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DEVELOPING

INNOVATION ECOSYSTEM TO ACCELERATE DIGITAL TRANSFORMATION IN THE ECONOMY

DESARROLLO DE ECOSISTEMA DE INNOVACIÓN PARA ACELERAR LA TRANSFORMACIÓN DIGITAL EN LA ECONOMÍA

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ABSTRACT

Digitalization and innovation have gained attention as important topics across sectors, profoundly influencing the transformation and success of the business landscape. In general, it is accepted that these elements are crucial for the revitalization of economies and the fostering of sustainable growth. But, considering the diversity of technologies and possibilities for accelerating digital transformation in this article we discussed the most promising approaches for their integration in innovation ecosystems, and, at the same time, shows the experiences of companies that have used these technologies successfully. The study show how digitalization accelerates labor productivity, business growth, and changes in industry dynamics while pointing out certain major implementation barriers faced by companies. By examining agile working methods and industry-specific impacts we provide actionable insights into how businesses can improve their efficiency and adaptability in the fast-changing digital economy. Therefore, this work contributes to the understanding of the role of innovation ecosystems in driving digital transformation and provides a roadmap for their implementation.

Keywords: Business, Digital transformation, Innovation ecosystem, Digital transformation models, Emerging technologies.

RESUMEN

La digitalización y la innovación han ganado atención como temas importantes en todos los sectores, influyendo profundamente en la transformación y el éxito del panorama empresarial. En general, se acepta que estos elementos son cruciales para la revitalización de las economías y el fomento del crecimiento sostenible. Pero, considerando la diversidad de tecnologías y posibilidades para acelerar la transformación digital, en este artículo se discuten los enfoques más prometedores para su integración en los ecosistemas de innovación y, al mismo tiempo, se muestra las experiencias de empresas que han utilizado estas tecnologías con éxito. El estudio muestra cómo la digitalización acelera la productividad laboral, el crecimiento empresarial y los cambios en la dinámica de la industria, al tiempo que señala ciertas barreras de implementación importantes que enfrentan las empresas. Al examinar los métodos de trabajo ágiles y los impactos específicos de la industria, se brinda información práctica sobre cómo las empresas pueden mejorar su eficiencia y adaptabilidad en la economía digital en rápida evolución. Por lo tanto, este trabajo contribuye a la comprensión del papel de los ecosistemas de innovación en el impulso de la transformación digital y proporciona una hoja de ruta para su implementación.

Palabras clave: Negocios, Transformación digital, Ecosistema de innovación, Modelos de transformación digital, Tecnologías emergentes.

INTRODUCTION

The changes that digital technologies have brought to all processes in businesses are increasing day by day. Some researchers attribute this to the fact that the application of digitization in industrial ecosystems is becoming more widespread. Markus & Loebbecke (2013) show that an ecosystem consists of sub-ecosystems within it. These sub-ecosystems, being directly connected to the upper ecosystems, interact with each other both indirectly and directly. In this context, innovation communities are any groups that create an innovation and are interested in using that innovation. These groups can be made up of organizations and people. According to Wang, innovation communities emerge around different types of regulatory activities and develop based on a common goal. If the common purpose disappears, they will surely cease to exist. An innovation ecosystem refers to the complex set of innovations developed internally, the producers of these innovations, and the interaction between them.

Participants of the innovation society are formed from different sectors. These participants have specific interests that motivate them. For example, scientists come up with a theory for any invention, engineers want to invent new devices, and salespeople want to find customers to sell their products. Of course, innovation is necessary for these processes to continue consistently and quickly. Although these ecosystem participants have different interests, these interests are actually interdependent (Wang, 2009).

Some researchers see the innovation ecosystem as directly connected to the economy. The innovation ecosystem models the economic dynamics rather than the energy dynamics of relationships between organizations whose purpose is to enable innovation and technology development. Here, the main participants in the ecosystem will include human capital and material resources that make up the institutional arrangements. The innovation ecosystem is made up of two distinct major economies: the market-driven commercial economy and the knowledge economy based on fundamental research (Granstrand & Holgersson, 2020).

In modern times, the widespread use of digital technology further enhances the flow of information between businesses. At the same time, this means that inter-organizational boundaries are also disappearing. Digital technologies can be useful to companies in the following areas:

- resource and capacity shortages are eliminated;
- businesses expand into new markets;
- opportunities arise to benefit from foreign and internal resources;
- new strategies for product development are found.

