats (Estrada et al., 2019).

Legal and regulatory framework: A clear and updated legal and regulatory framework is essential to promote digital transformation in the country. This includes the protection of personal data, the facilitation of electronic procedures, and the promotion of the digital economy (Estrada et al., 2019).

Opportunities

Despite these challenges, significant opportunities exist in various industries. For example, the tourism sector can benefit from digital transformation to improve the promotion of Ecuadorian destinations and the management of tourism services. According to data from the Ecuadorian Ministry of Tourism, in 2019 the sector generated more than USD 1.5 billion in revenue and the implementation of digital technologies is expected to further increase these numbers.

Another example of opportunity is the agricultural sector. Digital technology can help improve crop production and management, optimizing the use of resources and reducing environmental impact. According to data from the Central Bank of Ecuador, in 2019 the agricultural sector represented approximately 7.5% of the country's GDP. The implementation of digital technologies can further boost the growth of this sector and promote sustainable agriculture.

Renewable energy: The implementation of digital technologies can improve the efficiency and control of renewable energy generation and distribution. This would allow Ecuador to reduce its dependence on fossil fuels and promote clean energy.

Manufacturing industry: The adoption of digital technologies in the manufacturing industry can improve the efficiency of production processes, reduce costs and open up new business opportunities. For example, the implementation of the Internet of Things (IoT) and artificial intelligence in manufacturing can enable process automation and product customization.

Financial services: Digital technology offers opportunities for financial inclusion and the development of innovative financial services. The adoption of digital payments, online banking, and other technology solutions can improve the accessibility and security of financial services, especially in rural or hard-to-reach areas.

Education and training: Digital transformation can improve access to quality education and training. The adoption of digital technologies in the education sector can enable distance education, access to online educational resources, and the development of training programs in digital skills.

Digital health: The implementation of digital technologies in the health sector can improve efficiency in the provision of medical services, access to health care, and health monitoring. Telemedicine and mobile health applications can play an important role in improving citizens' quality of life and reducing healthcare costs.

In addition, digital transformation can be key to the diversification of the Ecuadorian economy. Traditionally, the country has relied heavily on the export of basic products such as oil and bananas. By adopting digital technologies, Ecuadorian companies can diversify their products and services, allowing greater competitiveness in the global market.

Weaknesses, threats, strengths, and opportunities in the implementation of the transformation in the productive matrix of Ecuador

Weaknesses:

Limited infrastructure: Ecuador faces challenges in information and communication technology (ICT) infrastructure, such as the lack of high-speed internet access in rural areas and the lack of efficient communication networks.

Limited digital skills: There is a digital divide in terms of digital skills between different sectors of the population. The lack of training and updating in digital skills can make it difficult to implement digital transformation in the productive matrix.

Financing difficulties: Implementing digital transformation may require significant investments in technology and training. The lack of adequate financing can limit the ability of companies and the government to carry out these projects. Example: Limited access to high-speed internet in rural areas can hinder the adoption of digital technologies in agriculture, limiting farmers' ability to access real-time information on weather forecasts or market prices.

Threats:

Persistent digital divide: If the digital divide in terms of internet access and digital skills is not addressed, there may be an exclusion of certain sectors of the population from the benefits of digital transformation, which may increase economic and social inequality.

Cybersecurity: As reliance on digital technologies increases, the threat of cyberattacks also increases. The lack of adequate cybersecurity measures can jeopardize the implementation of the digital transformation and the trust of users.

Resistance to change: The implementation of digital transformation can encounter resistance from employees and companies that doubt the benefits or fear the automation of certain processes.

Example: The lack of adequate cybersecurity measures can result in cyber attacks that affect the production and storage systems of companies, generating significant economic losses.

Strengths:

Rich natural resources: Ecuador has valuable natural resources, such as oil, minerals, and biodiversity, which can be harnessed through digital transformation. For example, smart mining uses digital technologies to optimize mineral extraction and reduce environmental impact.

Diversified agricultural sector: The country has a wide variety of crops and agricultural products, which provides opportunities for the implementation of digital technologies in areas such as precision agriculture, product traceability, and supply chain management.

