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The current industrial revolution - the leap into the unknown

With the advent of the internet we can speak of the leap into new technologies. Digitisation is the new technological phenomenon that requires us to rethink the way we do things. Artificial intelligence creates the conditions for the leap to Industry 5.0.

Robotics, the Internet of Things (IoT), autonomous vehicles, nanotechnologies, augmented reality and virtual reality, wearables are essential components of the world we live in.

Obviously, the question arises as to what is the real place of HUMANS in the current context. Artificial intelligence is creating unprecedented challenges because it requires rethinking all processes: economic, social, technological, cultural, biological, educational, political.

There is a very short distance between the facilities it creates and the dangers that may arise if this huge potential is not managed with great responsibility by decision-makers. It is essential to know who these decision-makers are and in whose hands the real power will lie in the future.

We remember that the advent of nuclear energy promised only benefits. It took only a few borderline situations for politicians to use this energy for destructive purposes.

From good intentions to tragedy is only a small step. We ask ourselves what will be man's place, with his limits, in a world where all man creates unimaginable risks to his existence.

Management will redefine itself because the reality of the future will be radically different from the realities of the past. Speaking of virtual reality we sense that the future is slowly taking shape beyond our will because humans may no longer be the CENTRAL PERSON of the world we live in. We will have to take a maturity test when we humans become the ASSESSMENT SUBJECT for Artificial Intelligence.

My message is one of realistic optimism because beyond favourable answers we must look for questions that make us responsible.

Prof. Ph.D. Paul Marinescu

Robotic Process Automation through Process Mining

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Abstract: *Robotic process automation, has revolutionized businesses and operations in the 21st century. This innovative technology makes automated tasks easier than ever before, allowing for faster processes and greater business efficiency. In an age that prizes convenience and speed, robotic process automation's success has been felt in a variety of industries including insurance, healthcare, banking, transportation, and more.*

Robotic process automation combined with process mining is a game-changing approach to operational efficiency. Through this innovative combination, businesses are able to take advantage of their existing data in order to autonomously and rapidly identify opportunities for automation across their organizational processes. In addition, this allows companies to monitor the performance of the robotically automated

processes, enabling them to quickly understand which processes are working and which could benefit from further optimization. With robotic process automation through process mining, companies have streamlined their operations and enhanced customer experience in ways that were not possible just a few years ago.

In this paper we aim to highlight the benefits of the fusion of these two technologies, software robots development and process mining, oriented both on the actual implementation, configuration and the final results.

Key words: Robotic process automation, process mining, technology, innovation, business analysis.

JEL: O - Economic Development, Innovation, Technological Change, and Growth

1. Introduction – Process Mining

These days, we are surrounded by technology throughout the entire time, and sometimes we end up integrating it into almost every activity that constitutes a program as a daily habit. Process mining, a growing area of data science and research, promises to revolutionize the way that companies monitor and evaluate their business processes. By automating the discovery, analysis, and optimization of business process flows, process mining has the potential to drastically improve efficiency within businesses by granting better insights into where mistakes are occurring and providing methods for streamlining activities. By incorporating and monitoring transactional feedback from multiple sources in real-time, process mining can help managers identify bottlenecks more quickly, allowing them to make informed decisions quickly and with greater accuracy. As such, process mining is an impressive innovation that can greatly optimize performance while providing clearer visibility into large-scale operations.

Process mining is a rapidly growing field in data science that focuses on analyzing business processes from event logs. Its main target is represented by this innovative technique used to improve current process practices within an organization or institution. This technology can be applied to automated processes, manual processes, and even hybrid ones, providing powerful insights into areas such as compliance and risk reduction. With the rise of big data, process mining helps provide organizations with a reliable method of developing better operational quality in order to optimize processes, reduce costs, and make organizational structures more efficient.

It enables the user to identify deviations from the programmed processes and automatically create an audit trail in order to improve process performance and algorithms that analyze the patterns and pathways found in recorded information like time-stamp logs to give a clear understanding of complex processes.

In addition, process mining tools can detect similarities between certain tasks or activities that may have been previously unidentified, leading to improved efficiencies throughout the entire organization. This allows personnel to better comprehend the integral elements of the process in question, while also providing insights into any discrepancies between actual and planned activities. By using specialized techniques such as these events log analysis, model discovery and conformance checking, process improvements can be effectively detected and executed on an ambitious timeline. Beyond just optimizing processes based on historical records, process mining can also be used as an analytical tool to predict future events and enable smarter

decision-making. Companies that invest in process mining are almost guaranteed to experience increased efficiency as well as better visibility across their entire operational landscape.

2. Literature review

Focusing on a specific technology, we tend to underline even its' reviews and the most important, customers' feedback. A result of a recent study, which is published on the official website of the UiPath vendor, shows that around 78% of people who aim to automate business flows, say that process mining is key to enabling targeted robotic process automation (RPA) efforts (UiPath, 2020). What can be more relevant than the feedback of customers who use the discussed implementations in their daily production environment? As highlighted in a recent article entitled "Customer experience: a conceptual overview", customer experience constitutes a multidimensional, complex, and context-based concept (Toma, Catană, 2021).

Also, in addition to the benefits directly brought by the configuration that is under observation, we can say that through the actual results obtained, we also receive the answer to the eternal question "What should be automated and what should be done by humans?" (Van der Aalst, Bichler and Heinzl, 2018), which was also highlighted in a relevant article entitled "Robotic Process Automation".

It is true that it is useful to use software robots with the aim of automating as many business flows as possible within a company, but in addition to the actual implementation that is handled by specialized developers, a part that represents the effective basis of the entire process is represented by business analysis. At this point, we are aware of the need for competent employees, who can master the targeted process and at the same time understand how software robots work and can be implemented, so that they can prepare documentation and analysis that will represent real support for developers. The truth is that it is difficult to train people who can take over business processes and transpose them from a technical perspective, since they do not have experience on the development side.

Given these reasons, process mining technology comes to the aid of the implementation of new automations, having reliable business perspective support.

Big companies like McKinsey and Co. mention in an article entitled "Four Fundamentals of Workplace Automation" that even "the highest-paid occupations in the economy, such as financial managers, physicians, and senior executives, including CEOs, have a significant amount of activity that can be automated." (Chui, Manyika and Miremadi, 2015). Therefore, being aware of the real demand that exists on the market to develop such automations, it is mandatory to judge step by step the key moments in such a configuration procedure.

Assessing a study from Everest Group, the target on which we focus our attention, UiPath, is confirmed that it represents the market leader targeting the technology we are talking about. As the main vendor of this technology, there is no doubt that it is the market leader in this niche. As an overview analysis of market adoption and capability, key performance factors were delimited as can be seen in Table 1.

Table 1: Process mining product profile – Market adoption and capability overview

Description	2021	YoY growth
Process mining clients (individual logos)	201	214%
Total FTEs (represents total employee base)	3,527	Not disclosed
Number of service provider partners / resellers	5,100	27%
Number of technology / software partners	500	Not disclosed
Key service provider partners / resellers	Ashling Partners, Capgemini, CGI, Cognizant, EY, Grupo Assa/Globant, PwC, and SYKES Digital Services	
Key technology / software partners	ABBY, Adobe, Alteryx, AWS, Box, Google, Microsoft, Oracle, Qlik, Salesforce, SAP	

Source: Everest Group, "Everest Group PEAK Matrix for Process Mining Technology Provider" – Focus on UiPath, (June, 2022)

After their assessment in 2022, UiPath is positioned as Star Performer and Leader in the market. They have also mentioned their capabilities from the perspective of offerings, market impact, strengths and limitations. From the point of hosting the effective product, Everest discovered that 90% of customers chose the on-premise and only 10% turned to cloud infrastructure. It is essential to take into account the opening of large companies that have the financial potential to purchase licenses related to the analyzed technologies as regardless of the context, truly big companies show that they are able to adapt to almost any given condition, managing even to thrive in challenging times (Grădinaru, Nica, Georgescu, 2021).

Another important detail is represented by the manner of splitting of the total full time equivalent (FTEs) by function, as Everest mentioned it "includes total company FTEs in product development, support services (product support, implementation, etc.), and sales & marketing; excludes FTEs in corporate functions such as HR and IT". The final results have outlined the percentages thus 15% for support services, 30% for product development and 55% in sales and marketing. They collected information about geographical positioning that accesses this technology, as follows 41% Continental Europe, 40% North America, 10% Asia-Pacific (APAC), 6% UK and only 3% for Latin-America (LATAM) (Everest Group, 2022). Their objective was to see what is the difference in vision and also the opening to the implementation of new technologies that dynamise the market and engage in competition in a process of evolution that can sometimes be forced by imposing new trends in the tech market.

3. Research methodology

A strategic approach of implementation in robotic process automation projects the process mining perspective should also take into consideration important key aspects. One of them are smart tags and key performance indicators (KPIs). When it comes to measuring success and total progress in software development, smart tags and KPIs have become increasingly important. Smart tags are labels that characterize the parts of a system or an application according to their special characteristics. On the other hand, KPIs are measurable indicators covering specific organizational objectives. These are extremely useful in tracking the progress of a software development project, helping identify where teams or individuals are falling short and enabling managers to adjust project plans accordingly. These two tools provide great insight into how various components interact and fit together in a component-based software development environment, allowing them to function as powerful methods for evaluation performance as well as ensuring overall development efficiency. Smart tags allow for increased visibility throughout the entire process and make it easier for operatives to track the success of specific tasks and stages. For example, a dashboard that is created with smart tags and KPIs can provide information about total workloads and compare that against completion rates. This information can help evaluate performance effectively, giving data-driven feedback on specific software developments.

As an advantage, having this objective view it is then possible to more realistically develop strategies, assign resources appropriately and overall have increased control over the project's progress. Furthermore, combining the two offers unique abilities to detect problems in a timely manner and improve communication between stakeholders along the software development process.

Event logs are a critical factor in the development of process mining. Initially, event logs list data events and other related information which can then be used to help identify and improve opportunities for efficiency within processes. This kind of log data helps to generate an understanding of processes in action and can be used to assess current performance metrics against necessary goals. Utilizing event logs allows researchers to create simulations which can be tested with different possible outcomes, pinpointing bottlenecks and inefficiencies, using available data models as a foundation. Thus, they form an integral part of the development process mining tools rely on in order to make successful improvements.

This inside which is the basis of the development of process mining technology, namely event logs related to the processes that are running, there are companies that not only want to put into practice the effective implementation of the tools available on the market at the moment, but also develop customized tools that customize according to your own needs or even those of possible future clients. A suitable example for this context is the product called "Action Logger" described in detail in the article "Action Logger: Enabling Process Mining for Robotic Process Automation" written by Leno et al. (2019). Therefore, as they wanted the process mining tool to meet certain functional requirements, they developed their own product to be in accordance with those requirements. The five big aspects that they took into account are represented by relevance, granularity, data-awareness, context-independence and last but not least, the interoperability.

Besides the key factors described previously, such as other applicability of similar technologies, the return of investment (ROI) indicator can represent a counterweight to an investment

balance. It is an important indicator in process mining implementations as it helps quantify the impact of the implementation on a business. Process mining can produce rich and actionable insights about how a business functions, but it only makes sense to invest in such technology if it can increase effectiveness and efficiency for the company. To make sure that a process mining implementation is likely to be successful, it's critical to consider return on investment indicators up front.

An important metric commonly used to judge the financial performance of a venture is the return of investment indicator, which can be calculated by subtracting all costs associated with the project from its total profits and then dividing this figure by the total cost. This identifying number can help investors evaluate potential investments and determine their profitability. Additionally, managerial staff should use this indicator to determine which projects are most likely to pay off, thus allowing them to make smarter research and development decisions. With an accurate ROI indicator, it is possible for an organization to more clearly assess its risks and returns, which allows them to allocate resources more effectively and maximize their profit margins.

This allows companies to accurately forecast if their investment in process mining will yield positive results and provide a return which outweighs the associated costs. Understanding ROI is essential to evaluating process optimization needs, implementing changes with confidence and reducing costs through innovative automation solutions.

As presented by the company on which we paid attention, this integration in the everyday development of software robots, ends up being considered as "Accelerating RPA with End-to-End Process Understanding and Monitoring" (UiPath, 2022). Understanding and monitoring processes from end-to end is essential for successful implementations of robotic process automation. Non-technical companies usually have difficulties in effectively integrating RPA into their existing systems due to the complexity of process mapping, but with end-to-end process understanding, getting started can be much easier. By having a holistic approach to process evaluation and modeling, process mining customers are able to identify critical processes at each step and accelerate implementation timelines. Additionally, companies can achieve greater ROI by automating more complex processes, who up to that point would not have been able to analyze it from a technical perspective, making a complex business analysis of the entire flow. Without such visibility of the entire system, it is impossible for individual components of a business process to operate correctly or efficiently. A robust end-to-end approach can provide granular insights into automated processes, helping to identify potential problems before they occur or optimize processes when the need arises. Real-time monitoring of RPA outcomes allows businesses to understand user behavior more thoroughly, identifying areas that need improvement or further optimization. With improved visibility into user data, they can refine existing system infrastructure while reaping the benefits that the automation offers.

4. Results and discussions

Ensuring successful implementation of processes within an organization requires process mining with robotic process automation to maximize efficiency and minimize costs. Process mining and RPA together offer unprecedented opportunities for businesses to gain insight, develop strategies and automate complex tasks.

Strategic goals are an integral part of leveraging process mining with robotic process automation. This combination of tools links the capabilities of process mining with pre-programmed bots to automate processes, resulting in improvements both in efficiency and accuracy. It can be considered as a strategic pair made by those two revolutionary technologies, can provide organizations with dynamic, data-driven insights into the effectiveness of their operations and contribute to clear goals for process improvement. RPA can examine existing processes and then identify bottlenecks, redundant activities, inconsistent approaches and mistakes due to human error. By pairing this analysis with software robots that can be programmed to replicate detailed execution logs, organizations can see significant improvements in cost savings, scalability as well as customer service from automating a bunch of tasks.

With predictive analytics based on past, present, and evolving trends within the operational structure, automated RPA supplemented by process mining can deliver accurate real-time metrics to identify inefficiencies and improve upon processes that are not meeting expectations. In this way, process mining with robotic process automation enables more informed decision-making as well as more tangible progress towards optimal levels of productivity.

An indicator we take into account when it comes to results is represented by the full time equivalent. FTE in RPA process mining is an interesting and complex area of study, as it seeks to understand the use of robotic process automation to supplement or replace traditional human labor for the purpose of providing analytics. Automation has become a major part of the modern workplace, allowing employers to reduce overhead costs while increasing the overall efficiency.

This indicator in a general context is a measure that captures the total labor effort for a project or organization regardless of the number of part-time employees needed to accomplish it. Expressed as a ratio, FTE usually represents the amount of time an employee works divided by the amount of time required to be considered full-time at that particular workplace. Additionally, there are two components, one each for full and part-time workers. A single full-time employee contributes 1 FTE, while multiple part-time employees can share a percentage among them so their combined work adds up to 1 FTE. This calculation system is useful because it allows service providers and organizations to track productivity precisely in both labor quantity and quality simultaneously. Using FTEs spares employers from needing to administer inconvenient manual tallies or calculations when establishing workload/employee averages.

However, because robotics technology is so sophisticated and specialized, there can be a lack of knowledge concerning how to evaluate its effectiveness in particular fields such as process mining, making FTE an attractive option that improves both accuracy and productivity. Using FTEs in this kind of process mining harnesses the human side of the equation, allowing experts to draw context and insights not available through the well known automated analysis. FTEs can capture intangibles such as industry standards and customer behavior by utilizing real-world experience and expertise.

As well as results of Garnter analysis are not just positive, but also promising, we admit that the perspectives of the implementation of such technologies are of real use, and the descriptions and data provided by the companies that provide them will not only fall into the category of sales and marketing strategy. Gartner calls a top strategic business trend as Hyperautomation. Also predicts that by 2024, organizations will, on average, reduce operational costs by 30% combining these hyperautomation technologies with redesigned operational processes using a „combination of multiple machine learning, packaged software, and automation tools to deliver work" (Gartner, 2020). They have also affirm that hyperautomation is considered to be the number one in their Gartner Top 10 Strategic Technology Trends.

Representing the most desired external vendor of such technologies, UiPath outlines the main benefits of the process mining services it provides. These are represented by native extract, transform and load (ETL) capabilities from the perspective of connecting to any database and transforming data without any third-party tools, the possibility of the easy to connect approach that unlocks process data from any line of business applications, out of the box principle that one application kickstarts the effective process mining with an average minimal effort, in the way of scalability, it is provided across large organizations and seen as an enterprise grade data management. In terms of security, stored data can be anonymized in environments called GDPR, tracy stands for the process graph to have an unique overview of the process that is designed for the users from business departments, there are possibilities to compare processes in order to understand their impact of optimizations through automation, and last but not least, business rules of applying KPIs and tags considering the target of staying on track with each key business goal (UiPath, 2022).

As their advanced studies show in terms of the Insurance perspective in a contact center automation project, overall an amount of 80% of work could be standardized and also around 568K in costs saving were confirmed being realized only in the contact center department.

5. Conclusions

Understanding the effective process is the key in the way of automating it. Investing in effective processes to achieve desired outcomes is critical, but navigating the gap between process expectations and process realities can be challenging. This gap can represent itself as a subtle discrepancy or large divergence, resulting in difficulties reaching goals or missing important requirements. Catching these discrepancies early on could help prevent costly situations further down the road. Process expectation vs process reality is an intriguing subject to explore further. While it may appear that processes are designed to meet certain goals, there may be deviations from this intentioned outcome in the real-world setting. Moreover, in development or implementation phases of procedures, underlying assumptions that are held by the designers may differ substantially from those who coordinate the actual task or activity. This discrepancy can lead to institutionalizing biases and misalignment with desired outcomes.