Digitalization is changing not only the way we communicate but also the landscape of business and work environments. If businesses are not successful in one place, they are forced to change and innovate. This is the only key to survival and success in the future. In order for a company to be digitally based, it is a basic condition to operate in an innovative environment. Digital transformation is not just about upgrading a website or replacing one device with another. This process should be data-driven, customer-centric, and actively aimed at growing, increasing sales, and reaching a larger audience.

In order to carry out digitization in business with quality, it is advisable to consider a number of issues:

- digitalization should not be done spontaneously; it should be clear what it means for both the business and its customers;
- a digital roadmap should be drawn up. This roadmap must include an action plan for how the technology will be implemented in the business;
- all data must be digitized, so that if the need arises, any information can be obtained efficiently and conveniently;
- it should be investigated for which aspects of the business automation will be useful. In which areas can software be used? What jobs can robots replace?

Thus, when we talk about digital transformation in the business environment, it is understood as a way to increase the automation of enterprises in order to speed up processes without human participation. For example, customers are more interested in how to successfully use the online capabilities of the offered system rather than using any support service. It is an accepted fact that the future of all businesses lies in the digital world. Digitalization of business goes hand in hand with automation and innovation. Business-oriented digitalization allows entrepreneurs to understand how to use technological opportunities, identify potential risks, and determine who to cooperate with to succeed in their projects.

Digitalization in business is characterized by a number of advantages:

- businesses increase their sales by saving additional costs.
- access to new audiences is accelerated.

- thanks to the Internet, time is saved, and a flexible work environment is created.
- new opportunities are opening up for small businesses. Digital tools are quick and inexpensive to acquire. In the past, opening a store required significant cost and time, but now it doesn't. You can also open an online store to sell your items.

To better understand digital transformation, we need to know its models. The following models are considered important in business:

1. Digital Innovation Model: It is a kind of digital vision. Businesses aim to better serve their customers by using the latest technologies. Therefore, companies are looking for new ways to align their strategies (Ancillai et al., 2023; Zhang et al., 2023).
2. Automation Transformation Model: Creating automated systems that will reduce costs while increasing business efficiency. For this, it is essential to be able to use data analytics tools together with artificial intelligence algorithms (Hetmanczyk, 2024; Lano et al., 2021).
3. Agile Transformation Model: Applying an iterative approach to achieving goals. It describes the company's process of moving to agile working methods. This model consists of applying the principles of adaptation to cooperation and teamwork to achieve goals. Agile transformation continues until the company achieves its initial goals. Once the business has reached a certain level, another plan for the next level is to be made, and new investments can be obtained (Ghezzi & Cavallo, 2020; Laanti, 2017).

Considering the elements discussed above, the main objective of this paper is to explore how digitalization and innovation can be effectively integrated into innovation ecosystems to accelerate digital transformation in the economy. It seeks to provide an understanding of the role of these technologies in revitalizing economies and fostering sustainable growth. Furthermore, the study aims to identify promising approaches to implementing digitalization in various industries, as well as highlight successful experiences of companies that have adopted these strategies. It also addresses significant barriers faced by organizations during the digitalization process and offers recommendations on agile working methods that can improve efficiency and adaptability in an ever-evolving digital economic environment.

DEVELOPMENT

As stated before, innovation ecosystems are intricate networks comprising diverse actors, resources, and relationships that collaborate to advance innovation. Mirroring natural ecosystems, where organisms interact for survival and growth, innovation ecosystems offer an environment conducive to generating, developing, and implementing innovative ideas. Core elements underlying these ecosystems include active players such as entrepreneurs, universities, and corporations; resources in the form of capital, talent, and infrastructure; and collaborative activities and relationships promoting knowledge flow. Besides, all of these elementes are embeded within an enabling culture with creativity and experimentation that adds the sparkle needed. Infrastructure comprising incubators and digital hubs also play their part in building these systems to support startup growth.

In this context digital transformation means the incorporation of digital technologies into all aspects of business, which really changes how operations are carried out and how customers interact. It involves embedding technology into processes, creating new business models, and fostering an economic shift toward digital services. It is continuous and agile, reshaping industries for greater productivity and economic growth. The interplay between innovation ecosystems and digital transformation is reinforcing, with the latter providing a platform for collaboration, resource sharing, and technological advancement that propels digital change. This relationship benefits SMEs through Digital Innovation Hubs, fosters cross-sectoral integration, and facilitates dynamic economic evolution.