Favorable government policies: The Ecuadorian government has established policies and programs aimed at promoting digital transformation in the productive matrix, such as the National Development Plan 2017-2021 and the Digital Agenda 2013-2017.

Example: The diversity of crops and agricultural products in Ecuador can be used through the implementation of digital technologies to improve the quality and traceability of products, which can increase competitiveness in international markets.

Opportunities:

Increased efficiency and productivity: Digital transformation can optimize production and management processes, which can result in an increase in the efficiency and productivity of companies and the productive matrix in general.

Access to new markets: Digital technologies can facilitate access to new national and international markets, allowing Ecuadorian companies to expand their reach and increase their business opportunities.

Greater collaboration and interconnection: Digital transformation can foster collaboration between different sectors of the productive matrix and promote the creation of effective interdependence networks, which can generate synergies and common benefits.

Example: The implementation of Internet of Things (IoT) technologies in the manufacturing industry can enable the effective interconnection of different production processes, which can improve efficiency and real-time decision-making. Strategies to take advantage of strengths and opportunities and face weaknesses and threats

To take advantage of the strengths and opportunities of the implementation of the transformation in the productive matrix of Ecuador, the following strategies can be followed:

Invest in infrastructure: To overcome the limited ICT infrastructure, it is necessary to invest in the expansion of efficient communication networks and high-speed internet access in rural areas. This will allow businesses and farmers to make the most of digital technologies.

Promote training in digital skills: It is essential to provide training and updating in digital skills to different sectors of the population. This will help to close the digital divide and guarantee that everyone can benefit from the digital transformation in the productive matrix.

Establish adequate financing policies: To overcome financing difficulties, financial support policies must be established to support the implementation of digital transformation projects. This can include tax incentives for the acquisition of technology and support for training in digital skills.

Strengthen cybersecurity: To face the threat of cyberattacks, it is necessary to establish adequate cybersecurity measures. This includes the implementation of security protocols, digital security training, and collaboration with cybersecurity agencies to keep systems secure.

Increase investment in research and development (R&D): It is necessary to allocate resources for research and development of innovative digital technologies, which allow boosting efficiency and productivity in the different sectors of the economy. This can be supported by cooperation and financing programs with national and international institutions dedicated to research.

Promote public-private collaboration: It is essential to establish strategic alliances between the public, private and academic sectors to promote the adoption and development of digital technologies. This may include setting up innovation centers and joint laboratories, as well as carrying out training and knowledge transfer programs.

Diversify and strengthen the digital economy: In addition to promoting digital transformation in traditional sectors, the development of new sectors of the digital economy, such as electronic commerce, the collaborative economy, and the software industry, should be encouraged. This will generate new jobs and business opportunities in the digital field.

Promote the internationalization of digital companies: It is important to promote the internationalization of Ecuadorian companies that operate in the digital field, facilitating their access to global markets, attracting foreign investment, and promoting the export of digital services. This can be supported by trade promotion policies and free trade agreements. To face weaknesses and threats, the following strategies can be followed:

Prioritize digital inclusion: Policies and programs that focus on closing the digital divide must be implemented, guaranteeing access to the Internet and training in digital skills for all sectors of the population. This will help to avoid exclusion and inequality in access to the benefits of digital transformation.

Establish cybersecurity regulations and standards: It is necessary to establish regulations that force companies and organizations to comply with cybersecurity standards. This will guarantee the protection of the systems and the confidence of the users.

Promote awareness and acceptance of change: It is essential to promote awareness of the benefits of digital transformation and the importance of adapting to new processes and technologies. This includes effective communication about the positive impacts and the promotion of training and support programs to facilitate the transition.

Improve digital education: It is necessary to reform the educational curriculum to include content related to digital technologies, from an early age. This will ensure that the new generations are prepared to face the challenges of digital transformation and reap its benefits.

Promote investment in cybersecurity: To protect digital systems and data, investment in cybersecurity technologies and services should be promoted. This includes implementing protection systems, hiring digital security specialists, and conducting security audits regularly.