As such, it's important to closely monitor your processes both qualitatively and quantitatively in order to ensure expectations are met and appropriate feedback is obtained at the right

times. Additionally, thorough risk analysis during the planning phase is strongly recommended as it can uncover potential issues that lead to unexpected realities. By building flexibility into plans and considering likely options for implementation, organizations will be better prepared when, inevitably, reality does not match expectation.

In order to fill this gap between process expectation vs. process reality, the actual key solution is using process mining as a business analyst support assistant that can provide insides and other perspectives of the actual business processes, of which they may not be aware from a first view as an advanced analysis. This fact comes to the aid of the automation development process, the subsequent changes and problems encountered after the moment of moving the software robot into the production environment, being significantly reduced.

Automation has been an immense challenge for businesses needing to perform routine tasks with minimal human intervention. Process mining provides an effective way of addressing these challenges by allowing processes to be identified, visualized, and optimized in order to streamline workflow and make the most efficient use of resources by the collaboration with other departments in the organization, and measure how successful each process is as a whole.

With this technology, organizations can simulate changes that may lead to higher productivity gains than traditional approaches or manual intervention. Additionally, process mining can help facilitate decision-making processes and optimize resource utilization within businesses. The ability to monitor processes from end-to-end and identify problems before they become costly can reduce inefficiencies and increase customer satisfaction. Additionally, process mining yields valuable analytics about business performance, allowing for informed decision making that ultimately leads to improved productivity. In this way, automation using process mining can have a major impact on modern businesses.

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The Fourth Industrial Revolution: history, design, and the impact on the private sector

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Abstract: *The Fourth Industrial Revolution (or the 4IR) emerged quite recently as a concept that describes the unprecedented transition of society towards a life governed by artificial intelligence, hyper-connectivity, and cyber-physical systems. To fully understand it, a short review of the previous revolutionary moments will be illustrated, focusing on their footprint on humanity, as well as on the business sector. After that, a definition framework will be constructed, that shows the structural design behind 4IR, from the fundamental characteristics to the technologies that it deploys. Lastly, as expected, when systemic dynamics are implied, the private sector will be the most reactive actor, playing the role of the transition enabler and the starting point of its dissemination. Therefore, the 4IR impact will be the most evident through the development of new, state-of-the-art business models, that will ultimately ensure the very fast process of adapting to contemporary reality. In the current paper, three examples will be described: the digital platform, the smart factory, and the industrial internet-of-things, which are based on five decisive characteristics: connectivity, access, innovation, autonomy, and cost efficiency.*

1.1 The Four Industrial Revolutions

When discussing the Fourth Industrial Revolution, the first thing we need to capture is a chronological understanding of the concept. Therefore, there will be four major moments in time, defined as revolutions, that inflicted major changes on society as a whole. Those moments generated a complete and abrupt redesign of the world, being facilitated by the most important advances in science, industry, and technology. Even though the fourth revolution might face some critique and controversy, the related literature seems to be in agreement regarding the first three periods and their representation as turning points in history. As a result, in this section, we will shortly describe them and their consequential impact on humankind.

Starting with the first industrial revolution, this period marked the transition from an agricultural society to the industrial one, fueled by the discovery of coal, steam, and water mechanics. As (Deane, 1979) mentions, the moment corresponds to a way of escape from poverty and the start of the affluent societies of today. The core of this period, happening in the 18th century, will be the invention of the steam engine, patented by James Watt in 1769. Along with this new mechanism, a brand-new notion will be introduced: that of production and industry. The effects were clear: global economic growth and a constant increase in both production and consumption for the common people (Mohajan, 2019). More than this, the transition from agricultural and animal labor to the use of machinery meant creating new jobs, involving more diverse categories of people, and developing skills that ultimately lead to an increased quality of life and overall reduced mortality.

Following that moment, a hundred years later, at the end of the 19th century, electricity will upscale every productive process, introducing the notion of mass production. Water and coal will be replaced by gas and oil, and the main core of production, the steam engine, will be replaced by the internal combustion engine, reaching totally new capabilities. The period can be described as a steady accumulation of useful knowledge (Mokyr & Strotz, 1998) with more and more technologies being built that extended the range of products and services. Consequently, the entire organization of production has changed, starting from the actual machinery, such as the assembly line, to the main economic principles besides industry success. Concepts such as economies of scale, measured productivity, or standardization became prevalent, as well as different forms of competition or marketing strategies. More than that, the core of nowadays economy, namely the giant corporations, were developed for the first time, rapidly gaining power, influence, and market shares. Besides the industrial perspective, lifestyle has also changed significantly. The great advancements in transport and communication, through the extension of the railroad networks or the invention of telephones, generated new opportunities and unprecedented freedom of movement. However, not everything related to this era is positive, along with the accelerated economy, a great deal of poverty spread around the population since not everyone has been so quick to adapt to the new dynamic. The middle class and white-collar jobs become the core segment of society, while the poor working conditions exposed the employees to great dangers. All this will be interrupted by the two world conflagrations that shifted the entire society to a massive, war-focused industry.

Starting in 1950, the Third Revolution will become the new framework for defining modern

life, with another source of energy taking the spotlight: nuclear. Once again, the historic context will play a major role, the second half of the 20th century being described as a complex and constant state of alert that pushed multiple states towards embracing and integrating the new revolution. However, this period will be slightly different from the ones before, since the main core of the transition is represented by information, the most important intangible asset anyone can possess. Therefore, any invention that was generated during this time revolved around the concept of information: from the first computers to the invention of the internet or the further devices that enabled its processing, transition, and understanding. Moreover, what is important to grasp about this moment is the fact that even though steam, coal, and electricity are still largely used, they are becoming more of a currency, rather than a core-productive factor that can produce a significant shift in the economy as we know it today. In other words, material resources are still a key factor, but they are not producing any new value, innovation, or progress. In contrast, the high potential and combinative power of different information technologies are actively changing entire industries and lifestyles.

However, when it comes to evaluating the general impact of those technologies, there are multiple lenses to see through. The first one would be marked by the changes in the dominant energy source and the switch to nuclear power and then to the renewable and green energy narrative. The second one will refer to the changes in the dominant technologies, towards information and data. Finally, the main poles of international power have also changed, as (Janicke & Jacob, 2013) will mention, China and India starting to play a huge role, in their research framework of studying the technological development of western societies and then building and adapting the principles to their industries. However, besides certain actors leading the acceleration race, globalization will remain the most evident effect of this period, with the trans-territorial connections becoming omnipresent and even imperceptible.

Reaching current times, the Fourth Industrial Revolution (4IR) will be the moment in which a fusion of technologies will blur the lines between the digital and physical worlds. This revolution, which started a decade ago, seems to be the most disruptive and radical, since it changes every aspect of life, replacing it in total with cyber systems that are complex and extremely smart. Starting from the breakthroughs in biology, to the ones in the energy sector, artificial intelligence, quantum computing, or nanotechnology, all these will give the right to call the current context a true revolution. More than that, the phenomenon is happening with an extremely fast rhythm, having a global contagious effect and a very clear goal: connecting both machines and people, in collaborative, fully integrated systems, with high autonomy, that will introduce an era of omniuse, connectivity, and minimized human intervention.

1.2 Related literature

One of the pioneers of the Fourth Industrial Revolution as a concept is Klaus Schwab, the World Economic founder and executive chairman. He will extensively describe his understanding of the new era as a period, unlike anything humankind has ever experienced before, inflicting dramatic change all around us and even challenging ideas about what it means to be human

(Schwab, 2017). Although it might sound grave and consequential, the main principle behind it it's simple: to develop a connected world, that manages to find an equilibrium between human intelligence and human necessity. In other words, as (Schwab, 2018) will also reassure, this world still needs to be developed by someone, so the technological landscape remains one made by people for people, the only ones that can give it structure and purpose. The difference however is laying in the needed intervention: the 4IR will propose an industry in which people are no longer responsible for mundane, repetitive tasks that can be easily replaced by machines, similar to the second and third industrial revolutions. What is different this time, is the fact that they will also lose a certain amount of control and power of decision, since the new technologies are meant to provide a high level of autonomy, self-learning, optimization, and diagnosis functionalities. So, the cycle doesn't exclude human labor, but it profoundly reconfigures it, starting from how people create, exchange, and distribute value (Philbeck & Davis, 2018). This process will have indeed a strong disruptive potential to fragment society, but it will also provide an opportunity to build a brand-new social foundation, around values like the common good, human dignity, and intergeneration stewardship (Schwab, 2017).

Further on, in the related literature, there is a confrontation between whether the Fourth Industrial Revolution is a distinct moment or a continuation of the third. The main advocators of the first scenario will base their theory on three main elements, to demonstrate that nowadays transformations are distinct and recognizable: velocity, scope, and impact (Xu, David & Kim, 2018). First, the velocity will refer to the evolution rhythm, and as mentioned before, this revolution seems to be moving at an exponential speed. The scope, or the breadth and depth, will focus on how a phenomenon changes the way we perceive, conduct, and evaluate all fields of activity: whether it is economy, industry, business, or politics. In correlation with the scope, the system impact or the paradigm shift will involve the transformation of entire systems, without time or space limitations, towards new frameworks and workflows. So, using these three elements, we can describe and validate the new revolution, since they are in perfect synchronization with the effects the 4IR already generates on a global scale.

On the other side, the scholars that consider this Industry 4.0 as being a prolongation of the third revolution will argue that the concept is a marketing strategy, that doesn't inflict systemic change, but only develops and extends the use of the internet and data that started 30 years ago. To further support it, Jeremy Rifkin will present the third revolution industry as a process that humanity is in front of, with the core elements being the transition towards a sustainable post-carbon era, the aversion of climate change, and the emergence of the collaborative age (Rifkin, 2011). So, for that to correlate to the chronology of moments, Rifkin's vision implies that the second and the third revolutions described before were merged and not distinct.

1.3 Main components and impact

Circling back to what the Fourth Revolution actually implies, the main element of this revolution would be the CPS or the cyber-physical systems, which have integrated different computational and physical capabilities useful in the production flows. This new generation of systems aims to control physical processes by constantly receiving information, measuring, and evaluating different parameters, and eventually constructing their own feedback loops. When it comes to

the opportunities they provide, enhanced efficiency and support in the decision-making process will be on top of the list, but their final goal will be to revolutionize the way enterprises conduct their business from a holistic viewpoint (Colombo et al., 2017). Therefore, many innovations will be based on CPS, such as airplanes, autonomous vehicles, or even brain prostheses (Baheti & Gill, 2011). That is explained by the fact that CPS as a concept can integrate a vast deal of new technologies, so a summary of those is necessary to understand what it means in terms of practical implementation. To do that, we have identified a classification approach based on the three fields of activities in which they are most likely to be deployed: production and services, lifestyle, and data. However, we need to mention that all these technologies remain in a constant state of confluence and convergence and the list is being updated as we speak.

Table 1. Main technologies of the 4IR.

Production and services	**Lifestyle**	**Data**
industrial internet of things, digital twin, signal processing, nanotechnology, autonomous robots, additive production, 3-D printing, business intelligence, digital trade, sensors, simulation	Internet of things, augmented reality, genome editing, synthetic biology, metaverse, autonomous mobility, drones, precision medicine	machine learning, big data, system integration, cybersecurity, cloud computing, blockchain and DLT (distributed ledger technology), data ecosystem

Source: self-processing, based on the review of the related literature.

Further on, in the current paper, the focus will be on how the above technologies affect the business sector and the general impact of the Fourth Industrial Revolution on an organizational level. A first method of measuring this impact will be illustrated by Schwab, clustering the effects into four distinctive categories: customer expectations, product enhancement, collaborative innovation, and organization forms[1] . First, the new technologies will connect the customers to the entire production flow (Prisecaru, 2016) and even put them in the center of all activities, becoming the epicenter of the economy. To satisfy their needs and meet the demand, products will be enhanced, and all the information and digital assets will increase their value, through innovative processes. To add on that, the organizations will have to restructure their workflows and find new forms of collaboration, in order to keep up with the competition, fight devaluation and depreciation and keep their relevance in the market. At the same time, a very important aspect is that of sustainability and what it means to be a sustainable enterprise in the 21st century and to find the right balance between stability and change (Ionescu & Cornescu, 2010). Finally, another important aspect, already mentioned in the previous section, will be the focus on increased productivity which could ultimately be a synonym for the displacement of workers with machines. This could generate great inequality in the labor market and a race between humanity and technology (Brynjolfsson & McAfee, 2012). However, the social effects remain to be seen since for

1https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/. Last accessed, 29/10/2022. https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/. Last accessed, 29/10/2022.

the new economic framework to work, a solid equilibrium between resources, costs, and results needs to be found.

Overall, the new 4IR platforms will improve the quality, price, and distribution models, helping companies have a better response to diverse challenges, such as volatility, product life-cycles, and global supply chain (Morrar, Arman & Mousa, 2017). Therefore, as (Marinescu & Toma, 2015) mentions, changeability constitutes a key competitiveness factor for any company, so as soon as the private sector understands and includes this principle in its strategy, progress will also appear. But what remains to be addressed, is how exactly will the new technologies impact businesses and how can they create value. By studying both the related literature (Lee et al., 2018), (Xu, David & Kim, 2018), (Tohanean & Toma, 2018), (Bloem et al., 2014) and multiple private case studies (pwc[2] , Deloitte[3] , Forbes[4]) we have summarized five characteristics of the new technological landscape that have the potential to inflict radical change. They will be shortly described below and then demonstrated throughout the illustration of the newly designed business models.

Connectivity – the ability to integrate multiple machines, platforms, humans, and devices to increase the communication capacity within a network. This effect will be the first gateway to the transition towards the 4IR, improving all business flows and encompassing new ways of maintaining contact between agents.

Access – the ability to provide entrance to any informational resource, especially in the digital and virtual environment. As mentioned before, information will be the most valuable asset in the new business world and immediate access to data that can be transformed into knowledge will make the difference between a slow-adapting business organization and one that is capable of agility.

Innovation – the ability to create, evolve, extend, or accelerate new value. Innovation will be imperative for all business activities, from distribution to production, marketing, or sales. This will boost the response capacity, provide a framework for assessing and avoiding risks and help build long-term strategic growth. More than that, as (Herman & Nistor, 2020) will point out, innovation will help companies cope with declining product cycles and faster new technologies.

Automation and Autonomy – the ability of the new technologies to perform tasks on their own, based on previous supervised or unsupervised learning processes. The newly deployed machines will be able to diagnose issues, identify the optimal solution, or monitor remotely without any human intervention. The effort and the time resources will be optimized, by providing capabilities that ultimately change the rhythm, volume, materials, or flows of production.

Cost Efficiency – the ability to alter the costs, by building economies of scale and an increased return on investment. This characteristic will be in a symbiotic relationship with the automation

2 https://www.pwc.com/us/en/library/4ir-ready/fourth-industrial-revolution-economic-downturn.html Last accessed: 29/10/2022.

3 https://www2.deloitte.com/content/dam/Deloitte/de/Documents/human-. capital/Deloitte_Review_26_Fourth_Industrial_Revolution.pdf. Last accessed: 29/10/2022.

4 https://www.forbes.com/sites/forbestechcouncil/2020/08/03/how-businesses-can-thrive-in-the-fourth-industrial-revolution/. Last accessed: 29/10/2022

part since robots and the adjusted machinery have a high potential to reduce operating costs, offer predictive maintenance, and avoid cost injuries related to human activity.

2 Business models

Regarding the business models (BM) analysis, before describing some of the newest and most efficient frameworks of the Fourth Industrial Revolution, it's important to first define them. Therefore, a business model will be a configuration that describes the way a business enterprise is organized and the way it delivers value to the customers, while also making profits (Teece, 2010). Other authors have described the concept as the design of the transaction content, structure, and governance (Zott, Amit & Massa, 2011), with the specific role of creating a heuristic logic that will connect the technical potential to the actual production of economic value (Chesbrough & Rosenbloom, 2002).

When it comes to the 4IR, the definitions are much more limited, since the new business models present a high level of adaptability, an integrated dynamism, and a high dependency on technology, so they cannot be so easily defined. What can help in this manner is illustrating certain ways of classifying the 4IR BM, based on different criteria. Consequently, one interesting framework would be the one developed by (Bagnoli, Dal Mas & Massaro, 2019). The authors will start from the main goal of a business model: to construct new ways of developing relationships with the customers and to deal with knowledge management systems. Based on that, they will identify four main categories of BM: mass-customization, which will focus on understanding the client's needs and providing a more on-demand approach, servitization, which will propose a way of transforming the products into services, data-driven, which will use the embedded value of information in the production process, and platform, that will aim to facilitate the entire exchange of resource throughout the ecosystem.

Another way to study the business model structure would be by circling back to the theoretical methodologies. One of the most used ones would be the Business Model Canvas, which has been developed by (Osterwalder & Pigneur, 2002) and continues to be extremely popular in the related literature (van Tonder et al., 2021). According to this framework, a business model can be studied using four main pillars: product innovation, customer relationship, infrastructure management, and financials. We can already see that the elements will be very similar to the five characteristics exposed in the previous section. Therefore, innovation will be found explicitly in both, the financials will integrate the cost-efficiency capability, and the infrastructure will embody the connectivity, access, and autonomy of the network. Finally, customer relations will add a new dimension to the business model, since the most adapted companies will be the ones that know how to engage their customers and create long-term transactional, functional, or strategic relations.