Examples of sector-specific transformative potential could be Industry 4.0 in manufacturing and AI in healthcare. However, a number of challenges persist, which include regulatory complexities, unequal access to infrastructure, and difficulty in building trust among ecosystem partners. Strategies for maximizing these benefits include promoting open innovation, using collaborative platforms, and emphasizing customer-centric approaches.

Technologies accelerating digital transformation

Currently, the main factor that concerns businesses in the globalization environment is choosing which technologies and methods are most effective to use to accelerate digital transformation. At a time when the world is experiencing increased political tension and the effects of the pandemic, the digital transformation agenda is becoming more and more relevant. The success of companies in this process cannot be achieved by slow adaptation. Business owners must accelerate the digitization of their operations to stay ahead in the competitive economy. Having the right technologies is considered very important for improving business operations. On the other hand, the application of modern technologies across different sectors in the country's economy will further accelerate

digitalization. next, we discuss some of the most prominent technologies

A. Artificial Intelligence

Artificial intelligence technology and machine learning are considered to be the main factors of digital transformation. Being providers of more innovative and effective solutions, they have a significant impact on accelerating the market and increasing competitiveness. The main advantages of artificial intelligence in digital transformation are that processes are automated, manual intervention is reduced, and efficiency is increased.

Machine learning algorithms can analyze large data sets that are physically impossible for humans to process. Information that people might overlook is easily identified. With this, businesses can easily make data-driven decisions. Through artificial intelligence algorithms, customers' business history and behavior can be easily analyzed. Thus, it becomes possible to create targeted marketing campaigns.

There are four main elements of the concept of artificial intelligence:

Authentication: Satisfactory demonstration of compliance of applications to certain standards;

Reliability: Knowing whether a system is built correctly indicates its reliability;

Security: Certain security mechanisms are needed in areas where the use of artificial intelligence is possible;

Control: Areas beyond human control should not be left to artificial intelligence. For example, human control should be ensured in self-driving cars (Halil & Övgü, 2020).

There are several ways that companies can harness the power of artificial intelligence. First, companies are automating their accounting tasks through intelligent classification techniques. Enterprise resource planning (ERP) systems can now scan physical invoices and identify key data related to sales and related costs. Additionally, these systems automatically process data to reconcile accounts, speed approvals, and detect fraud. Companies are also implementing artificial intelligence-powered digital assistants that make it easier to get work done. Finance departments can use digital assistants to keep employees informed. They can automatically send expense reports for faster reimbursement. The main AI tools used by companies include smart assistants, helpdesk chatbots, personalized recommendations, facial recognition technology, predictive maintenance, customer relationship management (CRM) systems, fraud detection, and more.

B. Cloud Computing:

In today's technology, there is a need to store more data on devices. This creates significant problems such as hosting capacity. Solving these issues related to the memory capacity of computers and laptops significantly increases their price. To overcome these difficulties and eliminate additional costs, emerging Cloud Technology includes the service of storing and processing data over the Internet. With this tool, it is possible to access any information even with the lowest capacity device.

Transactions take place over a digital network within multiple servers. In technology, there is software with a combination of three structural blocks: SaaS (Software as a Service), PaaS (Platform as a Service), and IaaS (Infrastructure as a Service). Cloud Technology creates opportunities to use it in different ways and areas:

- Public cloud: Mostly small and medium-sized companies use it. E-mails are an example of this pay-as-you-go model.
- Private cloud: The technology preferred by large companies. Here, security and privacy are at a high level, with data at the discretion of the founder.
- Hybrid cloud: This technology combines Private and Public cloud. For example, Netflix uses this model, utilizing public cloud to store customers' device data and payment details, while using private cloud for web hosting.

The main platforms that implement cloud computing services globally include: Google Drive, Yandex.Disk, SkyDrive, Dropbox, Box, Cloud, Ubuntu One, CloudLinux, Microsoft Azure, Oracle Cloud, and IBM Cloud.

C. Blockchain:

Blockchain is considered a major game-changer in the world of digital transformation. In Blockchain, data is stored in blocks linked together like a chain and in chronological order. Data is recorded in a way that anyone can verify and monitor. Records added to the system cannot be deleted or modified later. Permission must be obtained from all registered directories connected to the network before adding anything to the chain. To change or delete records in blocks, you need to change all the blocks in the register. This seems almost impossible. It is not possible to change data in the system without the consent of all parties. This also prevents fraud and data alteration. Currently, the area where blockchain is most widely used is cryptocurrencies. Blocks on the Bitcoin blockchain keep records of Bitcoin transfers between users.

