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The Impact of the Pandemic on the IT Industry in Romania

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Abstract. *IT development and digitization is a controversial topic when it comes to employment, because according to previous reports, technological advances may lead to the disappearance of some jobs at first sight, but in the long term they stimulate the creation of new jobs by increasing and economic development. Digitization changes the rules of operation of the labor market and also imposes on employees the need to adopt new skills and abilities through a proactive attitude. The purpose of developing the bachelor's thesis entitled "The impact of the pandemic in the IT industry in Romania" is to analyze the situation of the IT industry in Romania and to observe its evolution over the years in order to obtain an overview of the state in which the industry finds itself, following come up with a series of recommendations and solutions aimed at improving the IT industry in the future as well as solving some difficulties that remained either unsolved or only partially solved. Based on the processed information, the aim is to obtain data on the adaptability of enterprises, to find out the number of innovative enterprises, how many employees they have and their evolution over time.*

Keywords: COVID-19, IT industry, labor force, Romania.

Introduction

The impact of information technology (IT) on the labor market has become a hotly debated topic in recent times (Burlacu, 2021). In most recent studies, dating from 2020, a comparison is made of the effects of the IT industry on the labor market between EU countries and Romania (Belostecinic et al., 2022). The study reveals the existing gaps between Romania and other EU countries and underlines a strong positive correlation between the digitization of an economy and labor productivity (Radulescu et al., 2021).

The information technology industry is the star industry in recent economic history amid the intense digitization of any sector (Ciobanu et al., 2019). Romania has strongly felt this global status of information technology, especially in recent years when it became an oasis from an economic point of view for IT solution manufacturers who found here sufficient, highly qualified workforce and at much lower costs compared to other EU countries (Ladaru et al., 2022). Thus,

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labor productivity is very high compared to other sectors of the Romanian economy, of around 50,000 euros per employee per year (Acioli, Scavarda& Reis, 2021).

According to statistics, Romania is one of the leaders in the European Union, in 2019 Romania ranked third in Central and Eastern Europe in terms of the number of IT employees with 197.000, after Poland with 511.000 and the Czech Republic with 214.000. 12.000 IT companies were present in Romania, with investments worth 159 million euros and generating 5.9% of GDP, more than the European average. In the last decade, at least 50 large international companies in the technology sector have opened offices in Romania, among which are also giants such as IBM, Microsoft, Oracle, Intel, etc. (Davidescu et al., 2021).

The problem of the imbalance between demand and supply in the IT market is also recognized in other countries, such as Russia and Ukraine, where the active participation of the government is necessary to achieve a balance between technological development and the creation of a favorable environment for the functioning of the labor market. (Akpan, Udoh& Adebisi, 2020).

The majority of employees in the IT sector consider the legal sector to be very attractive from the point of view of financial reward, and most of them have acquired experience from a young age, many without following specific specialist studies, a good part of them considering them not to be necessary to work and perform in the field, placing an emphasis on self-learning which he considers to be much more effective than formal IT courses .

In particular, the tax incentives enjoyed by the IT sector play a significant role in preventing the loss of more IT workers through emigration, as well as stimulating investment in the sector (Profiroiu et al., 2020). Income tax exemptions and tax exemption on reinvested profits in the purchase of technological equipment and incorporated assets are some of the measures taken that must be adapted according to the evolution of the market. (Marinescu, 2021).

Literature review

The COVID-19 pandemic has revealed the need to urgently redesign the healthcare system from reactive to proactive and come up with innovations to facilitate proactive decision-making at local, state and national levels. (Balakrishnan& Ramanathan, 2021).

Technologies based on artificial intelligence (AI), machine learning, image recognition and deep learning can be used for early detection and diagnosis and prevention of infections, but also for the faster development of new treatments.

Big Data Analytics can be used to identify people who need to be quarantined based on their travel history, to accelerate the development of antiviral drugs and vaccines, and to understand the spread of COVID-19 over time and space (Gâf-Deac et al., 2024). In Taiwan, big data analysis has been successfully applied to help identify COVID-19 cases and generate real-time alerts by analyzing clinic visits, travel history, and presenting symptoms

Infrastructures such as supercomputers (High Performance Computing) are needed to tackle complex scientific problems and to process enormous amounts of data in shorter time frames to develop new drugs and vaccines (Negescu et al, 2021). For example, the High Performance Computing COVID-19 Consortium was launched to leverage computing resources in the US through the collaboration of the US Department of Energy and other leaders in academia and industry (Florescu & Burlacu, 2021).