Having now a clear framework of analysis, we will further focus on three distinct models, that can be considered representative of the Fourth Industrial Revolution: the digital platform, the smart factory, and the industrial internet of things. They will present the five characteristics described before, as well as demonstrate the combinative power of multiple technologies.

2.1 The digital platform business model

The digital platform business model will be a structure that creates value by facilitating exchanges between different entities, such as CPSs, humans, and devices, into a single informational and intellectual space (Geliskhanov, 2018). In other words, the new model will not produce anything directly and won't have linear and traditional supply chains or distribution flows, but it will incorporate services and applications that respond to a certain digital need. The concept can be compared to digital ventures, which will be a type of enterprise that trades and operates exclusively online (Stancu et al., 2017). The model has gained exponential popularity, while also absorbing a great share of business value, whether we refer to the number of customers, revenue growth, or market share. (Cohen, 2017) will describe it as the core organization form of the emerging informational economy, a description proved correct by the current status quo: 7 out of the top 10 most valuable international companies already operate this model and are forecast to handle 30% of the global economic activity by 2030[5] .

The principle behind this model is based on identifying customers' needs and building an ecosystem in which multi-functionalities respond to those specific needs. This ecosystem will be a perfect combination of software services, physical products, and platform facilities and will handle entire business processes, integrating the supply and the demand of economic activity. (Geliskhanov, 2018) will describe them as being both a transaction institute and an organizational institution. That means that they will offer multiple transitionary facilities, from the movement of information, goods, and services, to providing rapid intermediation between actors, increasing the awareness of certain products, or removing barriers to certain industries. At the same time, the model will also organize the users' interaction, by providing the architecture, pricing systems, and necessary configuration for the actual transactions to happen, demonstrating its potential as an organizational structure.

Further on, being one of the most used models nowadays, its complexity has increased significantly, while also facing a decomposition phase. Therefore, similar to the definition process of the business model, it would be easier to understand it when identifying distinct criteria of classification. As an example, we can look at agents' interaction and group the digital platform into three categories, as follows: business-to-business (B2B), business-to-consumer (B2C), and consumer-to-consumer (C2C). The first one would encompass all the sales channels and tools necessary in the interactions of a company, successful examples being Microsoft, Oracle SuiteCommerce, or even Google. The second one would be the most frequent, since it will be designed for the direct use of individual consumers and their according needs, whether it is entertainment, shopping, or transport (Netflix, Walmart). However, the third one is becoming more and more popular after the pandemic context, since they offer consumers a direct trade mechanism, where they have full control over their actions, decisions, and budgets (eBay, Craigslist).

Although it can already be grasped from the previous classification method, another way to analyze digital platforms is by looking at the main scope, whether it is sales, meeting a specific need, or building an information space. For example, the sales-driven models would be

5 https://www.weforum.org/agenda/2019/01/is-your-business-model-fit-for-the-fourth-industrial-revolution/. Last accessed 30/10/2022.

represented by the e-commerce platforms (Amazon, Alibaba, eMAG), which will allow multiple vendors the opportunity to sell and promote their business. In the second category, we have the applications that satisfy a certain need, by providing new or redesigned services, while also challenging entire industries (Uber, UberEats, Airbnb). Lastly, the third category, namely the social media platforms will be the most popular since they can integrate vast interaction capabilities (Facebook, Twitter, LinkedIn) and construct an informational space for alternative activities: education, entertainment, journalism (Quora, YouTube, Yahoo). Moreover, depending on their structure and profit mechanism, other configurations will be profiled, such as the multi-side commission fee, listing fee, pipeline model, or submission fee.

However, regardless of the monetization schema of the new business models, we reiterate the most important question, namely how they create, capture, and deliver value in the ecosystem, since they generate massive costs of developing and maintenance of the general architecture (Hein et al., 2020). A possible response would come from the exponential popularity they gained in the last 5 years, most incumbent companies choosing now to participate in a platform that is operated by a third party, rather than building its own[6] . So, there will be multiple concentrations of brands into platforms that ultimately don't split profits but provide economies of scale and almost zero marginal costs. Another argument is coming from the indirect network effects they generate, being the most evident in the marketplaces where multiple suppliers will mean multiple customers and multiple customers will ultimately mean multiple suppliers. As a result, the value cycle is completed, has integrated its feedback loops, and can be improved by finding patterns through the advanced use of raw data. This last concept would be a key function of any digital platform since its main objectives are to build the correct audience and optimize the matching between customers and information, while also making sure they implement correct standards and rules for users' interactions.

In conclusion, the digital platform model proves to have all five characteristics previously described, connecting different sides of the purchasing process, offering access to a vast volume of information, products, and services, and proving their innovation through easy-to-use functionalities that answer many users' needs. The companies that already operate this model have a highly automated structure, driven by artificial intelligence and machine learning techniques. Finally, they provide a cost-efficient structure, gaining impressive profits year on year and being some of the most looked-for choices for personal investment.

2.2 Smart factories

The second model relevant to the Fourth Industrial Revolution is the smart factory, a concept that doesn't have a unified definition and is being understood as a flexible and configurable productive structure. (Hozdić, 2015) will propose a conceptual definition in which the main goal of the new entity would be to solve problems arising in a production facility with dynamic and rapidly changing boundary conditions in a world of increasing complexity. In other words, a

6 https://www.mckinsey.de/~/media/McKinsey/Business%20Functions/McKinsey%20Digital/Our%20Insights/The%20right%20digital%20platform%20strategy/The-right-digital-platform-strategy.pdf Last accessed 29/10/2022.

smart factory will be an environment that organizes itself and provides improved manufacturing facilities, by employing highly connected machines. The concept will be frequently found in the related literature as an extension or a key construct of Industry 4.0 (Wang et al., 2016), (Shi et al., 2020), (Osterrieder, Budde & Friedli, 2020), but this will not be equal to a unified framework or roadmap of implementation. As with any new business model from the 4IR, each company will adapt the concept to its own needs, resources, and decision-making style, to ultimately improve the general key-performing indicators.

Referring to its structure, a smart factory can be described from the perspective of three layers or resource allocation plans: physical, network, and data (Chen et al., 2017). The physical layer will consist of all equipment, devices, and real-time hardware that ensures the informational flows. The network layer is the one that reunites all the business activities in a cooperative schema that guarantees the production, transmission, and control, being extremely connected to the data application layer. In other words, the network entity will provide the format and the protocols, while the actual data will turn into a self-learning instrument. It's important to mention that data acquisition and analysis will be extremely relevant in the automation process, ultimately providing the intelligence factor in the production equation. However, all three layers will have an equal contribution to the success of the implementation, existing in an interdependent state.

Watching the developments from the actual industrial reality, Germany seems to be not only the pioneer of smart factories but also of the strategic initiative named Industrie 4.0. As a direct consequence of the several strategies and action plans adopted by the government, we can already see successful examples of smart structures, such as the Tesla Gigafactory, the Adidas Speed Factory, the Bosch Connected Factory or the Siemens Elkronikwerk Plant from Amberg[7]. The German private sector perfectly understood that the changes inflicted by the smart capabilities are not only desirable but mandatory, since the consumers' needs are dynamic and unpredictable, so organizations need to be able to adapt fast and cost-efficient. More than that, although the initial investment might be costly, the general advantages they present in the long term are balancing the expenditure: they help companies integrate sustainability and safety regulations, ensure product quality and excellence in execution, and improve overall customer experience and productivity[8].

To add to the above, if in the previous case, of the digital platform model, the focus was on the digital aspect, by creating and handling intangible assets, for the smart factories the main principle will remain the actual production of physical goods. That means that they will encompass multiple technologies which improve the manufacturing process, from cyber-physical systems to cloud computing, predictive maintenance, 3D printing, smart sensors, or big data analytics. We will describe two of them, namely sensors and big data, to understand how a smart factory structure works and the main changes they inflict on the production lines.

Sensors will be one of the most frequent instruments employed in a smart factory since

7 https://www.rokin.tech/post/intelligent-manufacturing-5-examples-of-smart-factories-across-germany. Last accessed 30/10/2022.

8 https://www.sap.com/insights/what-is-a-smart-factory.html. Last accessed 30/10/2022.

they present the capacity to continuously collect, process, and monitor data from a physical phenomenon, while also codifying it in a digital system. Therefore, they will be extremely important in the production flows, having the power to identify issues or changes in parameters, provide control points or generate new impulses or outputs. Their main functionality will be recording and generating feedback from a network, by transforming inputs into a certain, desired output. As a consequence, a way of classifying sensors would be by the type of input they sense from pressure to temperature, proximity, humidity, force, gas, color, or light (Javaid et al., 2021). Other classification methods would look at the size (nano, micro, or macro) or at the way they convert the stimulus, by using one conversion step (direct) or multiple intermediate (indirect). However, regardless of their size and inputs, they remain one of the most efficient and popular instruments that can track the entire process of production by offering enhanced capabilities, such as process automation, building automation, asset monitoring, or predictive maintenance.

Another important technology worth describing will be Big Data methodologies, which will amplify the vast and complex process of performance analysis. In the last ten years, this subject has captured the attention of many different stakeholders, including governments, scholars, and private companies. Consequently, there will be multiple frameworks that aim to define and explore its potential. One example would be the McKinsey Global Institute, which will describe this field as the next frontier for innovation, competition, and productivity[9]. When asking the same question as before, namely how big data creates value, the institute's arguments are based on five capabilities: transparency, enabling experimentation, tailored segmentation, replacing and supporting the human decision, and development of the next generation of products[10]. Referring strictly to the manufacturing process, the advantages will multiply, from improved demand forecasting, to supply chain planning and control, or operational and sales support. At the same time, this new concept will employ multiple changes of paradigms, such as the switch to flows as opposed to stocks, the reliance on data scientists and not data analysts, or the transition of analytics from the IT departments to the core business, strategic, management and operational functions (Davenport, Barth & Bean, 2012).

However, we cannot discuss big data without illustrating the most known framework of definition, the three V: variety, velocity, and volume. They were first introduced by (Laney, 2001) and then used in multiple publications to describe the differences between big data and traditional data analysis (Sagiroglu & Sinanc, 2013). Therefore, the variety will refer to all the data sources and types such as structured, semi-structured, or unstructured, volume can be understood as the amount or size of data, as well as the adjacent technology that has been constructed to be able to manage and process such quantities, and velocity will refer to the processing speed. Some sources go even further and add two more characteristics, the value and the veracity[11],

9 https://www.mckinsey.com/~/media/mckinsey/business%20functions/mckinsey%20digital/our%20insights/big%20data%20the%20next%20frontier%20for%20innovation/mgi_big_data_exec_summary.pdf Last accessed 30/10/2022.

10 https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/big-data-the-next-frontier-for-innovation. Last accessed 30/10.2022.

11 https://www.teradata.com/Glossary/What-are-the-5-V-s-of-Big-Data. Last accessed 30/10/2022.

or the quantifiable business benefits and the accuracy of data. But once again, regardless of the definition framework, big data, through its prescriptive, descriptive, and predictive power will manage to enhance any productive or commercial process, being applicable in all fields of activity and inflicting radical and almost immediate change. That is why, big data remains one of the fundamental technologies employed in a smart factory, without which the innovation dimension will not be feasible.

In conclusion, the smart factory, through the employment of sensors and big data, but not limited to it, is proving to be a winning model in the current business environment. It constructs a highly connected, automated, and accessible ecosystem, that is capable of innovative insights, while also providing multiple cost savings. In a world of increasing complexity, this solution checks all the key features of the 4IR business models and already provides the results it promises.

2.3 IIoT – Industrial internet of things

Finally, the IIoT model will introduce another concept that has exploded in popularity over the years: the internet of things. The term was first mentioned by Kevin Ashton in 1999, more than 20 years ago, and later reiterated[12], as a phenomenon that is here now and that gives computers the potential to observe, identify and understand the world – without the limitation of human-entered data. From that moment, the notion has been extensively developed, but similar to the other cases, it still lacks a clear definition. However, we can describe it as a multitude of devices, services, applications, and platforms that will be highly connected and will communicate in an intelligent manner. In an IoT, all things will exchange, generate, and process data according to the predefined schema (Li, Xu & Zhao, 2015) and will use multiple modern technologies. (Rose, Eldridge & Chapin, 2015) will profile some of the most important, mentioning that it is a confluence of those that make the internet of things concept possible: ubiquitous connectivity, adoption of IP-based networking, miniaturization, or cloud computing being some of the examples. More than that, the authors will enunciate the transformational potential that IoT has: to initiate the transition from passive engagement with devices to the active use of the entire and unlimited internet architecture and processing power.

Referring now to the industrial internet of things, this model will add the production perspective to the characteristics described before. As a result, IIoT will encompass the interconnected elements that will perform all the activities involved in an industry: manufacturing, distribution, production, marketing, or sales. (Sisinni et al., 2018) will develop a way to differentiate the IoT (or the consumer IoT) from the industrial sense of the concept. In that scope, they will use six criteria: the impact, service model, current status, connectivity, criticality, and data volume. To further elaborate, IIoT will aim for evolution, will be machine-oriented, and will use structured and centralized networks (as opposed to ad-hoc). Another important characteristic will be the criticality, the IIoT being mission critical and focused on different parameters such as time, security, and reliability as opposed to the non-stringent character of IoT.

Lastly, as a final, but equally important feature, this new business model will rely on numbers and the overall production improvements will be easy to quantify. In that matter, (Daugherty et al., 2015) estimate that the IIoT field will generate 12$ trillion of global GDP by 2030. In their

12https://www.rfidjournal.com/that-internet-of-things-thing. Last accessed 30/10/2022.

understanding of the concept, the industrial internet of things manages to converge the information and the operations technology, through three capabilities: intelligent machine applications, industrial analytics, and sensor-driven computing. Once again we can see the strong connection between all concepts described above, from the main technologies (sensors, analytics, machines) to the key characteristics (connectivity, access, innovation, automation, and cost-efficiency).

Nevertheless, to differentiate the IIoT and the smart factory, we can state that the latter will be a component of the industrial internet of things or Industry 4.0, without being limited to it. The IoT infrastructure will enrich industrial manufacturing and offer a holistic view of how to integrate information and communication in all product flows. While the smart factory will be based on CPS, the main enabler and confluence between the digital and physical worlds, the IIoT will use the complex capabilities of the internet. To do that, the main element will be the DCS (Distributed Control System), which extensively uses cloud and edge computing functionalities to store and optimize process controls. Lastly, when it comes to the actual implementation of IIoT systems, some industries will prevail in terms of usage and adaptability. The car manufacturing, agriculture, and extracting industries are some of the fields in which extreme precision and connectivity between agents will be the key to successful results.

To sum up, all the advantages of IIoT are becoming more and more evident to companies and external developers that will use it as an optimization strategy and a source of new revenue streams. But besides all its performances, there is however an amplified liability that the IIoT brings to the table: security and especially cyber-security. Software vulnerabilities, the use of obsolete applications, or the lack of authentication practices may lead to breaches and exposure to hacker attacks[13]. However, this is a concern that can be addressed by designing highly encrypted systems, educating employees, and investing in IT resources that can further minimize the risks.

Conclusion

Overall, in this paper, we have revisited the four main industrial moments that inflicted radical change in the way people view and organize all productive and economic activities. The focus has been on the Fourth Industrial Revolution, a period that is happening as we speak and that introduces a multitude of new technologies, changes in paradigms, and societal effects. The 4IR or Industry 4.0 will focus on the extensive and confluent use of modern informational and computing concepts, to enhance the industrial flows and provide immediate results in terms of productivity and efficiency. We have identified five characteristics that are relevant for the 4IR, namely connectivity, access, innovation, automation, and cost-efficiency, all of these describing the new business models of the present and future. The digital platform model, the smart factory, and the industrial internet of things have been discussed from the lens of the five key features, describing shortly their structure, classification, and immediate business advantages.

To conclude, the current period is one in which the frontiers between the digital, physical, and biological worlds are thinner and thinner and the only way to benefit from it is by recognizing the 4IR potential, adapting it to the current business models, and transforming it into immediate and sustainable growth.

13 https://www.tibco.com/reference-center/what-is-iiot. Last accessed 30/10/2022.

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Small and Medium-sized Enterprises in Romania in the Dynamic Context of Recent Years

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Abstract: *This paper examines Small and Medium-sized Enterprises (SMEs) in the dynamic context marked by the Fourth Industrial Revolution, the conflict in Ukraine, and, particularly, the COVID-19 pandemic. The study highlights the measures taken in various countries to support their economies, with a specific focus on SMEs. Moreover, the paper emphasizes the significance of female entrepreneurship in the Romanian economy, both in general and in the current context. Research indicates that female entrepreneurship can bring greater value to the labor market and contribute to diversity and innovation. The research methodology adopts a descriptive approach based on specialized literature and statistical data, utilizing bibliographic research and the analysis of secondary data. The study analyzes data related to the number of active SMEs in Romania and the impact of the pandemic on the establishment of new businesses. It underscores the need for effective management to handle risks in a dynamic and complex entrepreneurial environment. This paper emphasizes the importance of SMEs for the economy and the necessity of efficient management to mitigate risks in the context of the COVID-19 pandemic and the Fourth Industrial Revolution. The development of female entrepreneurship adds supplementary value and can contribute to economic recovery. Thus, this paper serves as a valuable source of information for those interested in the situation of SMEs and their management.*

Keywords: Small and Medium-sized Enterprises (SMEs), challenges in the current context, resilience, Romania, development prospects.
JEL Classification: D81, L21, L26, M21

Introduction

Small and Medium-sized Enterprises (SMEs), small companies, and medium-sized businesses, including micro-enterprises, play a significant role in the global, European, and national economies, particularly during times of multiple changes and challenges. The current context, encompassing the conflict in Ukraine, Industry 4.0, and the post-pandemic situation, is highly complex, where factors such as agility and resilience are critical determinants for the economic development of each business. Globalization has a big influence on the business world and it makes it more homogenous day by day (Veith, 2020).