The important features of blockchain are considered to be: secure, data immutability, decentralized, fast, open

and transparent, with minimal or no costs. Blockchain creates the following economic opportunities:

- All individuals have access to banking services.
- Money transfers between countries occur quickly and without additional costs.
- Financial services become more transparent.

D. Big Data and Analytics

Processing large amounts of data in business under modern conditions is one of the main obligations of digital transformation. Big data and analytics tools are completely based on real data analysis. This enables businesses to target advertising spend, reduce costs, save labor, and deliver products that meet expectations. Examples of companies offering big data tools include: Google Cloud, Amazon Web Service, IBM Big Data Platform, Microsoft HDInsight, Hortonworks Data Platform, IBM Watson, Pivotal Cloudera CDH, and MapR.

Companies such as Amazon and Walmart, which make the best use of Big Data and Cloud computing technology, have significantly increased their sales with information obtained from user preferences on social networks. With the use of big data, banks can see the details of money movements, better understand consumer behavior, and predict and prevent theft. In the international arena, banks have begun to take advantage of the power of big data in many areas, such as risk management, customer behavior analysis, regulatory compliance management, cross-product sales, and dealing with financial crimes (Ertuğrul, 2018).

E. 5G Technology

The main advantage of 5G technology is high speed, which was not observed in previous technologies. This speed offers beneficial opportunities to users in many areas such as education, health, transportation, commerce, and social interactions. Thanks to 5G technology, it will be possible to reduce energy consumption and extend the battery life of devices. In the long term, it is expected that regional economies will strengthen along with the expansion of mobile network access.

5G usage scenarios will be possible in factories, mining, oil and natural gas, automotive plants, education, and the iron and steel sector. For example, when there is a malfunction in equipment that works in the traditional way in factories, manual intervention is typically required. However, when you are far away and no specialist is present, it is possible to find a solution by contacting a specialist using special glasses. A report by Oxford Economics indicates that the integration of 5G using mmWave spectrum has the potential to increase productivity in global GDP by 1.7% in 2030 (Oxford Economics, 2023).

F. Quantum Computing

Quantum computing represents the creation of technology that can manipulate various laws of physics. A quantum computer uses the unique properties of quantum physics to solve problems that are too difficult for normal computers and supercomputers. There are opportunities to solve optimization problems more efficiently with quantum computing algorithms. It can greatly benefit logistics companies, financial institutions, and supply chain management by optimizing routes, reducing costs, and increasing efficiency. IBM is already working with firms such as JP Morgan and Barclays to create specialized financial software for quantum computers. It is believed that the detection of financial fraud and attempted theft can be accelerated with the help of quantum computers (Gülden, 2023).

How digitalization contributes to business growth

Digitization has the power to affect the economy in various ways. Transformation creates efficiencies by automating business operations and reducing costs. The rapid development of technology is fundamentally changing the business world. Technologies such as big data analytics, cloud computing, and artificial intelligence are giving businesses a new look. The form of production becomes more efficient with automation. Smart factories optimize the efficiency of machines, equipment, and production processes. The financial sector has become safer, faster, and more accessible with the help of digitization. Technologies such as digital payment systems, mobile banking, and blockchain have changed the shape of financial transactions around the world.

Digital transformation has also significantly impacted the field of education and learning. Distance education platforms and virtual classrooms offer online education content and remote learning opportunities. The retail sector is one of the areas that most strongly feels the impact of digital transformation. Innovations such as smart stores, online shopping, and mobile payment systems have fundamentally changed the customer experience.

Adaptation of business areas to digital transformation is a very important factor in order to continue competition and explore new opportunities. The successful business models of the future will be those that strategically embrace digital transformation and constantly innovate. Digitalization also has some disadvantages. These disadvantages include security risks, dependency, and privacy violations. Digitization brings with it security challenges

such as online fraud, increased cybercrime, and data breaches.

Agile project management

Agile project management is short and cyclical in nature. With this approach, better and faster forecasting of customer demand is possible. Agile project management is a way of working that involves delivering a project throughout its entire life cycle. With the help of such an iterative development process, teams work until they are satisfied with the result. The advantage of iterative work is that it is possible to solve problems and adjust as you go. Some important agile methods are used according to the application area. These methods show concrete steps you can take to solve problems within the organization.