Mobile applications can be used to track people's movements, to warn people visiting outbreaks of COVID-19, to help doctors diagnose patients through video and telemedicine services, telework, online shopping, e-learning. (Ivanov, Dolgui&Sokolov, 2019).

Through the use of portable devices, it is possible to diagnose patients, monitor and recover them, it is possible to observe whether patients comply with the requirements of quarantine, data relating to their state of health, such as temperature, is collected, based on which the medical staff can take the necessary decisions and measure (Ghobakhloo, 2020).

The COVID-19 pandemic highlighted the weaknesses of existing public health systems (Popescu et al. 2021). To combat the pandemic effectively, unprecedented coordination of medical personnel and systems worldwide is required (Sarbu et al., 2021). Public health researchers, epidemiologists, and government officials need to be connected through integrated systems to better understand the evolving pandemic and take appropriate action to manage this crisis (Monostori& Váncza, 2020).

Currently, most systems and applications designed to combat the pandemic are defined by poor interconnectivity, as they were developed by separate government agencies and health authorities. The imposition of standardized protocols by governments, healthcare organizations and IT is necessary to facilitate data communication and security (Ralston& Blackhurst, 2020).

Since the countries of the world have faced this pandemic in different contexts and times, the World Health Organization proposed in 2020 the establishment of a coordinated effort based on the exchange of knowledge, specific solutions, resources, practices and effective strategies to combat the Covid-19 virus (Nuta et al., 2024),

IT professionals have created the applications, services and systems for quarantine monitoring, but these technologies are viewed with distrust and concern by many citizens because in the eyes of the common man they represent a limitation of personal rights and freedoms (Burlacu et al., 2020).. Public trust is necessary in the adoption of these emerging technologies, and these unfounded doubts only serve to undermine public trust and slow their adoption. (Türkeş et al., 2024).

In the context of this pandemic characterized by many losses of human life, IT researchers must contribute to the evaluation and education of the use of digital technologies in a responsible way, to the development of ways to encourage users to share relevant data, to ensure that the use of information is used based on ethical principles to ensure transparency, fairness and security, thereby enhancing public trust. (Türkeş et al., 2024).

The importance of IT infrastructure in enabling telecommuting, online learning, e-government, e-commerce and other online activities has been widely recognized. The pandemic is forcing a record number of employees to work remotely for an extended period, leading to heavy online traffic. It is imperative to continue investing in the development of IT infrastructure and accelerating digitization efforts to face both the impact of the COVID-19 pandemic and future health crises (Burlacu et al., 2021).

Considering the social distancing imposed, the ability of companies to adapt to the new situation and continue to carry out their activity remotely through telework has proven to be a real challenge as well as a long-term investment for many businesses. In this context, with the exception of companies that have benefited from an agile operating system, the knowledge necessary to coordinate teams and the use of high-quality practices to achieve continuous productivity, as well as ensuring the well-being of employees, many companies have had to resort to restructuring the workforce or going bankrupt, thus resulting in increased unemployment (Bran et al., 2023).

Indeed, the COVID-19 crisis represented a series of challenges for Romanian businesses, but it also represented a series of advantages and opportunities, among which we can mention digitization and the adoption of agile concepts in the conduct of businesses (Radulescu et al., 2021).

Digitization can be considered the first solution adopted by organizations in the world, representing the only way to continue their activity (Burlacu et al., 2020).

This represents a solution that contributes to the creation of new jobs, the progress of the educational system, the stimulation of competitiveness and innovation, but the forced transformation has raised new difficulties because it requires the development of new digital skills for employees, which requires first of all that they be open to acquiring this knowledge and be supported by appropriate training and on-the-job learning.

According to a 2021 study by the European Investment Bank, there is a gap between the level of digitization in Romania compared to the other EU member states, i.e. in 2020 in Romania only 40% of SMEs have implemented at least one digital technology, compared of the European average of 55%. Some of the major obstacles encountered in the digitization process are the associated costs, resistance to change, the way in which the digitization budget was allocated (Radulescu et al., 2021).