The COVID-19 pandemic has significantly affected SMEs, subjecting them to restrictions, temporary closures, and supply chain disruptions. Many of these small and medium-sized enterprises had to adapt their business models and seek digital solutions to survive during this difficult period. Before the pandemic the knowledge regarding: digital skills and, also, the confidence to use those was at very low, among everybody (Stoica, et al., 2021). Nevertheless, technology has significantly progressed, and individuals have become adept at utilizing the internet and various devices like laptops, tablets, and smartphones. Digitalization has become an integral aspect of everyone's daily routine, revealing its merits and drawbacks even prior to the pandemic (Veith, et al., 2021).

Until this point in history, humanity has undergone three industrial revolutions. The first one emerged at the onset of the 17th century, catalyzed by the invention of the steam engine. The second industrial revolution was triggered at the beginning of the 20th century by the widespread use and mass production of electricity. Subsequently, following World War II, the advent of computers sparked the third industrial revolution (Veith, 2018).

The pandemic has expedited the process of digitalization across various sectors. With the state of emergency in place, working from home became the only viable option for many individuals to ensure continuity in their work (Veith, et al., 2021). Consequently, there has been an increased interest in and adoption of Industry 4.0-related technologies, such as automation, artificial intelligence, and digital technology. So, the digital transformation in Europe was accelerated by artificial intelligence, robotics, cloud computing, and blockchain (Veith, 2020). Cloud computing stands as the cornerstone that has paved the path for this revolution (Veith & Savin, 2019). Digitalization plays a vital role, also, in propelling the shift towards a circular economy. Modern technologies like artificial intelligence, the Internet of Things, big data, and blockchain act as enablers for various production processes, enhancing the utilization of natural resources and optimizing the design, production, repair, and recycling of specific products. However, it is important to note that digitalization alone does not guarantee higher levels of sustainability (Veith, et al., 2022).

Notably, SMEs in Eastern Europe face a series of significant challenges, including access to financing, lack of necessary infrastructure for sustainable development, restrictive regulations, bureaucracy, limited access to international markets, and, most importantly, a shortage of skilled labor. Moreover, the instability experienced over the last five years has been a crucial aspect.

SMEs in Romania, being one of the countries in Eastern Europe, have encountered all the aforementioned challenges, but their most pressing difficulty lies in accessing financing. These

companies often face financial constraints, including high interest rates, stringent collateral requirements, and a lack of bank trust in the SME sector. Additionally, inadequate infrastructure, especially in less developed regions, poses a major challenge for Romanian SMEs. The absence of modern and efficient infrastructure, such as transportation, telecommunications, and energy networks, limits these companies' capacity to operate efficiently and expand. Furthermore, there is a low representation of women in entrepreneurial activities.

The purpose of this paper is to shed light on the current situation of SMEs in Romania, presenting the challenges they have faced recently and outlining their development prospects for the future. The research question addressed is: "What is the current situation of SMEs in Romania, and what are their future development prospects?"

To address the research question, three research hypotheses have been formulated as follows:

Hypothesis 1: The COVID-19 pandemic has had both negative and positive influences on the development of SMEs in Romania, depending on their field of activity.

Hypothesis 2: Romanian SMEs have a weak administrative model, where key personnel and owner-administrators have multiple roles in managing the business, resulting in a lack of time and internal resources to plan and manage risks effectively.

Hypothesis 3: Women are underrepresented in the entrepreneurship sector in Romania, but they can offer opportunities for development, innovation, and diversity.

Literature review

Peter Drucker is the one who stated that "small businesses are the central element of stable and continuous economic growth" (Rolando A. Alum, Jr., 1986). This is why it is necessary for them to have all the tools for efficient business and risk management to continue their core activities.

The COVID-19 pandemic has had a significant impact on global trade, leading to a decline of 5.3% in 2020 and 8.0% in 2021 (Dumitrescu et al., 2022; Andrei et al., 2021), as reported by the World Trade Organization (WTO). The Romanian economy was also affected, with a contraction of 2.2% in the Gross Domestic Product in 2020 compared to 2019. To support entrepreneurship, the Romanian government provided micro-grants of 2000 euros to each applicant, with a total budget of 100 million euros, 85% of which came from EU funds, and 15% from the Romanian budget (Luca & Fauskanger, 2021). Additionally, SMEs in Romania received support through deferred payments for utilities and furlough schemes (Antonescu, 2020).

The pandemic impacted various sectors in Romania differently, with agriculture and trade experiencing revenue declines, while online commerce witnessed growth (Dumitrescu et al., 2022). To counteract the economic consequences, governments worldwide adopted expansive fiscal and monetary policies, providing financial assistance and support to businesses. The European Union allocated financial assistance for member states under the NEXT GENERATION - Recovery and Resilience Facility (RRF) program, with Romania set to receive significant grants and loans. In response to the threat of unemployment and to safeguard the standard of living,

various governments implemented expansive fiscal and monetary policies to mitigate job losses and business bankruptcies. For instance, the United States implemented measures to cover a substantial portion of salaries, contingent on companies retaining their workforce. Denmark and the United Kingdom committed to paying 70% of salaries, on the condition that businesses refrained from laying off employees. Additionally, the Australian government, in collaboration with Australian banks, facilitated a loan program amounting to 40 billion US dollars for SMEs. Meanwhile, South Korea extended support by covering rents for street vendors (Song & Zhou, 2020). At the same time, other nations also took measures to protect their domestic economies. The Chinese government introduced a support package to facilitate the digitalization of SMEs amid the crisis. Additionally, Brazil and India extended aid specifically targeted at small businesses (Belitski et al., 2021).

Studies have shown that the measures taken by governments globally had dual effects on economic indicators, leading to an increase in inflation and a decline in the exchange rate (Abdelkafi et al., 2022). The impact on Romanian companies, especially SMEs, has been a subject of research due to their vulnerability during the crisis. Entrepreneurship, a vital part of the Romanian economy, has faced challenges but also opportunities during the pandemic. The pharmaceutical industry experienced positive effects, with an acceleration of digitization in drug deliveries, while the tourism and air transport sectors were severely affected (Nicola et al., 2020).

Overall, the pandemic resulted in reduced revenues, lack of customers, capital needs, reduced investments, production suspensions, and decreased employee working hours (Dumitrescu et al., 2022). Companies that were inexperienced in operating within the virtual realm had to adapt and select from a myriad of solutions available in the market. The primary solutions these companies pursued to enable direct communication with employees working from home and facilitating telework were online platform (Veith & Dogaru, 2020). Many companies had to adapt to the virtual realm and utilize available solutions for communication with employees working from home. Agricultural entrepreneurs turned to digitization and technological advancements for economic recovery (Modgil et al., 2022). In India, digitalization offered hope for the agri-food sector, which employs a significant portion of the workforce (Kumar et al., 2020).

In the era of the Fourth Industrial Revolution, known as "Industry 4.0," global economies face significant challenges, impacting various economic sectors. The changes brought by this era of digitalization are rapid and have an extensive impact on both companies and the daily lives of citizens. In response to market conditions, enterprises across various sectors are striving to enhance their market positioning. As a result, a growing number of new or re-branded products are continuously emerging in the market (Veith & Lianu, 2013).

The term "Industry 4.0" was first introduced in 2011 at the Hanover Fair and sparked numerous debates (Pfeifer, 2017). The purpose of "Industry 4.0" is to initiate the fourth industrial revolution. However, the term has faced criticism, such as that of Wolfgang Halang, who argues that it represents "the second stage of the third industrial revolution," given the shared technological foundation of microelectronics. "Industry 4.0" constitutes an organizational concept with four fundamental principles: interconnection, information transparency, technical assistance, and decentralized decision-making. This organizational approach within companies has a direct and inevitable impact on management.

The World Economic Forum (WEF) identified an increased risk associated with "Industry 4.0" for jobs held by women. A WEF report estimates that by 2026, 1.4 million jobs in the US will be affected by digitization, of which 57% are held by women (WEF, 2018). Additionally, in the so-called "jobs of the future" domains, women face a decrease in power and influence.

In the field of entrepreneurship research, it has been concluded that one of the variables influencing risks and their emergence is related to the gender of those involved in this field.

Based on this conclusion, it is identified that regardless of gender, entrepreneurship and the workforce in this field have been defined as a combination of physical, intellectual, and even personal skills (Jaba, 1979). Other research has concluded that female entrepreneurship can bring higher value compared to the work of the same gender in the labor market, at home, or in other external services (Gaddis and Klasen, 2014).

The importance of the female gender in the field of entrepreneurship and its involvement in risk mitigation has been analyzed in several studies, which concluded that an increase in female entrepreneurship is different from an increase in the labor market of the same gender and different from the labor market as defined in the past (Greenwood et al., 2005). This conclusion was identified to have a positive influence on economic phenomena (Tam, 2003).

Nationally, several studies in the field over the last 10 years (Zamfir, 2005; Dima, 2012; Enescu, 2012) have concluded that female entrepreneurship is associated more with a family and open environment. This conclusion has been highlighted at the international level in certain studies (Da Costa Barreto, Ryan, and Schmitt, 2009). Other national-level research demonstrates that "family matters to 60.9% of women, and professional integration is a secondary element but not at significant differences (57.4%), while 54% of men believe that women should orient themselves towards family life, and only 44% of women agree with this statement" (Dobre, Ailenei, 2010).

Other authors who have researched female entrepreneurship and its involvement in business management and risk reduction in this field include Mincer (1963), Collier et al. (1994), Cleveland et al. (1996), Stolzenberg and Waite (1977), Lehrer and Nerlove (1986), and Thévenon (2009).

Moreover, the specialized literature highlights the importance of female involvement in entrepreneurial activities. Their involvement can lead to risk reduction and bring greater value to this domain. As such, female involvement in entrepreneurship can contribute to diversity, innovation, and a more efficient risk management approach within SMEs.

Thus, entrepreneurship and business management can be influenced by gender, depending on how individuals of different genders choose to anticipate risks or implement concrete solutions for risk reduction. Furthermore, it has been concluded that gender dimensions are involved in business management and risk management and can influence internal and external communication with business partners, customers, or employees, as well as the selection of risk management tools, the application of legislation, and interim or ex-post evaluation.

Research methodology

The research in this paper is of a descriptive nature, based on specialized literature and statistical data. Thus, secondary data research was conducted. The bibliographic research was carried out by selecting relevant literature in the field of SME management and the context influenced by the COVID-19 pandemic and the Fourth Industrial Revolution, using sources such as books, scientific articles, and relevant publications. This research allowed the identification of theories, concepts, and specific challenges of SMEs in the given context. Subsequently, available statistical data from sources such as Eurostat and the Statistical Yearbook of Romania were collected to obtain information about the number of active SMEs in Romania, startup and closure rates, as well as other relevant data. This information was used to support the arguments in the paper and provide necessary context.

The next step involved a literature review. An analysis of existing literature related to the specific challenges of SMEs in the given context was conducted to identify relevant concepts, theories, and studies related to the subject matter. This review provided a solid foundation for developing the arguments and conclusions presented in the paper.

The data and information obtained from the bibliographic research and statistical analysis were analyzed and interpreted to identify trends, patterns, and relevant conclusions. This analysis was used to support the presented arguments and draw conclusions regarding the importance of SMEs in Romania in the current context.

Based on the conducted research and analysis of the results, conclusions were formulated, and recommendations regarding the importance and benefits of implementing efficient management for SME development were presented. These conclusions were integrated at the end to highlight the significance of the subject matter.

The types of companies studied include all kind of Romanian SMEs.

Results and discussions

According to Eurostat data, there are approximately 23.3 million SMEs (micro, small, and medium-sized enterprises) in Europe, contributing to about 52.7% of the value added generated in the non-financial business economy of the European Union.

Regarding Romania, the country ranks last in terms of the number of active SMEs reported per 1,000 inhabitants, with only 29 active businesses per 1,000 inhabitants compared to the European average of 58 active businesses per 1,000 inhabitants. This indicates a need for development and support for the SME sector in Romania.

Based on the latest statistical data published by Eurostat at the European level, there are around 23.3 million SMEs, contributing an estimated 52.7% to the value added generated in the non-financial business economy of the European Union. Given the significant contribution of the SME sector, it is evident that their influence on the Gross Domestic Product (GDP) is substantial, although it varies from one country to another. While recent statistical processing is not available, historical analyses at the European Commission level suggest that Romania ranks last in terms of the number of active SMEs, with a ratio of 29 active businesses per 1,000 inhabitants, half the

European average (58 active businesses per 1,000 inhabitants). The analysis also indicates that the countries with which Romania is compared in terms of development indicators (average wages, GDP per capita) are much better placed in terms of the number of active SMEs reported per 1,000 inhabitants.

Table 1 - Enterprise Demographics, 2020

	The Business Creation Rate (% of newly established enterprises among active enterprises)	The Average Employment Size of Newly Established Enterprises (number of employees)	The Enterprise Liquidation Rate (% of newly established enterprises among active enterprises) (1)
EU	8,90	1,20	7,20
Belgium	6,90	1,50	3,20
Bulgaria	9,10	1,40	14,60
Czechia (5)	8,20	0,80	7,50
Denmark	11,00	1,10	12,20
Germany (2)	7,20	1,90	9,50
Estonia	12,10	1,40	9,90
Ireland (2)	6,70	1,50	1,60
Greece (1) (3) (4)	4,60	2,10	:
Spain (5)	7,40	1,40	8,30
France (6)	11,30	1,10	3,90
Croatia	9,40	1,60	10,00
Italy (5)	6,50	1,20	8,00
Cyprus	9,10	1,10	8,90
Latvia (5)	11,30	1,20	11,70
Lithuania (5)	18,10	0,70	20,80
Luxembourg (5)	7,80	1,70	7,10
Hungary (5) (6)	10,70	1,10	7,60
Malta	14,10	1,50	4,50
Netherlands	10,40	0,60	7,40
Austria (1) (3)	5,40	1,50	4,10
Poland	10,40	1,30	8,80
Portugal (5)	12,20	1,20	13,00
Romania (5)	10,80	1,70	7,60
Slovenia	9,10	1,10	6,10
Slovakia (5)	10,40	1,10	8,40

Finland	8,80	1,00	10,40
Sweden	6,80	1,10	5,60
Iceland	11,80	0,90	8,70
Norway	7,70	0,70	2,60
North Macedonia	8,00	1,90	7,30
Serbia	8,60	:	6,90
Türkiye	14,70	1,70	:

(:) not available; (1) Enterprise Birth Rate: provisional; (2) Average Employment Size of Newly Established Enterprises: estimate; (3) Average Employment Size of Newly Established Enterprises: provisional; (4) Average Employment Size of Newly Established Enterprises: confidential; (5) Enterprise Liquidation Rate: estimate; (6) Data break.
Source:https://ec.europa.eu/eurostat/statisticsexplained/index.php?title=Structural_business_statistics_overview#Size_class_analysis

The demography of SMEs is relevant for statistical analysis, as it indicates the birth and exit rates of enterprises, as well as the average size of newly established enterprises in terms of employment. According to Eurostat, in the published statistical hierarchy, Romania's rate of new active SME creations is at a medium level: 10.8%, offset by an exit rate of 7.6% (Eurostat, 2022).

Regarding the survival rate of SMEs, Eurostat statistics reveal that less than half of new businesses in Europe remain active after five years, which highlights the importance of identifying potential risks and threats as early as possible to address them effectively. In the early stages, companies have more options to adapt and address unfavorable situations (Accountancy-Europe_SME_Insolvency_2021).

Data from the Statistical Yearbook of Romania 2022 (National Institute of Statistics, 2022), which presents the most recent key statistical data, reports a total of 622,384 active SMEs, with a slight increase in the indicator of active SMEs per 1,000 inhabitants (32 active enterprises per 1,000 inhabitants) (National Trade Register Office, 2022).

In relation to other relevant statistical data for the SME sector, the latest edition of the White Charter of SMEs in Romania, which highlights the situation, trends, and perceptions of the business environment, reveals that inflation is the main difficulty, followed by uncertainties regarding future developments and bureaucracy. Previous surveys estimated that although over a third of SMEs have annual plans and policies, about 10% of them operate based on strategic approaches established for 2-3 years, while over 37% of respondents state that they do not plan their activities.

This underscores the need for effective risk management implemented within these entities to address multifaceted risks that may arise from failing to meet the expectations of stakeholders (clients, regulatory authorities, partners, financial institutions, etc.) due to weaknesses in the supply chain, limited resources, and other specific factors.

According to experts in the field (Berry, T., Sweeting, B., Goto, J. & Taylor, M., 2002), the entrepreneurial environment, particularly for SMEs, is subject to greater rigor due to increased competition and experience. SMEs must also comply with more stringent European and national

regulations, including those related to globalization, technology, the digital environment, environmental policies, etc.

In 2019, the gender distribution of authorized persons in active legal entities showed that women represented 34.46%, while men accounted for 65.54% (National Trade Register Office, 2022). Similarly, the age distribution of entrepreneurs in the same year was as follows: individuals under 29 years old at 8.74%, individuals between 30 and 39 years old at 27.34%, individuals between 40 and 49 years old at 29.74%, individuals between 50 and 59 years old at 19.67%, and individuals over 60 years old at 14.51% (National Trade Register Office, 2022).