The Scrum Agile method is about managing work and projects. The Scrum Method is used to manage software processes. It also ensures goal attainment through planning and regular feedback. This method is based on the principles of transparency, adaptation, and monitoring. The Kanban method is built on communication and transparency. This allows team members to know what stage they are at with their intended plan. The method is considered much better for situations facing small changes. Lean Agile is a method of orientation and regulation aimed at achieving organizational goals. Processes can be repeated, and routines can be part of development. In these processes, the added value of the product or service is delivered for what the customer ultimately pays.

But in general, the Agile Manifesto is built on some core values. These are as follows:

1. Cooperation with the client is more important than contractual agreements.
2. People and communication are more important than processes and tools.
3. Reacting flexibly to change is more important than following a rigid plan.

CONCLUSIONS

Nowadays, it is impossible to imagine businesses without digitalization. Digital transformation has become an indispensable component of modern businesses, reshaping operations across sectors through the integration of innovative technologies. These technologies have enable companies to operate transparently, reduce costs, save time, and minimize issues such as information falsification. For businesses to be successful in a competitive environment, adaptation to digital transformation is no longer an option but a strategic necessity for opening up new opportunities. In this regard, innovation ecosystems provide a basic framework that accelerates this transformation through collaboration among diverse stakeholders. Open innovation, startup engagement, and shared platforms help drive cost reduction, improve competitive positioning, and enable organizations to manage both risks and rewards together. By harnessing collective intelligence and resources, businesses can respond more effectively to the demands of a rapidly evolving digital landscape. However, challenges such as regulatory constraints, inadequate digital infrastructure, and misalignment among stakeholders need to be addressed. This challenges are more notorious in developing countries, but also iun emerging economies. We believe that understanding and leveraging these dynamics will position organizations to succeed in the digital age and turn challenges into pathways for long-term economic and operational excellence.

REFERENCES

Ancillai, C., Sabatini, A., Gatti, M., & Perna, A. (2023). Digital technology and business model innovation: A systematic literature review and future research agenda. ***Technological Forecasting and Social Change***, ***188***, 122307. https://doi.org/10.1016/j.techfore.2022.122307

Ertuğrul, A. (2018). Big Data: Application Areas, Analytics and Security Dimension. ***Journal of Information Management***, ***1***(2), 1–22.

Ghezzi, A., & Cavallo, A. (2020). Agile Business Model Innovation in Digital Entrepreneurship: Lean Startup Approaches. ***Journal of Business Research***, ***110***, 519–537. https://doi.org/10.1016/j.jbusres.2018.06.013

Granstrand, O., & Holgersson, M. (2020). Innovation ecosystems: A conceptual review and a new definition. ***Technovation***, ***90–91***, 102098. https://doi.org/10.1016/j.technovation.2019.102098

Gülden, K. (2023). Quantum finance. ***Journal of International Economics, Finance and Trade***, ***1***(1), 17–23.

Halil Yasin, T., & Övgü, B. (2020). Digital transformation office in the context of artificial intelligence. ***Ankara University SBF Journal***, ***75***(2), 775–803.

Hetmanczyk, M. P. (2024). A Method for Evaluating the Maturity Level of Production Process Automation in the Context of Digital Transformation—Polish Case Study. ***Applied Sciences***, ***14***(11), Article 11. https://doi.org/10.3390/app14114380

Laanti, M. (2017). Agile transformation model for large software development organizations. ***Proceedings of the XP2017 Scientific Workshops***, 1–5. https://doi.org/10.1145/3120459.3120479

Lano, K., Kolahdouz-Rahimi, S., & Fang, S. (2021). Model Transformation Development Using Automated Requirements Analysis, Metamodel Matching, and Transformation by Example. ***ACM Trans. Softw. Eng. Methodol.***, ***31***(2), 18:1-18:71. https://doi.org/10.1145/3471907

Markus, M. L., & Loebbecke, C. (2013). Commoditized Digital Processes and Business Community Platforms: New Oppornsformation of manufacturing on corporate performance—The mediating effect of business model innovation and the moderating effect of innovation capability. ***Research in International Business and Finance***, ***64***, 101890. https://doi.org/10.1016/j.ribaf.2023.101890