Due to the considerations of this slow evolution, the Authority for the Digitization of Romania (ADR) was established in 2020 to achieve the objectives set by the Government of Romania for digital transformation. ADR proposes the following: the implementation of an electronic identity project; the development of a national strategy in the field of digital transformation; promoting the adoption of advanced technologies, designing and implementing IT systems that can facilitate digital interaction at the public administration level.

Another objective of the Authority for the Digitization of Romania is to accelerate the digitization of enterprises by implementing concrete digital solutions based on artificial intelligence and services that contribute to the digital literacy of the workforce: archiving documents in electronic format; the possibility to issue invoices electronically; digitization of data collection; developing the digital skills of employees and entrepreneurs; as well as the possibility to access non-reimbursable funds by SMEs for digitization investments.

Online education has created unprecedented learning opportunities during the Covid pandemic. This method of education can be achieved by combining interactive online courses with recorded lessons, thereby reducing the impact of connection problems and simultaneously increasing the active participation of students. (Radulescu et al., 2021).

The online learning system introduces new courses and innovative learning methods, encourages students to exercise their freedom and independence, enjoying self-challenge and working at their own pace. This has the benefit of reducing costs for both students and educational institutions, but the high quality of teaching must be ensured. Bringing in special guests can deeply enrich the lessons and topics studied, the main problem being their availability due to non-complementary schedules and geographical movements, but with the e-learning platform this becomes a problem of the past and allows specialists the necessary flexibility to share their experience practice (Farooq et al., 2021).

Other main benefits recognized by most teachers are the following: the ease of conducting online courses, the flexibility of the program, the ability to adapt to various teaching styles, the availability of the necessary resources to monitor and document the didactic activity (Malik, Masood& Kousar, 2020).

According to Verestiuc, since they cannot understand what they are being taught or cannot process the information due to ineffective pedagogical techniques, the number of students who have lost their motivation to learn has increased during the COVID-19 pandemic. Once motivation was lost, dropping out was just the next step, an inevitable progression because teaching was problematic and assessments felt less meaningful.

However, the COVID-19 pandemic did not cause professional abandonment only among the student population; teachers being put in a precarious situation, especially those who suffer from chronic diseases and fear that infections can be catastrophic for them. As a result, as Cojan pointed out, many of them seem to have asked for early retirement. It is clear that teachers must not only familiarize themselves with electronic devices for better academic performance in online education (during or after the COVID-19 pandemic), but also undergo digital training on a constant and regular basis.

According to Nandi et al., there is a direct link between the digital competence of teachers and the natural expectations of students, so the issue must be addressed in a way that improves online education for both categories: teachers and students.

Digital training is important, vital even for teachers not only during the COVID-19 pandemic, but also beyond it, being crucial for teachers primarily because of the times we live in, where electronic devices and internet services become complementary elements of education naturally

Methodology

The process of developing the paper was structured in three distinct stages, namely defining the problems - identifying the most relevant distortions or constraints that limit the performance factors of the industrial system; identifying the policy mechanisms responsible for impacting, directly or indirectly, on the industrial system; recommendations for an industrial policy framework at the level of the Ministry of Economy, Entrepreneurship, both through a direct intervention role and one of coordination with other institutions.

The research methods used were predominantly quantitative regarding statistical data at national, sectoral or European level, supplemented by qualitative methods for analyzing relevant documents/programs at the level of the industrial system, both European and national. The research methods used were the following: 1. document analysis / content analysis / comparative analysis; 2. analysis of statistical databases (quantitative method). The qualitative analysis underlying the Romanian Industrial Strategy included several cross-cutting areas with an impact on industrial policy: trade, internal market, research and innovation, employment, environmental protection, defence and public health.

The quantitative analysis focuses on the evolution of the headline indicators included by the European Commission in the list of key indicators used to monitor the Industrial Strategy of the European Union. Among the criteria considered for the selection of these indicators are the availability of data sources, their degree of updating and relevance to the themes of the Strategy, as well as their ability to facilitate international comparisons. The full list of these indicators is presented in the Annual Report on the Single Market for 2022.