Before the pandemic outbreak in 2019, Romania had a total of 134,220 companies, with 21.8% in the Trade sector (29,304 enterprises) and 11% in the Construction sector (14,760 enterprises) (National Trade Register Office, 2022). The Scientific Activities sector ranked third with 9.6% (12,875 companies). In the same year, 14,040 firms suspended their activities, with the majority from the Trade sector (4,280 cases), and 6,524 companies went into insolvency, with the Trade sector being the most affected (1,995 cases) (National Trade Register Office, 2022).

In 2020, Romania registered 109,939 companies, with the Trade sector representing 24.3% (26,748 firms), followed by the Construction sector with 12.4% (13,682 enterprises), and the Transport and Storage sector with 10.6% (11,688 companies) (National Trade Register Office, 2022). During the pandemic, 10,913 companies suspended their activities, and 5,694 companies went into insolvency, with the Trade sector being the most impacted in both cases (National Trade Register Office, 2022).

The pandemic led to an 18% decrease in the number of newly established businesses in 2020 compared to 2019, but the number of companies that went into insolvency or suspended their activities decreased compared to the previous year (National Trade Register Office, 2022). The Transport and Storage sector saw significant digitalization growth, adopting the "knowledge-based economy" concept to enhance e-commerce and services (ERP).

In 2021, 148,294 companies were registered in Romania, with the Trade sector representing 19.8% of them, followed by Construction with 11%, and Agriculture with 10.4% (National Trade Register Office, 2022). Despite an overall increase in the number of established companies, the pandemic's effects were evident, resulting in a rise in insolvencies and suspended activities (National Trade Register Office, 2022).

The digitalization trend also affected the agricultural sector, enhancing development opportunities for digitally enabled farmers. However, female entrepreneurship experienced a downward trend, while male entrepreneurship increased during the period 2019-2021. The 40 to 49 age group remained representative in Romanian entrepreneurship during this time interval. Female leadership traits, such as flexibility, intuition, effective communication, attention to detail, and team motivation, have become crucial for successful management (Veith & Costea, 2019).

In 2021, the Information and Communications sector experienced a 46% growth compared to 2019, indicating a substantial acceleration in digitalization and technological advancements in Romania. The "knowledge-based economy" concept found its place in various sectors, including the medical field, where it facilitated patient tracking and data management (National Trade Register Office, 2022). Pharmacies also contributed to digitalization efforts by delivering

medicines and antigen tests to customers' homes. The Romanian educational system emphasized digital skills development to align with European standards.

In this reality, risk management within SMEs becomes a priority to make businesses more resilient and capitalize on potential opportunities. Most SMEs have a weak administrative model, where key staff and owner-administrators have multiple roles in managing the business, leading to a lack of time and internal resources to plan the business and manage its inherent risks. Furthermore, risk management is not only about addressing negative aspects but can also involve seizing new opportunities that make the business more resilient to risks in general. The purpose of risk management is not to eliminate all risks but rather to facilitate the appropriate risk approach to achieve the desired outcomes.

In conclusion, all three research hypotheses have been demonstrated based on the evidence presented.

Conclusions

The study highlights the importance of entrepreneurship in the economic development of Romania and its impact in the context of the COVID-19 pandemic and the Fourth Industrial Revolution. Entrepreneurship represents a vital element of the economy, providing over 60% of employment nationwide and over 95% of all companies globally.

The COVID-19 pandemic had a significant impact on the global economy and the economy of Romania. World trade and Gross Domestic Product experienced considerable declines. In this context, SMEs were profoundly affected, facing reduced revenues, a lack of customers, and the need to take measures to sustain their operations.

The Romanian government adopted measures to support entrepreneurship, including providing micro-grants and deferring utility payments. Additionally, through the NEXT GENERATION - Plan for Recovery and Resilience (PRR) program, Romania is set to benefit from 33 billion euros in grants and approximately 55 billion euros in loans. Similarly, other countries have intervened to support their national economies through various fiscal and monetary policies.

The study's results indicate that technology implementation and digitalization were pivotal factors in the economic recovery of SMEs during the pandemic. Online commerce and digitalized services had a positive impact on the pharmaceutical industry, while the tourism sector and airline transportation were severely affected.

Extensive research has been conducted on female entrepreneurship, and the results have shown that women's involvement in entrepreneurship can bring additional value and contribute to diversity, innovation, and effective risk management within SMEs.

The study employed a descriptive research approach, using statistical data and specialized literature. The research findings highlighted the need for efficient risk management to address the specific challenges and threats faced by SMEs.

Entrepreneurship plays a crucial role in the economic development of Romania and the global economy. To respond to current challenges, SMEs must embrace technology and digitalization and implement efficient risk management. Governments also play a significant role in supporting entrepreneurs through appropriate policies and financial support. Female entrepreneurship

holds significant potential for economic development, and diversity and innovation are key elements in ensuring a sustainable and prosperous economy.

This study also presents some limitations that invite researchers to delve further into the subject, namely:

The study primarily focused on the situation in Romania, which means that the results and conclusions may apply specifically to this country. This limits the generalizability of the findings to other countries or regions with different economic and social contexts.

The research relied on secondary data and statistical analyses but did not include a proprietary study sample. As a result, the conclusions and results presented are based on aggregated data at the national and European levels, without exploring the specific peculiarities or variability of different regions, industries, or sectors.

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Key Aspects in Assessing Entrepreneurial Risks Before and After Implementing a Business Idea

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Abstract: *This paper examines the importance of risk management within small and medium-sized enterprises (SMEs) and investigates the specific situation in Romania. SMEs represent a vital component of the European economy, making significant contributions to the generated value added and beyond. Effective risk management is essential for the survival and success of these enterprises. A correct understanding of the context, without actually facing the same challenges, is particularly important for guiding and advising other entrepreneurs. The utility of this paper lies in offering a comprehensive perspective on the importance of risk management in SMEs and proposing directions and solutions for its improvement. The paper highlights the need for implementing effective risk management internally at the SME level to protect and sustainably develop them. By identifying and assessing risks, developing risk management plans, and continuously monitoring and updating these plans, SMEs can become more resilient to changes and challenges in the business environment. To achieve this, the paper proposes a risk assessment checklist for evaluating and accurately planning the directions of action and development for SMEs. This evaluation is valuable for any SME in different stages of its existence.*

Keywords*: e*ntrepreneurship, risk management, resilience, Romania, risk assessment.
JEL Classification: D81, G32, M21

1.Introduction

Regarding risk management in small and medium-sized enterprises (SMEs), it has become even more critical in the current post-pandemic context, marked by the fourth industrial revolution and the conflict in Ukraine. In this context, SMEs need to identify and manage risks associated with economic uncertainties, changes in market demand, resource availability, and other specific aspects. Implementing effective risk management can help SMEs face challenges and capitalize on opportunities in a more resilient and sustainable manner.

The COVID-19 pandemic has significantly impacted the SME sector, necessitating adaptation and the adoption of Industry 4.0-related technologies. Risk management is essential for the survival and success of SMEs in an uncertain economic environment, and the involvement of female entrepreneurship can bring value in this context. COVID-19 has not only impacted the economic landscape but also profoundly affected the daily lives of citizens worldwide. People have faced numerous restrictions, primarily centered around social distancing and significant changes in their professional practices (Veith & Dogaru, 2020). The pandemic has expedited the process of digitalization across various sectors. Remote work became a prevalent option during the state of emergency, enabling individuals to sustain their work activities (Veith, et al., 2021).

In Europe, the digital transformation has been expedited by a combination of factors, including the pandemic and advancements in technology such as artificial intelligence, robotics, cloud computing, and blockchain (Stoica, et al., 2021). The progress made in the realm of Information and Communication Technology (ICT) in recent years has been remarkable (Veith, 2020). So, the objective of "Industry 4.0" is to integrate all these components into an interconnected global value chain that is shared by multiple companies across various countries. These technologies encompass a range of cutting-edge advancements, such as advanced robotics, artificial intelligence, sophisticated sensors, cloud computing, Internet of Things, data capturing and analysis, digital printing (including 3D printing), software as-a-service, smartphones, and other mobile devices, along with platforms utilizing algorithms for driving vehicles (including navigation tools, ride-sharing applications, and autonomous vehicles) (Veith, 2018). In an increasingly digital global economy, SMEs in Romania also face challenges related to the adoption of digital technologies and innovation.

In many cases, these companies encounter resource limitations, skills gaps, and technological expertise, hindering their ability to improve business processes and remain competitive in the market. The business environment is often dominated by excessive bureaucracy and a complex legislative framework. This poses significant challenges for SMEs as it creates difficulties in complying with regulations and obtaining approvals necessary for their operations. The labor market currently experiences a lack of adequate skills for the needs of SMEs. Attracting and retaining qualified workforce poses a challenge, and investments in training and skill development are difficult to achieve for SMEs. The variations in leadership styles can be regarded as an advantage, benefiting both men and women, as they foster the essential leadership skills required for effective management in today's world (Veith & Costea, 2019).

Expanding into international markets is also challenging due to trade barriers, varying regulations, and fierce competition. Access to international business networks and the development

of strategic partnerships are essential to overcome these challenges. On the global market the competition is every day higher and higher. The advantages of this competition are primarily evident in the production and presentation of high-quality products, as well as in establishing the competitive price achievable by the bidders (Veith & Lianu, 2013). This is a great challange for the SMEs. In numerous European countries, the prevailing economic model fosters rapid consumption and extensive exploitation of natural resources. We are witnessing a growing vulnerability of the sharing and green economy model to global market trends. People are increasingly receptive to green products, with a growing demand for organic goods, which plays a crucial role in transitioning towards a green economy (Veith, et al., 2022).

In this context, we deemed it important to address the following research question: "What are the main risks and challenges faced by SMEs in Romania concerning risk management, and how can they be efficiently addressed to ensure the sustainability and resilience of businesses?"

The research objective of this paper is to answer the research question by analyzing the importance and influence of risk management in the Romanian SME sector and highlight the need for implementing effective risk management for the development and success of these small and medium-sized enterprises.

2.Literature review

Confidence in a business relationship is associated with the level of risk undertaken by the parties involved (Veith, 2020). In research studies focusing on risk management, several central theoretical and scientific elements have been identified, including concepts and terms (such as the probability of risk occurrence, the risk itself, vulnerability), knowledge for overcoming risks, types of uncertainty and their management, integration of implementation principles and methods with risk anticipation, resilience, reevaluation or redefinition of the management field, and approaches to anticipating, managing, or combating risks (Chapman & Cooper, 1983).

Althus (2005) defines risk as the "probability that an event affecting business activities and projected outcomes will occur at the business level" (Althaus, 2005). Within the research domain, risks have been classified into various categories, and assuming these risks has been framed as a method of development and innovation (Chapman & Cooper, 1983). From this perspective, risks are primarily categorized as external or internal. External risks relate to national economic policies, environment, technology, national economy, social environment, purchasing power, etc. Internal risks pertain to material, financial, and even human resources, internal technology, internal infrastructure, etc.

Regarding risk management, it has been concluded that SMEs and other entrepreneurship entities tend to deny and ignore risks and lack a well-formed risk management policy (Jaynes, 2005). Risk assessment involves identifying actual responses to classifying risks based on their impact on company activities when they occur. Uncertainty is a fundamental characteristic of risk assessment, being integral to risk conceptualization and evaluation. Depending on the degree of uncertainty, identified risks can be evaluated as possible (Commission, 2018).

Knight defines risk as the concept directly involved in identifying situations that can affect

business management, while uncertainty refers to situations where the probabilities of a particular situation/risk occurring cannot be identified (Watkins, 1922). These two concepts have been introduced into the realm of statistical probabilities (Ritholtz, 2012). Nevertheless, it is essential to note that both risk and uncertainty, regardless of the situation, can have a positive or negative impact on any business. This necessitates effective risk management, preferably within the framework of risk management as an internal management form clearly defined in any business. In business management, decision-making is based on past and present data and predictions regarding identified risk situations.

In the specialized literature on risk situations, the notion of resilience emerges. It has been associated with a firm's ability to respond efficiently to natural disasters (e.g., floods or earthquakes) and human-made disasters (e.g., financial crises or wars) (Dahles & Susilowati, 2015; Iborra, Safón, & Dolz, 2019; Ortiz-de-Mandojana & Bansal, 2016), through changes meant to protect or enhance the business in challenging conditions (Korber & McNaughton, 2018). SMEs have been the focus of many studies examining resilience (Audretsch & Belitski, 2021; Iborra et al., 2019; Torres, Marshall, & Sydnor, 2019). Given their significant numbers in various sectors (García, Castillo, & Durán, 2012) and limitations related to resource access (Petrou et al., 2020), SME resilience has serious implications for the sustainability of local and national socioeconomic systems (Adekola & Clelland, 2020; Hadjielias et al., 2022). Companies, as the dominant unit, have been at the center of resilience studies, particularly concerning exogenous shocks (Dahles & Susilowati, 2015; Ortiz-de-Mandojana & Bansal, 2016).

Resilience is also crucial at the individual level. Resilient individuals, especially owner-managers, have been identified as vital for SME survival (Ghobakhloo & Tang, 2013; Herbane, 2019; Kevill et al., 2017) because they seek alternatives in adverse conditions and demonstrate the capacity to manage complex situations and identify solutions (Renko, Bullough, & Saeed, 2021; Santoro et al., 2021). Previous research has shown that both individual resources of owner-managers prior to adversity and their cognitive and behavioral responses to such events are decisive for SME success (Kevill et al., 2017; Shepherd, Saade, & Wincent, 2020).

3.Research Methodology

To conduct this study, a comprehensive literature review was conducted in the fields of risk management and entrepreneurship, utilizing sources such as books, scientific articles, and other relevant publications, with a focus on the most recent data available. The databases used to search for scholarly articles and books included Google Scholar, Springer, Academia.edu, BRILL, and Wiley Online Library. This research allowed the identification of theories, concepts, and methods related to risk management within SMEs.

Additionally, statistical data from reputable sources such as Eurostat and the Statistical Yearbook of Romania were included, as well as empirical data derived from European entrepreneurship projects carried out by the primary author of this paper.

Based on these collected pieces of information, an analysis of the existing literature on risk management and entrepreneurship was performed, providing a solid foundation for developing

the arguments and conclusions presented in this paper.

The data and information obtained from the literature review and statistical analysis were carefully analyzed and interpreted to identify trends and create a list of relevant elements essential for ensuring sustainable development within SMEs, as proposed by the authors in this paper.

Furthermore, within the conclusions, the significance and benefits of implementing effective risk management within SMEs were highlighted, and recommendations were presented. These conclusions were integrated at the end of this paper.

4.Results and disucssions

Risk assessment in the field of entrepreneurship represents a critical element that can influence the success or failure of a business and the efficient resolution of potential issues that may arise within it. An incomplete risk assessment in entrepreneurship, or one that fails to consider all the variables of the current and future realities, can lead to ineffective and disconnected problem-solving approaches. Business management plays a critical role in meeting these emerging demands, as it must provide the necessary conditions for dynamic capacity development, efficient learning, and innovation (Veith & Savin, 2019).

In the evaluation stage, the initial "generations" are represented by Lincoln and Guba (1989). According to this approach, evaluation involves defining and characterizing variables and recording the instruments used to measure the degree of achievement of predetermined objectives. Authors such as Ralph Tyer, Percy Bridgman, and E.L. Thorndike, who initiated this type of evaluation, focused strictly on quantifiable and measurable results in relation to the initially set objectives. Consequently, other authors noted that this type of risk evaluation can only be applied to areas of limited complexity that emphasize quantified and measurable outcomes, rather than qualitative aspects, and only for a short period (Shinkfield, 2007).

The next "generation" of risk assessment is represented by Scriven and Campbell, emphasizing the identification of causes that led to the appearance of a specific risk and the application of direct measures to address those causes, not the problem itself (Shadish, Cook, & Leviton, 1991). This period of evaluation promotes validity and its types: internal or external validity (Radeli & Bruno, 1996, p.52).

In this domain, certain questions that form the basis for risk assessment in entrepreneurship have been adopted, even from the public domain (such as the evaluation of entrepreneurship support programs), including: What is the problem to be addressed? What solutions have been identified to address it? What are their consequences? What are the possibilities of their occurrence in the future? What resources are required (financial and non-financial)? How can the identified alternatives be classified based on the resources involved? What criteria can be used to make the most appropriate choice among the potential solutions? (Vendung 2005, p.24).

The third "generation" of risk assessment was initiated by Rossi and Freeman. Within this approach, the authors highlighted the necessity of applying more concrete methods for risk evaluation.

From the previous presentations, it can be inferred that risk assessments in the field of entrepreneurship can be either summative, specific to the three stages, or formative, which are more

commonly used nowadays. Formative risk assessments start with identifying the explanations for the potential risks and continue with adapting them to the situations that arise during the process, aiming to identify optimal solutions to overcome them.

In risk assessment within entrepreneurship, several studies have shown that this domain is quite complex and ontological, which is why classic research tools (statistics) can be used for evaluation. The assessments may also involve making assumptions, taking measures to prepare for their validation, implementing a stable risk management approach even if no potential risks have been identified until a certain point, and allocating annual financial resources to implement risk management and solutions to combat possible risks. Both internal and external validity of the measures taken in this domain and improving future actions based on the conclusions drawn from the current evaluations are also important aspects (essentially, redefining objectives based on possible risks or how certain risks have already been addressed).