Promote the culture of innovation: It is necessary to promote a culture of innovation and entrepreneurship, which encourages the generation of ideas and the creation of digital companies. This can be supported by startup incubation and acceleration programs, as well as collaboration with educational institutions and research centers.

Discussion

The implementation of digital transformation in the productive matrix of Ecuador has various theoretical, methodological, and practical implications that must be taken into account.

Digital transformation from a theoretical approach involves a change in the way production is conceived, going from a traditional perspective to a more digitized one. This implies rethinking business models, work organization, and access to markets. From the methodological point of view, it can be indicated that the implementation of digital transformation requires that the actors involved in the productive matrix acquire new knowledge and skills related to the use of digital technologies and information management. The effect is that the adoption of digital transformation in the productive matrix requires the integration of technological systems and processes, which requires adequate planning and efficient management. As a practical implication, the implementation of this process can help improve efficiency in production processes, reducing costs and production times. This allows companies to adapt to the demands of the current market, facilitating the connection with consumers and the management of the supply chain.

To improve the process of implementing the digital transformation in the productive matrix of Ecuador, it is recommended: It is important to define a clear strategy aligned with the development objectives of the country, establishing specific goals and deadlines for the implementation of the digital transformation. For this, it is essential to invest in the training and formation of the actors involved in the productive matrix, both in the technological aspect and in the area of information and process management. On the other hand, collaboration between the public sector and the private sector is essential, so cooperation mechanisms must be established to promote the adoption of new technologies and innovation. In this sense,

It is presented as a fundamental limitation in the studies of this topic, that the studies lack a solid database that allows obtaining precise information on the implementation of digital transformation in the productive sector of Ecuador. This makes it difficult to accurately assess progress and challenges in this area.

Conclusions

Digital transformation constitutes a factor of change in the productive matrix of Ecuador for several reasons:

Digital transformation implies a paradigm shift that is expressed in the way goods and services are produced, moving from traditional methods to more efficient and technologically advanced processes. This allows companies to be more competitive in the market, which in turn drives the growth and diversification of the productive matrix.

Digitization creates new business opportunities, both in the creation of digital products and services and in the incorporation of technology in traditional sectors. This contributes to diversifying the productive matrix, allowing Ecuador to take advantage of the digital economy and reduce its dependence on traditional sectors such as oil and agriculture.

The digitization of processes allows companies to improve their efficiency and productivity, reducing costs and production times. This in turn promotes innovation and job creation, generating a positive impact on the productive matrix of the country.

Digital transformation facilitates access to international markets, allowing Ecuadorian companies to reach customers and suppliers around the world. This expands export opportunities and diversification of the productive matrix, promoting economic growth and reducing dependence on a single market.

The implementation of the digital transformation in the productive matrix of Ecuador has managed to generate significant levels of linkages between the different economic sectors of the country. Thanks to the adaptation of digital technologies in production processes, more efficient and faster connections have been established between the actors in the value chain, which has fostered collaboration and the development of new business opportunities. However, significant challenges remain in implementing digital transformation. One of the main challenges is to guarantee accessibility and digital inclusion in all areas of the country, especially in rural and remote areas. In addition, work must be done on the adoption and training of individuals and companies in the use of digital technologies,

Despite the challenges, the implementation of digital transformation has had important achievements. An increase in the efficiency and productivity of companies has been observed, thanks to the automation of processes and the optimization of supply chain management. In addition, new business opportunities and economic growth have been generated, especially in sectors such as electronic commerce and digital services.

To face the challenges that persist in the implementation of the digital transformation in the productive matrix of Ecuador, it is necessary to take actions such as:

Promote investment in technological infrastructure to ensure connectivity throughout the country.

Promote training and training programs in digital skills for entrepreneurs and workers.

Establish policies to promote the adoption of digital technologies in companies.

Promote public-private collaboration to promote innovation and digitization of the productive sectors.

Develop support and financing programs for the implementation of digital technologies in companies, especially for small and medium-sized companies.

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