The analysis methodology also takes into account the correspondence between the ecosystems defined in this report and the NACE activities at division level. Other indicators were added to the analysis, such as those associated, on the one hand, with resources – labor force, investments, research and development expenditures – and, on the other hand, with results – apparent labor productivity and value added.

In the context of the crisis in electricity and natural gas prices, a brief description of their evolution compared to European levels and those of some neighboring countries was also added, taking into account the effects they had on enterprises and inflation in the last two years. Finally, an image of the proportion of vertical specialization of industrial ecosystems was included, an indicator widely used in the analysis of value chains. The data sources used come from the National

Institute of Statistics (Tempo online database), Eurostat (statistical database) and OECD (Trade in Value Added – Tiva database)

Results and discussions

The impact of the pandemic on society has radically changed the operating mode of the education system, of health as well as of the IT systems, these being forced to adapt to the new requirements in order to combat the uncontrolled spread of the virus, to assist in the normal development of economic activities, but and to maintain an element of normality and predictability in the everyday life of the common man, both in the context of education, the professional environment and the family environment.

In this part of the paper, the evolution over time of different indicators will be analyzed such as the total number of enterprises, innovative enterprises, enterprises with product and business process innovation, the evolution of the number of employees for innovative enterprises according to product innovation, process innovation or in the case of both.

In order to appreciate in a qualitative and quantitative manner the changes that have occurred, the following indicators can be observed and analyzed with the aim of obtaining a deeper understanding and forming a series of conclusions regarding the impact of the pandemic on the IT industry in Romania.

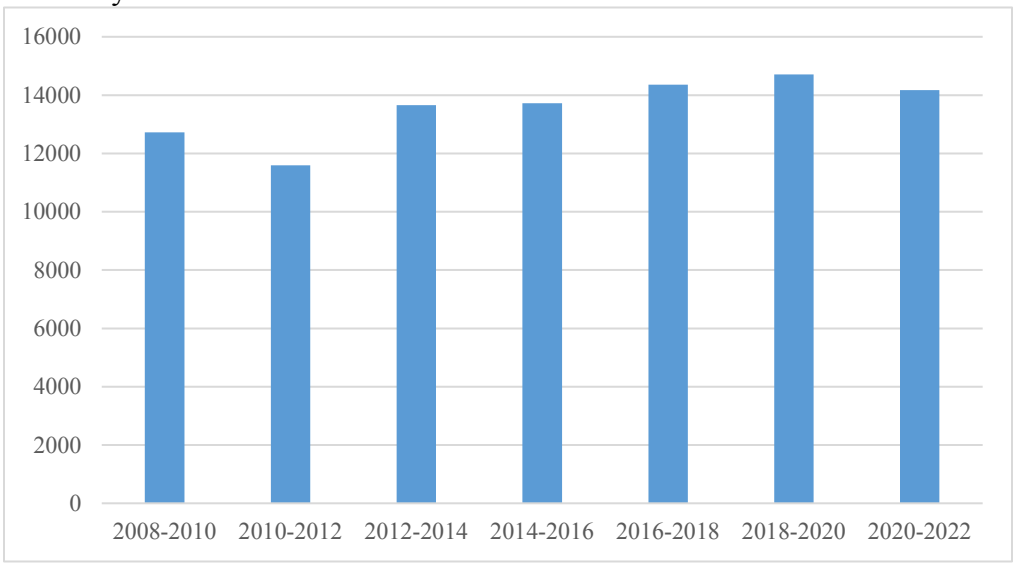

Figure 1. Evolution of the total number of enterprises for services in the period 2008-2022

Source: INSSE.

In figure 1, it can be seen that the total average number of service enterprises in the period 2008-2022 was 13561. In the analyzed period, there was an increasing trend from 12719 enterprises in the period 2008-2010, to 14168 enterprises in period 2020-2022.

Therefore, we can state that from year to year, the total number of enterprises increased, on average, by 206, respectively by 1.81%.