In a recent advanced research study examining risk management practices in Romanian SMEs (Prioteasa et al., 2021), exploring organizational factors and practices that integrate risk management into the daily activities of Romanian SMEs, it was found that organizational differences affect the extent to which risk management is integrated into the current activities of SMEs. Medium-sized enterprises operating globally and having a medium presence in the market (5-10 years) have a major influence on the extent of risk management integration due to significant financial and human resources and well-organized procedures that are continuously adapted to collaborators' requirements and regulatory institutions. The results also show a positive relationship between risk management, SME-level practices, and the current inclusion of risk management information. It was found that risk assessment in entrepreneurship shares common elements with the evaluation of public entrepreneurship programs (Jack, Dodd & Anderson, 2008).

Guba, Lincoln, Fischer, Forester, Torgerson, and Deleon have also contributed to this framework, stating that evaluation should not be solely scientific and should reflect the reality as closely as possible regarding risks, assumptions, variables, and objectives (Connolly, Boyne, 2003).

Risk assessment in entrepreneurship is an approach aimed at identifying, evaluating, and managing risks associated with entrepreneurial activities. Entrepreneurs face various risks such as business failure, financial risk, market risk, and innovation risk. The objective of risk assessment is to analyze these risks, identify influencing factors, and develop strategies to manage them effectively.

The generation of evaluating public entrepreneurship programs refers to the process of assessing the effectiveness and impact of public entrepreneurship programs. These programs are initiatives carried out by governments or public institutions to support entrepreneurship development and stimulate economic activity. The evaluation of public entrepreneurship programs aims to assess the outcomes and effects of these programs in achieving their objectives, creating jobs, fostering innovation, and developing the entrepreneurial sector. There are several common points between risk assessment in entrepreneurship and the generation of evaluating public entrepreneurship programs, namely those related to risk identification, evaluation, analysis, risk management, relevance, and reality. Both in risk assessment in entrepreneurship and in evaluating public entrepreneurship programs, it is crucial to identify and understand the risks involved.

In the first case, risks associated with entrepreneurial activities, such as business and market risks, are analyzed. In the second case, risks and the impact of public entrepreneurship programs on the economy and society are identified.

Both methods involve risk or public entrepreneurship program evaluation and analysis. Specific techniques and tools are used to evaluate the probability, impact, and risk management in entrepreneurship or to assess the success, impact, and effectiveness of public entrepreneurship programs. Both in entrepreneurship and public entrepreneurship programming, risk management is essential. In entrepreneurship, entrepreneurs must develop strategies and plans to manage risks and minimize their impact on the business. In the case of public entrepreneurship programs, responsible authorities and institutions must implement measures and actions to reduce risks and maximize the positive impact of the programs. Both methods emphasize the importance of relevant and realistic evaluation. In risk assessment in entrepreneurship, it is essential for the evaluation to reflect reality and provide a faithful perspective on risks and the specific context of entrepreneurship. In evaluating public entrepreneurship programs, the assessment must offer an accurate picture of the impact and effectiveness of these programs within the social, economic, and political context.

Based on the concise presentation of the characteristics of risk assessment generations, the work aims to identify complex criteria that can underpin risk assessment before implementing an idea in entrepreneurship. These criteria can be subject to evaluation both before implementing a business idea and ex-post, after its implementation, to make necessary adjustments along the way.

The considered criteria are encompassed in an "evaluation checklist" and are based on including all main categories that should be taken into account when initiating a business, as well as when deciding whether to continue or not with its implementation, in case certain discrepancies arise during the process.

Table 1: Main Categories of Evaluation Checklist Factors

Main Categories	Subcategories	Details
Defined Business Need	Was the need that triggered the business genuine or is it genuine?	Emphasizing the condition that a business idea should stem from a clearly defined need within the target group, aims to consider reducing potential risks that may arise during the process. If the need is not genuine, the potential risks that could emerge will be more complex and prolonged.
	Was the need that triggered the business current or was it current?	The timeliness of the need within a business is a fundamental aspect as it can determine the success or failure of the venture and give rise to multiple risks within the business.
	Have the potential causes of risks underlying the initiation of the business been accurately and comprehensively anticipated?	In this scenario, the comprehensive definition of potential risks that could occur within the business is highlighted. Only through this approach can effective and tailor-made risk management measures be implemented to address current needs.
	Have all the risks that may arise during the implementation and operation of the business been identified?	In this context, the focus is on identifying risks based on their respective domains, categories, and urgency levels. This aspect will also lead to the correct identification of measures that can be taken to mitigate these risks.
Target Group	Was the target group correctly identified based on the initially identified need?	In this case, it is necessary for the target group to be accurately defined and encompass all the socio-demographic variables necessary for its identification.
Purpose	Was the business objective achieved?	In this context, the intermediate evaluation of risks is taken into account within business management. It is essential for this type of business to be applied regularly, especially during the initial years of operation.
	Was the business objective identified based on the initially defined need?	For effective business management and early risk reduction, it is crucial for the purpose and objectives of the business to be aligned with both the initially described need and the target group considered within it.

Objectives	Were the business objectives achieved within the initially set timeframe?	This aspect will also be evaluated during the intermediate assessment. If it is identified that the initially set objectives have not been achieved, they can either be redefined or additional measures can be taken to reach them.
	Were the business objectives formulated in correlation with its purpose and the initial need?	For efficient business management, it is necessary for the business objectives to correspond with the initial purpose and the initially identified need. The evaluation of objectives will also be carried out during the intermediate stage. Similar to the previous subpoint, it is recommended to evaluate objectives regularly, particularly during the first years of business activity.
Direct Beneficiaries	Did the direct beneficiaries correspond to the target group?	It is taken into consideration that the direct beneficiaries should be identified based on the initial target group. This aspect leads to the preservation of the business objectives and the identification of the same variables considered at the beginning.
	Did the direct beneficiaries undergo any changes during the implementation of the business?	In the event that the direct beneficiaries undergo changes in terms of their variables, then the business objectives will also be subject to modifications. In this case, the initial fundamental elements will no longer be adhered to, and the potential risks will become much more complex.
Actions	Were the business actions formulated based on the initially identified need?	Internal actions within a business, aimed at ensuring efficient management and a reduced level of risks, are advised to be formulated considering the need taken into account when starting the business.
	Did the business actions take into account its purpose and objectives?	Similar to the previous subpoint, internal actions within a business, aimed at ensuring efficient management and a reduced level of risks, are advised to be formulated in a manner that leads to the achievement of the initial purpose and objectives.
Costs	Have the financial costs not been exceeded?	Business management also takes into account the identification of risks in the financial domain. From this perspective, it is recommended that the initially established costs should not be exceeded. By doing so, financial risks will be extended over a longer term.
	Can the financial costs be substantiated realistically?	In the context of business management, for the included financial costs, there needs to be justification, reasoning, and a realistic assessment. This aspect significantly reduces the occurrence of financial risks.

Human Resources	Have the human resources been prepared in advance for the respective field of activity?	To mitigate risks in business, one of the most important resources is the human factor. It is advisable for individuals to be adequately prepared for the specific field of activity, thereby minimizing the potential for human-related risks.
	Have the human resources been adequately involved in the business?	The appropriate involvement of human resources within a business facilitates the implementation of efficient business management and significantly reduces the potential risks that may arise along the way.
	Was the number of human resources correlated with internal needs?	In business management, to minimize risks, it is necessary for the involved human resources to be aligned with the internal needs of the respective business. In case of surplus or insufficient human resources, the business will be affected, and risks will extend to other categories such as financial and productivity-related risks, etc.
The responsible parties	Have the direct stakeholders been involved in the implementation of the business?	Effective business management takes into account the direct involvement of responsible individuals and managers in the business operations. This aspect contributes to reducing risks over time.
Timeframe	Have the time frames established within the business management been respected?	Failure to adhere to timeframes in business management increases the likelihood of various risks (both financial and non-financial) arising. Complying with timeframes leads to proper business management and, consequently, efficient business management.
Outcomes/ Results	Have the anticipated results been fully achieved?	Achieving this element results in the mitigation of potential future risks and the implementation of high-quality business management.
	Can the obtained results be measured and verified objectively?	Quantifying results makes the evaluation process much more transparent and objective. This aspect eliminates any risk during the evaluation stage and throughout the business management process.

Source: Generated by the author.

The purpose of the presented "evaluation list" is to provide the possibility of conducting a comprehensive and objective evaluation that reflects the real elements characterizing a specific situation in the field of entrepreneurship at a given time. It comprises 11 main evaluation categories and 27 subcategories (Table 1).

The main proposed evaluation categories are: defined need within the business, direct target group, purpose, objectives, direct beneficiaries, actions, costs, human resources, responsibilities, time, and outcomes.

5.Conclusions

Through the proposed evaluation list, we provided a simple and organized response to the research question: "What are the main risks and challenges faced by SMEs in Romania regarding risk management, and how can they be efficiently addressed to ensure the sustainability and resilience of businesses?"

The research objective of this study, which aimed to analyze the importance and influence of risk management in the Romanian SME sector and highlight the need for implementing effective risk management for the development and success of SMEs, was achieved through the developed evaluation list. The significance of this list is further explained by the fact that most SMEs have a weak administrative model, where key personnel and owner-managers have multiple roles in business management, leading to a lack of time and internal resources to plan and manage the inherent risks of their operations.

Risk management is a domain that combines scientific and practical categories, particularly from a decision-making perspective. Risk evaluation and risk management are integral internal components of business management. Without them, implemented strategies and other types of management remain without a safety net to ensure business continuity during uncertainties and crises. Risk management is an essential part of efficient and complex business activities.

Risks are characterized by uncertainty, which necessitates specific research and analysis methods to anticipate and identify effective measures for combating or at least mitigating risks.

The proposed list of main evaluation factors for identifying risks in a business serves as a practical tool during the initial stage and post-evaluation of risks, rather than a research instrument or statistically verified method within SMEs or businesses.

The proposal of a list of main evaluation factors for identifying risks is valuable in itself as it offers a clear structure and a solid foundation to thoroughly explore the subject of risk identification.

The advantages of proposing an evaluation factor list for risk identification include: clarity and organization of information, synthesis of relevant information, and a practical working basis for any entrepreneur, especially in today's dynamic context. As such, the evaluation list is beneficial for professionals in various fields, such as project or company managers engaged in risk management and planning. It can also serve as a valuable resource for individuals interested in risk management and minimization.

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Human resource evaluation in the public health system in Romania. Perspectives of management system optimisation

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Abstract: *Human resources are an essential component of every healthcare system. The experience, competence, and devotion of the workers responsible for providing these services are critical to the efficiency of healthcare systems. Despite recognizing the importance of workers, several countries perform ambiguous and ineffective health workforce policies and initiatives. Health workers play a critical role in promoting people-centered health systems, supporting resilient economies, and fostering sustainable development. Success in achieving these global goals depends on the efficient deployment of competent and motivated health workers where they are needed to provide a full range of quality health services in a respectful and accountable manner.*

The aim of this study is a spatial analysis of the number of doctors in relationship to the needs of the Romanian population. Data were collected from 42 counties and several spatial analysis tools were applied to measure the optimal distribution of medical human resources in relation to the Romanian population, for the period 2000-2021. As a result, spatial inequalities can be observed which need to be taken into account in public policy and management system optimization.

Key words: Public Healthcare, Health Planning, Human Resources for Health, Management of Public Healthcare, Number of doctors

JEL: I15, I18, I10

1. Introduction

The goal of any healthcare system is to improve public health by ensuring better quality management. Performance measurement is one of the methods of quality management in healthcare (Rasouli and Zarei, 2016). This allows health professionals to discover areas for growth and share their experiences. However, performance measuring methods will be unsuccessful unless the data are backed up by a continual quality improvement approach. As a result, there is a strong link between performance assessment and quality management in healthcare (Cinaroglu and Baser, 2016).

The basic purpose of health policy is to encourage adequate care while taking into consideration patients' desires. As a result, nations are creating strategies to eliminate obstacles to access and use of health care, such as regional inequalities (OECD, 2014). As a result, policymakers require data from geographic information systems (Philips et al., 2000). The accessibility of healthcare is determined by geographical location and level of development. With recent technology developments, current statistics on accessibility, whether rural or urban, are now available (Chirikos and Sear, 2000; Philips et al., 2000). Without a geographic region or level of development, regions cannot properly connect to health effectiveness indicators that have the capacity to influence health outcomes. Variations across some demographic areas are greater in some countries than in others, and differences in development level between rural and urban parts of the country are much higher in developing countries; that is, developing countries are still attempting to meet the basic health needs of their poor population in rural areas.

Health human resources are essential to the operation and development of health systems. The development and upkeep of human resources in the health industry are influenced by a number of variables (Salehi et al., 2021). Effective human resource management in the health sector requires the inclusion of availability, accessibility, acceptability, and quality characteristics in national health policy (Dubey et al., 2021). For the public health sector to retain and engage its personnel, management techniques such as recruiting, remuneration, succession planning, and performance evaluation are essential (Nkala et al., 2021). It is crucial to restructure work through participatory initiatives, adopt cooperative policy-making, and engage in capacity development at all system levels in order to solve weaknesses in health human resource policies (Denis et al., 2021).

The healthcare system and overall health are essential foundations of any society. The healthcare system is essentially dependent on connections established through trust. Trust is the primary foundation for these relationships (Gilson, 2003). In this context, trust is defined as the belief that healthcare personnel will act in the best interest of patients and adhere to the principles of beneficence, fairness, and honesty, reflecting their knowledge, ability, and competence. At the individual level, trust enhances the efficacy of the interaction between doctor and patient, leading to higher levels of patient satisfaction and improved adherence. At the societal level, trust plays a crucial role in achieving the desired impact by meeting expectations and enhancing influence (Davies and Shields, 1999; Pearson and Raeke, 2000; Lee et al., 2007).

The Romanian healthcare system has major issues that must be addressed. People now have less faith in the public health system as a result of its numerous failures. Among the several

difficulties observed in the health system, we may list bureaucracy, patient waiting time, obstruction of the electronic card system, and so on. All of this has an influence on both patients and medical personnel. As a result of the difficult economic times, individuals with more reason choose to rely on rapid solutions and ad hoc results, even if it means curing themselves in their homes rather than going to the doctor (Dinulescu et al., 2018).

2. Literature review

According to Chen Xiao-ming (2012), human resources for health refer to the number and skill level of healthcare professionals in a specific time and region. They play a crucial role in maintaining and enhancing healthcare systems, and serve as an important indicator of the quality of healthcare services. Human resources in health are a key factor in the delivery of medical and health services. Therefore, their equitable distribution is crucial to ensuring fair access to healthcare for residents and promoting equity in the healthcare industry (Xu Min-xuan and Jia Li- ying, 2018).

Human resources, in particular, are one of the three major inputs into a health system, the other two being physical capital and consumables (World Health Organization, 2000). Human resources in healthcare relate to the numerous clinical and non-clinical professionals who are in charge of public and individual health treatments (World Health Organization, 2000). The knowledge, skills, and motivation of the personnel accountable for delivering health services are perhaps the most important of the health system inputs, and the system's effectiveness and the benefits it can give are mostly dependent on their knowledge, skills, and motivation (World Health Organization, 2000).

An analysis of healthcare systems on a global level brings up numerous general issues and questions surrounding human resources. The most relevant issues include the size, composition, and distribution of the healthcare workforce, workforce training, the migration of healthcare professionals, the level of economic development, and sociodemographic, geographical, and cultural factors. The diversity in size, distribution, and composition of healthcare workers within a county is a matter of great concern. For instance, the availability of healthcare workers in a country is a crucial indicator of the country's ability to deliver medical services and interventions (World Health Organization, 2003). When determining the demand for medical services in a given country, it is necessary to consider cultural characteristics, sociodemographic factors, and economic aspects (Zurn et al., 2004). Training the workforce is another important aspect to consider. Considering the composition of the health workforce in terms of both skill categories and training levels is essential, according to reference (World Health Organization, 2003). To ensure that the healthcare workforce is aware of and prepared to meet the present and future needs of a particular country, new options for education and in-service training are required (World Health Organization, 2003). Having a competent and well-trained workforce is essential for the success of any healthcare system.

The migration of healthcare workers is a crucial concern when investigating global healthcare systems. Healthcare professionals' mobility tracks other professionals' migration trajectories

since relocating to urban centers is widespread in all nations (World Health Organization, 2003). Employee mobility can lead to imbalances that require enhanced workforce planning, attention to compensation and other incentives, and better overall workforce management. Aside from salary incentives, developing countries employ other strategies, such as providing housing, infrastructure, and chances for job rotation, to attract and retain health professionals (World Health Organization, 2003). This is because numerous health workers in developing countries receive inadequate payment, lack motivation, and express strong discontent (Zurn et al., 2004). Health worker mobility is a critical human resource issue that must be properly analyzed and controlled.

A further issue when analyzing global healthcare systems is a nation's level of economic development. Significant positive correlations have been found between a country's level of economic development and the number of human resources for health (Zurn et al., 2004). Nations with greater GDP per capita spend more on healthcare than nations with lower GDP, and typically have larger health workforces. This factor should be considered while studying and implementing solutions to problems in developing-country healthcare systems.

Socio-demographic characteristics, such as population age distribution, are critical in a country's health-care system. As the population ages, so does the need for healthcare services and staff [3]. An aging population among the healthcare staff has significant implications: younger workers will require additional training to replace the large number of retirement-bound healthcare professionals.

Considering cultural and geographical factors is essential when analyzing global healthcare systems. Geographical elements such as terrain and temperature can have an impact on healthcare delivery. Furthermore, a country's cultural and political values can influence the demand for and supply of human resources in the health sector (Zurn et al., 2004).