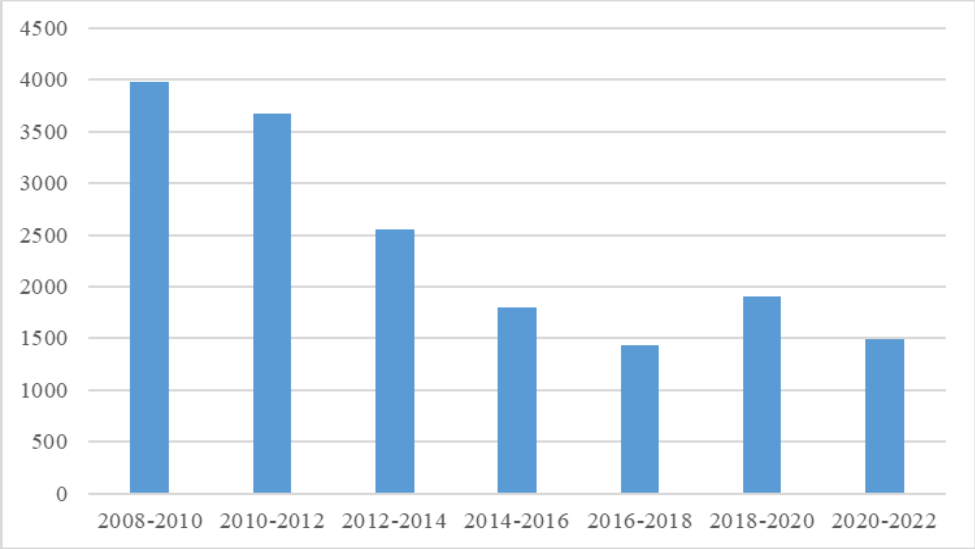

Figure 2. Evolution of the total number of innovative enterprises for services in the period 2008-2022

Source: INSSE.

In figure 2 it can be seen that the average number of innovative enterprises in the period 2008-2022 was 2406. In the analyzed period there was a downward trend from 3983 enterprises in the period 2008-2010, to 1496 enterprises in the period 2020 -2022.

Therefore, we can state that from year to year, the total number of enterprises decreased, on average, by 356, respectively by 15.05%.

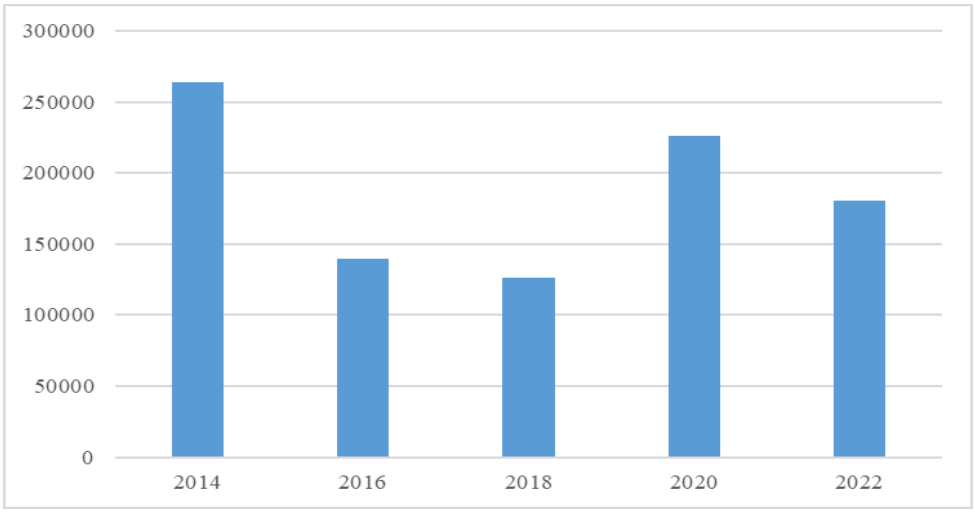

Figure 3. Evolution of the total number of employees for innovative service enterprises in the period 2014-2022

Source: INSSE.

In figure 3, it can be seen that the average number of employees for innovative service enterprises in the period 2014-2022 was 187,100. During the analyzed period, there was a downward trend from 264.031 employees in the period of 2014 to 180.172 employees in period 2022. Therefore, we can state that from year to year, the total number of employees for all enterprises decreased, on average, by 16.772, respectively by 9.11%.