Examining global healthcare systems, it is necessary to investigate the effect of human resources on healthcare sector transformation. Although healthcare reform varies by country, certain patterns can be observed. Efficiency, equity, and quality objectives are three major trends (Zurn et al., 2004).

Several human resource initiatives have been implemented to improve efficiency. Outsourcing services have been adopted as a way to change fixed labor expenses into variable costs with the aim of enhancing efficiency. Measures such as contracting-out, performance contracts, and internal contracting have also been employed (Zurn et al., 2004).

Human resource initiatives for health sector reform often include attempts to increase equity or fairness. To promote equity based on needs, specific strategies require more systematic planning of health services. Several strategies can be employed such as introducing financial protection mechanisms, targeting specific needs and groups, and providing re-deployment services (Zurn et al., 2004). Human resource professionals must aim to increase equity in their countries by implementing these and other measures.

The objective of human resources in health sector reform is to enhance the quality of services and patient satisfaction. There are two methods to describe healthcare quality: technical quality and sociocultural quality. Technical quality refers to the impact that accessible health care can have on a population's health (Zurn et al., 2004). Sociocultural quality refers to the level of

acceptability of healthcare services and their ability to respond to patients' expectations (Zurn et al., 2004). Human resource professionals encounter numerous barriers in their endeavors to provide high-quality healthcare to citizens. These impediments consist of budgetary issues, incongruity of values among stakeholders, high absenteeism rates, elevated turnover rates, and low staff morale.

Health sector reform (Kirby, 2002) has recommended better utilization of healthcare providers and improved coordination of patient services through interdisciplinary teamwork. Effective human resources management will be crucial for the success of health sector reform as all healthcare services are ultimately provided by people.

Developing countries invest a significant amount of their national resources in training healthcare professionals. However, many of these professionals relocate to other areas of the world to pursue better opportunities and benefits. Human resource professionals are faced with the task of trying to find and/or retain employees in areas most affected by the loss of valuable workers.

3. Research methodology

The aim of this study is a spatial analysis of the number of doctors in relationship to the needs of the Romanian population. Data were collected from 42 counties and several spatial analysis tools were applied to measure the optimal distribution of medical human resources in relation to the Romanian population.

Study area

Romania is represented in the $v_{it} \sim IID(0, \sigma_v^2)$ study area by 42 counties (Bacău, Botoșani, Iași, Neamț, Suceava and Vaslui part of North-East Development Region; Brăila, Buzău, Constanța, Galați, Vrancea and Tulcea part of South-East Development Region; Argeș, Călărași, Dâmbovița, Giurgiu, Ialomița, Prahova and Teleorman part of South-Muntenia Development Region; Dolj, Gorj, Mehedinți, Olt and Valcea part of South-West Oltenia Development Region; Arad, Caraș-Severin, Hunedoara and Timiș part of West Development Region; Bihor, Bistrița-Nasăud, Cluj, Sălaj, Satu Mare and Maramureș part of North-West Development Region; Alba, Brașov, Covasna, Harghita, Mureș and Sibiu part of Center Development Region and Municipality of Bucharest and Ilfov part of Bucharest-Ilfov Development Region) which were analyzed spatially.

Figure 1: Study area - Romania

Source: Data provided by https://www.naturalearthdata.com/

Spatial analysis

On the data spread over 42 counties, conventional spatial analysis was done. A database containing the number of doctors and population at the county level was constructed. The geographical analysis was carried out using the county-level datasets comprising the number of doctors and population for the period 2000-2021 as follows: specific intervals have been created for each studied type (number of doctors and population number), a group of 21 distinct maps (choropleth map) were developed for each type of data, representing: the year 2000 (the first year of the analysis), the years 2009 and 2010 (when the economic crisis was felt in Romania) and the last 2 years - 2020 and 2021 (the beginning and duration of pandemic crisis).

The plotting method used is called a bivariate choropleth. The first variable is represented by the number of doctors, oriented vertically in the legend (see Figure 2) with values from small to large (top◎bottom), and the second variable is represented by the size of the population, oriented horizontally in the legend with values from small to large (left◎right). The aggregation of the 2 variables can be seen in the Data Show Agreement Between the number of doctors and population number. The color of the map is given by the number of classes resulting from the aggregation of the 2 variables. QGis (spatial analysis) and Inkscape (vector graphics) were used.

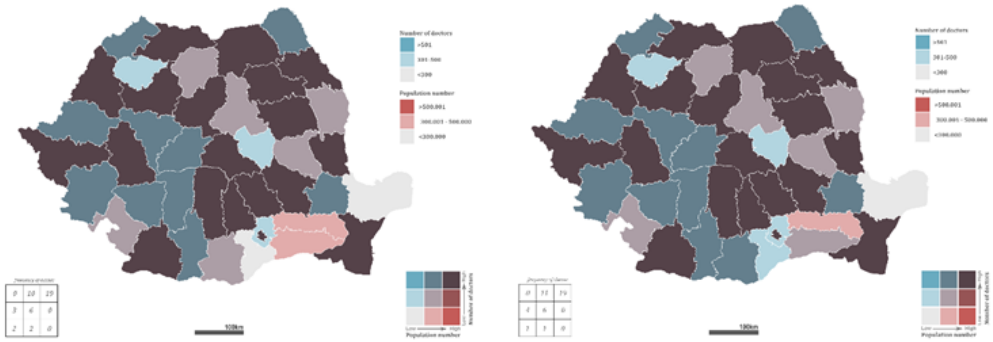
Figure 2: Bivariate Choropleth map legend

Source: Authors' own research contribution

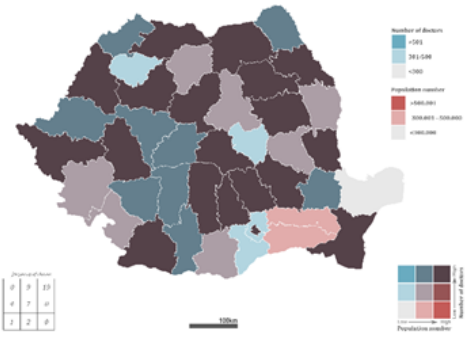
4. Results and discussions

In 2000 there are several situations: the lowest values of the number of doctors are recorded in the counties of Ialomița (with 284 doctors for a population of 309,984 inhabitants) and Tulcea (with 284 doctors for 264,449). At the opposite pole, the highest values of doctors are recorded in the counties of: Timiș (2,304 doctors), Iași (2,779 doctors), Cluj (2,891 doctors) and Bucharest (7,076 doctors) (Figure 3).

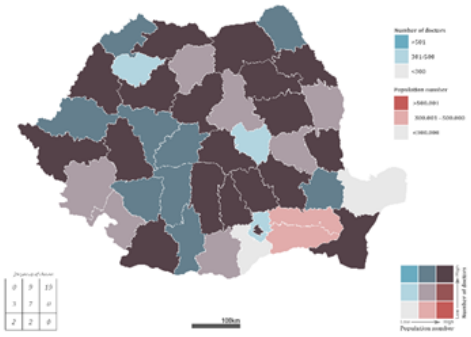
In 2021 we had the following situation: the counties of Giurgiu, Calarași and Tulcea had the lowest number of doctors with 174, 188 and 198 doctors respectively. The highest values being recorded by the counties of Timiș, Cluj, Iași and Bucharest, with values of 3,324 doctors, 3,674 doctors, 3,688 doctors, respectively 11,034 doctors (Figure 3). The spatial distribution reveals very clearly the situation of human resources in the Romanian health system.



Year 2000 *Year 2001*



Year 2002



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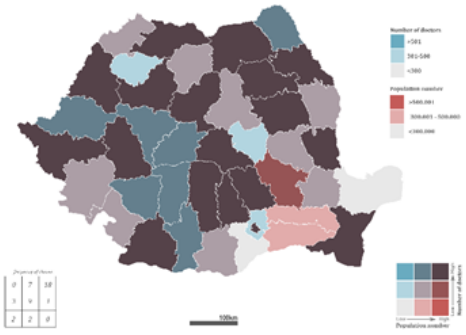

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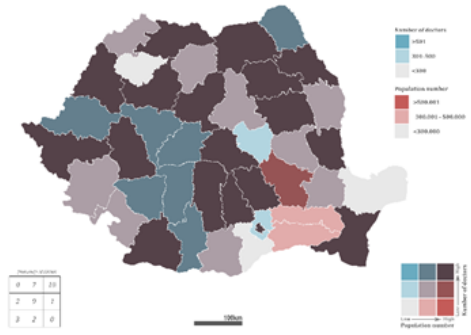

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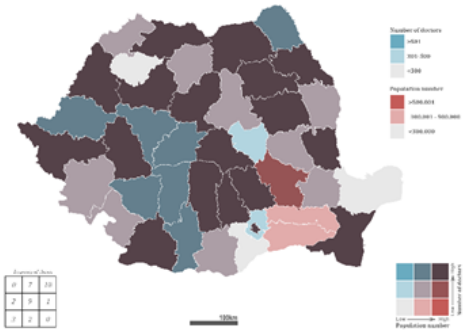

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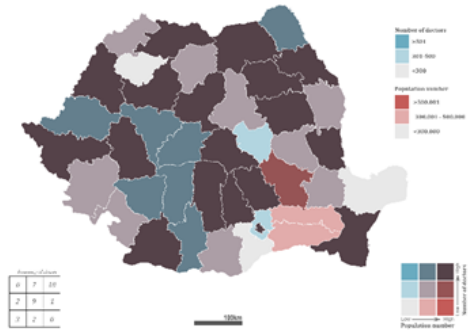

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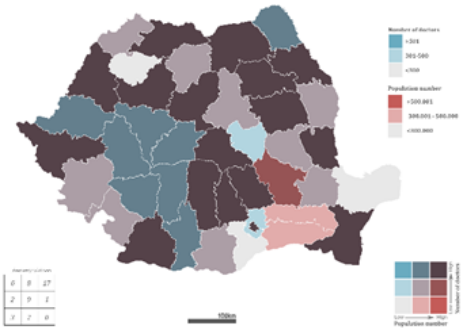

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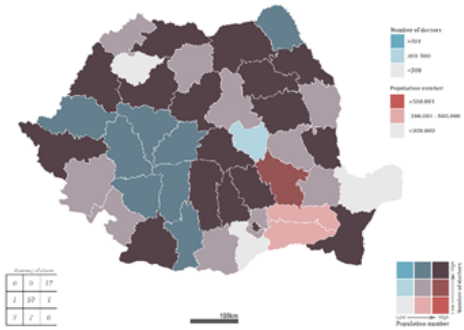

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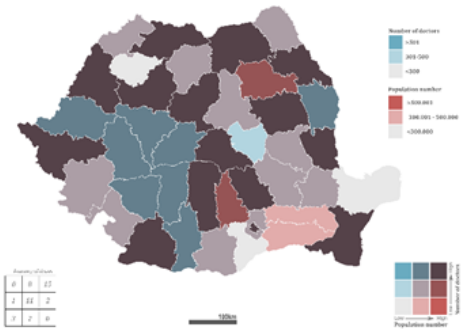

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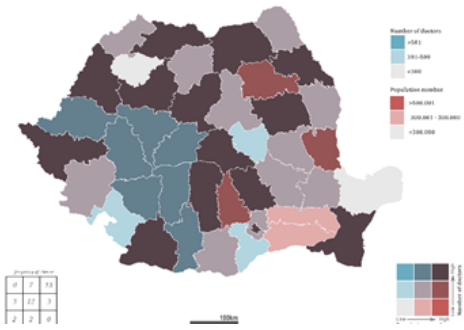

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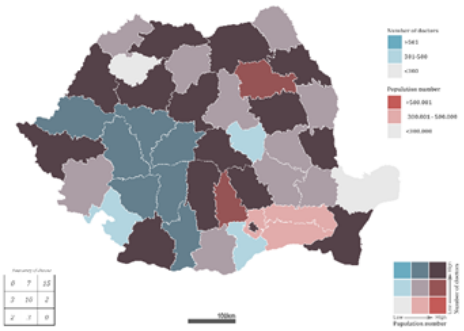

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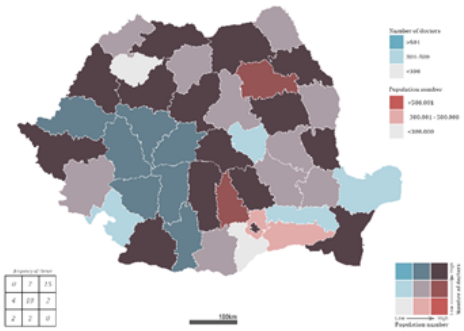

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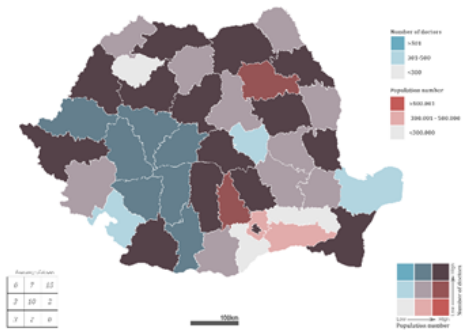

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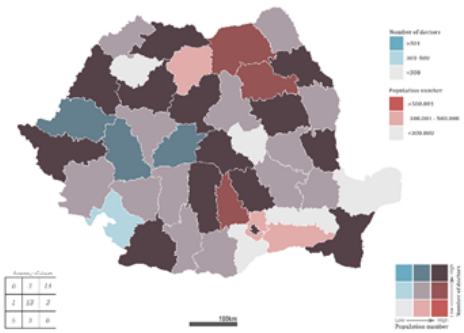

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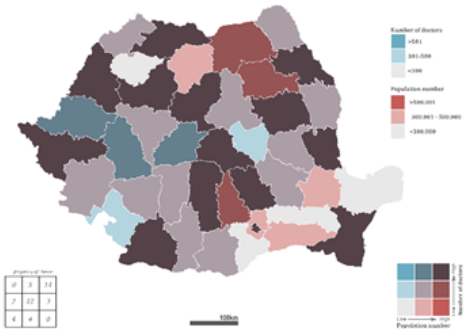

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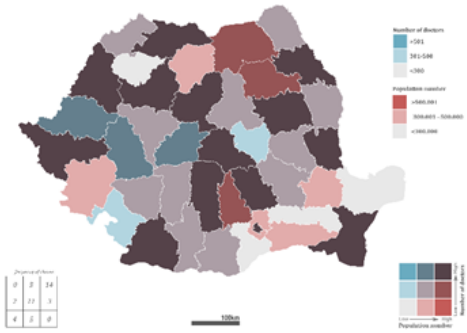

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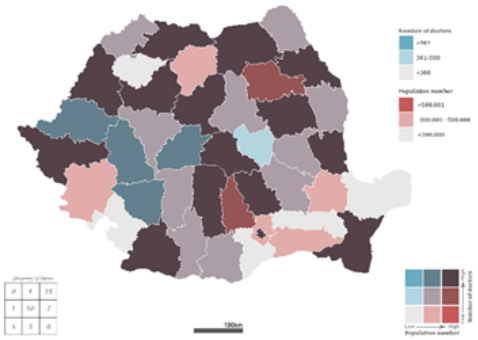

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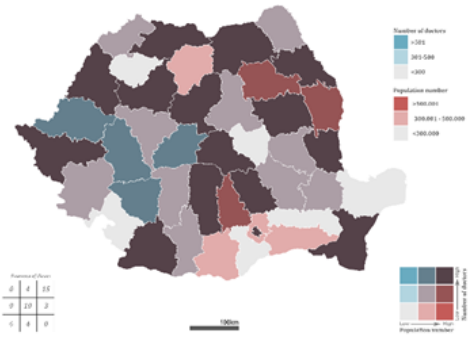

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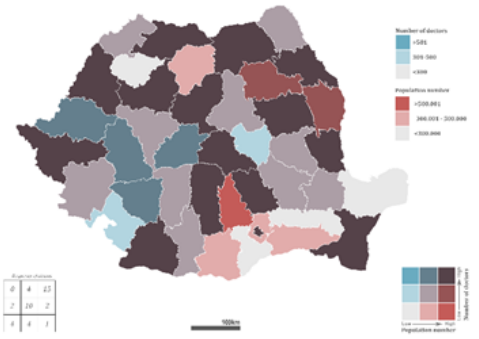