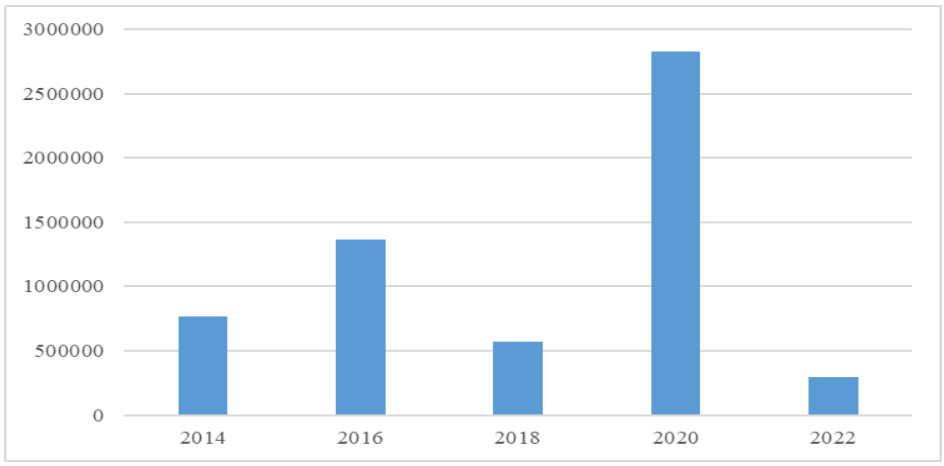

Figure 4. The evolution of the total expenses for innovation of enterprises (in thousands of RON current prices) in the period 2014-2022

Source: INSSE.

In the figure above, it can be seen that the average number of total expenses for innovation of enterprises for services in the period 2014-2022 was 1703722 thousand RON.

During the analyzed period, there was a growth trend from 769.708 employees in 2014 to 2.988.722 employees in 2022. Therefore, we can state that from year to year, the total number of employees for all enterprises increased, on average, by 443801, respectively by 40.37%.

Conclusion

The Covid-19 pandemic had a profound impact on the IT industry and employees in Romania, significantly changing the work environment in which people work, live and interact. As the pandemic forced governments to impose shutdowns and social distancing measures, the IT industry was catapulted into the limelight, becoming the backbone of the economy and one of the country's most important sectors.

The period during the pandemic led to a strong change in people's nutrition and lifestyle. With gyms and outdoor recreation spaces closed, many IT professionals have turned to online fitness classes and home workouts through fitness apps that have seen a rise during this time. The shift to working from home has also led to an increase in sedentary behaviour, with many employees spending long hours sitting in front of computers.

With the removal of the need to commute to work, the barrier between personal and professional life has become more blurred, however many employees have enjoyed an increased work-life balance thanks to the measures taken by companies to ensure good operation of the steps.

The pandemic has highlighted the need to implement flexible working hours, compressed work weeks and unlimited leave policies, thereby allowing employees to carry out their work from anywhere and at any time as long as their results are satisfactory and performance targets are met.

The pandemic has been an element that has greatly accelerated the shift to remote work, with many companies adopting flexible ways of working to ensure business continuity under optimal conditions. This has led to a significant increase in productivity, with many employees appreciating the flexibility and autonomy they have gained from working remotely. However, remote work also raised a number of challenges, such as social isolation, communication interruptions and the need for efficient time and problem management.

To lessen the effect of these problems companies have implemented virtual social events and training and specialization programs to support remote employees.

The pandemic has highlighted the need for digitization in all aspects of life, from education to healthcare. The IT industry has played a key role in supporting this digital transformation, developing solutions to support online learning, telemedicine, e-commerce and combat the effects caused by the pandemic crisis. The development of e-learning platforms has accelerated, with many educational institutions and companies investing in online learning solutions. This has led to a significant increase in access to education, with many people taking advantage of online courses and training programs to upskill and reskill.

In conclusion, the Covid-19 pandemic had a profound impact on the IT industry and its employees in Romania. While the pandemic has presented numerous challenges, it has also accelerated the shift to remote work, digitization and e-learning.

As the industry continues to evolve, it is critical to prioritize the wellbeing and development of IT employees, ensuring they have the skills and support they need to thrive in an ever-evolving world.

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