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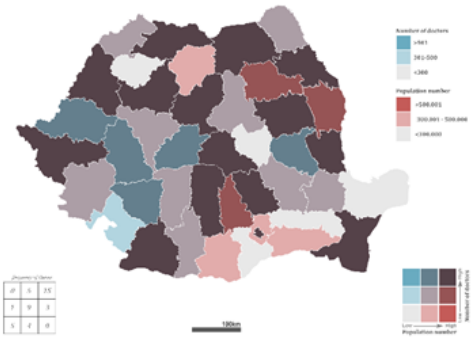
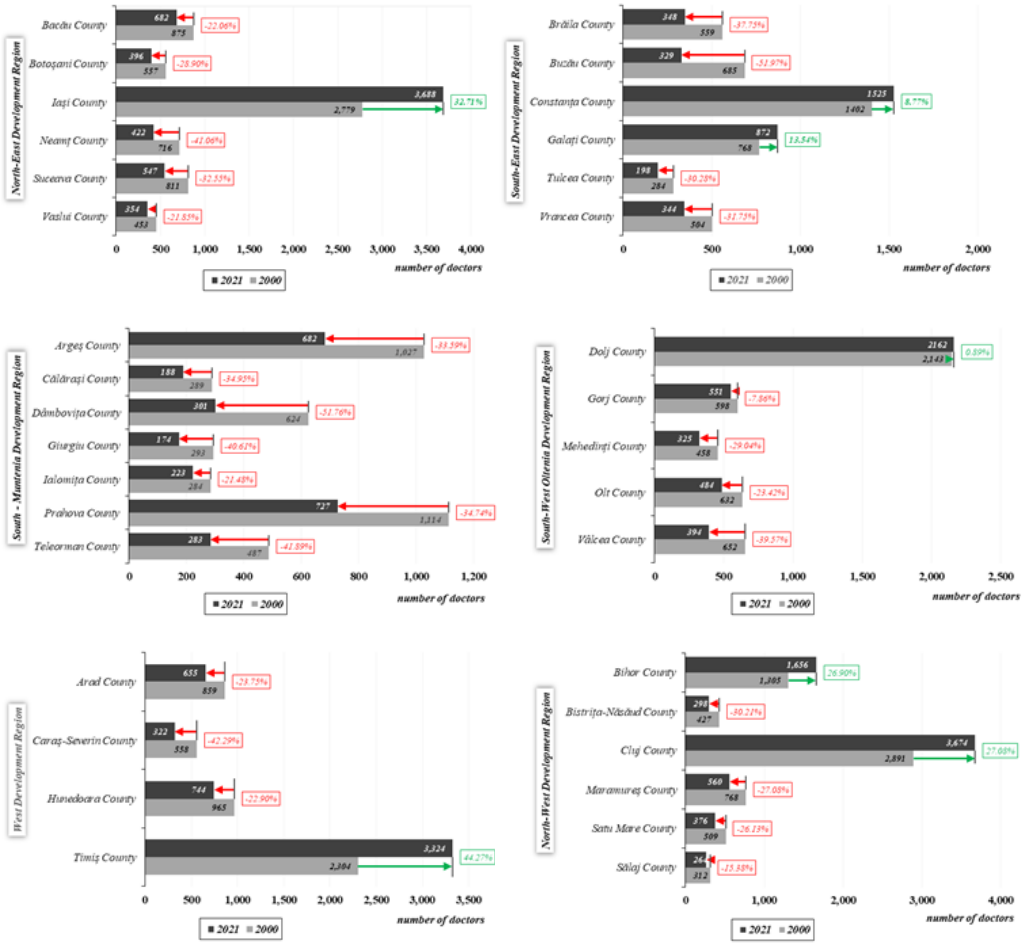
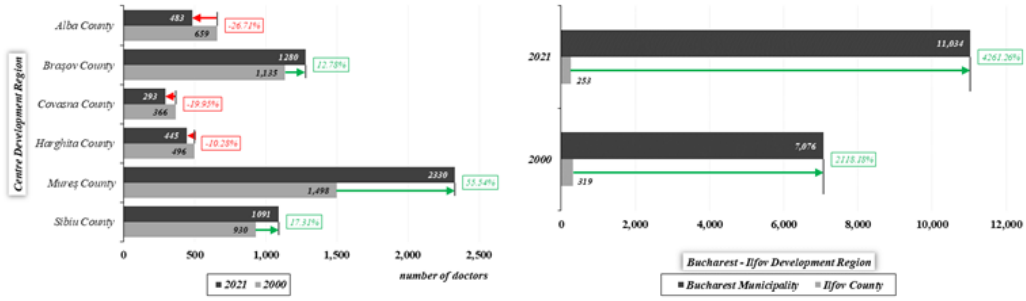


Year 2021

It can be seen that during the period analyzed, 2000-2021, at county level, the situation of the number of doctors worsens, with decreases in almost all counties (Figure 4). Growing inequalities in health status, access problems, declining returns on healthcare investment and the challenge of controlling rising costs are some of the major issues in the health sector. Achieving health objectives for a population largely depends on the delivery of effective, efficient, accessible, viable, and high-quality services by personnel. The workforce must be available in sufficient numbers and appropriately distributed across different professions and geographic regions. In most countries, the absence of clearly defined policies for human resources for health development has led to imbalances that jeopardize the ability of healthcare systems to achieve their objectives. The workforce in the healthcare sector possesses distinct characteristics that must be acknowledged.

Figure 4: Evolution of the number of doctors for the year 2000 and 2021 at county level





Source: Data provided by the National Institute of Statistics (INS)

Health employees are in low supply and are distributed inequitably in the industry. An increasing need for healthcare is being created by an aging population, as well as an increase in chronic and age-related disorders (Blštáková and Palenčárová, 2021).

One of the most important components of a health system is its human resources. The efficiency of healthcare systems relies on the expertise, competence, and dedication of the workforce responsible for delivering these services. Though acknowledging the significance of personnel, various nations enact ambiguous and inefficient policies and programs related to health workforce (Gorji et al., 2018).

Including workforce issues in the political agenda and establishing clear health workforce policies can help clarify objectives and priorities in this area. This approach can also bring together all the involved sectors and promote a more comprehensive and systematic approach to human resources management. Long term, this opens up the possibility of establishing healthcare systems that are more responsive to the population's expectations and requirements.

5. Conclusions

The development of a growing society and the medical and healthcare systems depend heavily on human resources for health. Human resources for health are necessary for economic and social development and for meeting the healthcare needs of the population. When planning and implementing human resources for health, it is crucial to develop and enhance creative methods and processes to enhance health workforce growth. This should be done from a structural, quantitative, quality-oriented, environmental, and managerial standpoint.

When seeking to integrate human resource planning across key health services, three concerns must be addressed: why integrate, what to integrate, and at what level of care. It is critical to recognize that efficiencies might be obtained by combining some of the duties done by separate employees for various health services.

A solid comprehension of human resources management issues is necessary to ensure the success of any healthcare program, as ultimately, healthcare is delivered by and to people. Many healthcare systems require additional human resources initiatives, and deeper research is needed to develop new human resources policies and practices which will benefit individuals globally.

Achieving a sustainable health workforce presents growing challenges. Provider

organizations and health systems face challenges due to skill imbalances, shortages of healthcare professionals, and the lack of needs-based competencies and integrated workforce governance; mobility only exacerbates problems for many countries. This compromises the goal of universal health coverage as well as the quality and safety of health-care services. Although certain nations and areas are hit more than others, all healthcare systems, including the EU's resource-rich welfare states, are affected.

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Romania – social transfers as tool for reducing poverty

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Abstract: *In order to battle poverty and promote social inclusion for vulnerable groups and other disadvantaged and disadvantaged families, Romania is able to make progress in these areas thanks to the present strategy for social inclusion and poverty alleviation. Fighting poverty and social isolation needs to be a lifetime endeavor. Offering developmental opportunities to individuals under the age of 17 is the approach, regardless of their upbringing. Youngsters who are raised in diverse settings where poverty is a possibility are more likely to drop out of school. The purpose of this article is to identify the main opportunities offered to vulnerable groups to participate in the social, economic, and cultural life of Romania.*

Key words: Poverty, social exclusion, health, education, social services, regional policy, regional inequities

JEL: I32, D63, B55, A13

1. Introduction

Numerous social programs and initiatives are in place in Romania to address poverty and social exclusion, and in recent years, expertise and resources for identifying those who are disadvantaged have grown. Policies and intervention initiatives must be coordinated in order to yield a higher return (Wagle, 2023). Positive results necessitate a set of social policies for people to facilitate access to work in order to give financial support, as there is a strong correlation between social exclusion and poverty rates (Bodislav, 2015).

A crucial component of putting social inclusion policies into practice is determining the needs of marginalized and disadvantaged populations (Đurić, Simin and Glavaš-Trbić, 2023). The state wants to build tailored services to improve social and economic participation because vulnerable groups have issues for which policies could not offer effective answers.

The proper distribution of resources across the nation's area is one of the strategy's main issues. About half of Romanians reside in rural areas, where some face economic and infrastructural disadvantages. Reducing the disparities between rural and urban communities is the goal of the government (Balasubramanian, Burchi and Malerba, 2023).

Social transfers are predicated on introducing a formula that promotes employment, removing barriers to social services and assistance, streamlining the social protection system's accessibility for individuals with disabilities, and exploring ways to create provisions that guarantee a living wage for elderly residents of rural areas without pensions (Tselios and Rodríguez-Pose, 2022).

The plan is structured on a review of recent trends in poverty and social exclusion, along with a forecast for the years ahead. Sectoral policies that target both the places affected by poverty and those impacted by this issue are presented in the second section (Bergstrom, 2022). The major concerns in fields like health, education, social services, regional policy, and regional inequities are presented in this part along with an analysis of social transfers and employment policies (Samiyeva, 2022). At the conclusion of the strategy, several projects that will help to lessen poverty and encourage social inclusion are presented (Sompolska-Rzechuła and Kurdyś-Kujawska, 2022).

2. People who are vulnerable to social marginalization and poverty

Two prerequisites must be met in order to assess poverty using a one-dimensional approach:

- an indicator that represents each household's resources or welfare level;
- a poverty threshold that compares each household's welfare level such that those with a level below that threshold are classified as impoverished.

Over the years, several approaches to assessing poverty in Romania have been tried and tested, and they have suggested variations on these two components. The principal ones are (Jianu, Dobre, Bodislav, Radulescu and Burlacu, 2019):

- The national method for calculating absolute poverty was approved by the government in 2005 and was developed by World Bank experts, the Anti-Poverty and Social Inclusion Commission, and the National Institute of Statistics. Its goal is to identify households that are

unable to meet their basic needs for food, services, and non-food items. It uses consumption expenditure as a welfare indicator rather than income, which more accurately reflects the living standards of Romanian households.

• The relative poverty calculation method developed and computed by Eurostat: this method computes the poverty line as 60% of the median of the adult income distribution and is used to track Romania's progress toward its national poverty reduction target. It does not indicate whether materially or materially deprived individuals can meet their basic financial needs (for instance, if a company's income doubles or falls short, it would be halved for all individuals in one year, the number of people in relative poverty would remain constant).

The Romanian government measures social exclusion and poverty using a variety of metrics. Therefore, focusing on individuals at risk of poverty or social exclusion (AROPE) who are in at least one of the following three circumstances serves as the primary indicator for assessing the accomplishment of the EU aim for improving social inclusion:

• Even after receiving social payments, individuals remain vulnerable to relative poverty (AROP, or at-risk-of-poverty indicator). These are the people whose annual disposable income, as a percentage of the total number of equivalent adults, is less than 60% of the median income. The total income earned less all taxes (property or income), social contributions, and other expenses is the amount of revenue available.

• They reside in households with extremely low labor intensities, meaning that in the reference year, less than 20% of the members, aged 18 to 59, worked in their full capacity. In 2017, the percentage of Romanians under 60 who were under the age of 60 was only 7.4% (the EU average was 10.4%).

• Severe material deprivation affects people in families when at least four of the nine scenarios listed below apply:

- Not being able to afford rent, mortgage payments, or utility bills; not allowing themselves to keep their house warm enough; not being able to handle unforeseen expenses; not being able to eat meat or protein more than once every two days; not being able to afford a week away from home; not having a color television; not having a washing machine; not having a car; and not having a telephone.

3. Poverty-risk populations and social services and transfers in Romania

The two main issues facing Romania are corruption and poverty. With a relative poverty rate of 25.4%, Romania is ranked second in the European Union per Eurostat data for 2018. 8.5 million people in Romania are at danger of poverty or social exclusion, according to NIS data. Furthermore, a third of the population cannot afford the things that are thought to be required to live a decent life. Furthermore, Romania has by far the largest rate of wealth disparity in the European Union.

As the accompanying graph illustrates, Romania's poverty rate varied considerably from 2007 to 2007. Despite a 6.1% decrease in the poverty rate between 2007 and 2011, there was a rising tendency in 2012 and a subsequent declining trend by 2017. Consequently, there was a 9.6

percentage point decrease in poverty between 2007 and 2015, which lifted 2,605,000 people out of poverty.

Social protection's primary goal is to assist those who are members of vulnerable groups, old, disabled, or otherwise unable to work and who need to be guaranteed a minimum income (Krugman, 2009). Over the past few years, Romania's social assistance system has undergone a number of modifications to improve it. The primary goals are on raising administrative efficiency through cost-cutting measures, enhancing the training and caliber of services rendered by social assistance workers, enhancing the system's equity, and lowering fraud and mistake rates (Lakner, Mahler, Negre and Prydz, 2022).

There are three primary sources of help within Romania's system of care for individuals with disabilities. Individuals who have lost their capacity to work while they were employed receive rehabilitative assistance and an invalidity pension. Enrolled individuals with severe or environmental disabilities receive monetary incentives, such as free or heavily discounted equipment, to guarantee their social involvement. Furthermore, there is an institutionalized care system that receives funding from the state budget and serves roughly 17,000 individuals.

Romania's population is aging rapidly due to declining birth rates and a continuous rise in life expectancy. The age distribution of society is significantly altered by these processes. The public pension system and health care services will face significant financial strain due to demographic shifts, and income taxes will rise. Healthcare services will rise as a result of the growing senior population, both in absolute terms and as a share of the overall population (Friedman, 2005). However, economic production may also experience a decline in headcount and slow economic growth. The state must take action to reduce these hazards associated with an aging population. Some of these actions include making sure the elderly who are capable of working have jobs, reviewing laws pertaining to early retirement and retirement age, and examining social retirement benefit policies.

Public social support services are lacking in approximately one-third of rural areas and more than 10% of small towns (Stroe, 2022). Services for employment, health, education, and social protection are extremely uncommon. The areas' specialized services for the adult category are not well coordinated. In order to provide equal access to social services for all resident countries, the state is working to establish a national network for these services.

A series of activities known as social services are intended to address not only the requirements of the community but also the unique needs of a family or an individual to get through or avoid a challenging circumstance (Dinu, 2010) . Even if the finances for social protection have increased, our nation receives insufficient funding from the European Union. Like the rest of Europe, Romania saw an increase in social benefit spending during the global financial crisis, while GDP was steadily allocated to goods and services at a rate of 4-5 percent, as opposed to the 8–10 percent (or over 10 percent, with an upward trend after 2008) average for the EU.

In 2017, social services, additional health care services, risk reduction, and unemployment assistance accounted for a mere 0.8% of the nation's GDP. The majority of social service expenses—as opposed to medical costs—go toward lowering hazards to individuals and disability-related problems.

Enhancing the financial framework requires taking steps like finalizing and assessing social service financing systems, organizing funding mechanisms, and enhancing and raising the transparency of national procedures (Miežienė and Krutulienė, 2019).

The costs associated with establishing and running Community Integrated Intervention Teams must be carefully estimated, and a suitable budget must then be set aside to meet these expenses. The goal of the government is to create a complete financial plan that incorporates all relevant budget lines from other sectors, European funds, and any other forms of external support, together with a minimum budget for social assistance (Rădulescu, Bodislav and Burlacu, 2018).

4. Major projects suggested for the years 2015–2025

The government suggests the following measures, which are anticipated to have the most effects on reducing poverty and fostering social inclusion, and are to be put into action between 2015 and 2025:

- Promote employment among vulnerable and low-income populations by implementing tailored workforce activation initiatives - poverty is made worse by the fact that more than 25% of the impoverished population is unemployed and does not attend school. The government wants to spend more money on job services and labor activation initiatives for others who are in similar circumstances. Therefore, the execution, oversight, and assessment of active employment strategies will be reinforced with the assistance of EU funds.
- Creation of community-based integrated social services - the government proposes to develop protocols to govern the work of these community workers in various sectors, including clear guidelines for reporting, information sharing, and documentation; to define functional links between community worker teams and other service providers (such as family doctors, nurses, and NGOs); and to establish functional relationships between community worker teams and higher management levels to ensure professional coordination, supervision, training, and retraining, among other things. The goal is to improve the basic services provided by social workers and community workers while also maximizing cost efficiency.
- Enhance the methods for locating underprivileged schools so that all kids can take advantage of equal possibilities - because of the plan it has suggested to remove barriers to education and allow all children from low-income households the opportunity to attend school and learn the skills they will need in the real world, this step is crucial in the fight against poverty (Sultanovich, 2023). However, many underprivileged institutions also have significant budgetary issues. Some of these schools might be able to become sustainable and stay open with the help of a more equitable financial structure that takes social factors into account when calculating per capita funding. Therefore, in order to better allocate funds to children in need and guarantee that funds are utilized for efficient interventions that will expand educational opportunities and raise educational standards for disadvantaged populations, the government has proposed to amend the financing mechanism.
- Creating a method to identify impoverished villages and marginalized rural communities - in order to address these regions, it is necessary to first identify them as soon as feasible and

then to make certain social services available to their citizens. In order to ensure the effectiveness of interventions, case studies will be conducted in these areas to validate the preliminary methodology and simplify it for use by local authorities. This will help them create a typology of marginalized rural communities and centralize a list of the areas most affected, from which they can target interventions. In order to efficiently prioritize the required expenditures, an index for rural development will also be created (eg in water supply, gas or social services).

• Fortify coordination mechanisms and establish a system of monitoring and evaluation - this will encompass enhancing the ability to oversee the family budget and quality of life surveys, optimizing the gathering and application of administrative data, and gaining access to EU funds to conduct program assessments of several representative projects. To make sure that important components of poverty reduction, inclusion and social participation, and an integrated approach to social services are reflected in national and local policies, the government will gather data on the creation of a national social inclusion monitoring system.

5. Conclusions

Policies focused on people should be effective in as many contexts as feasible. Employment policy should, first and foremost, aim to lower unemployment and increase the number of members of disadvantaged groups who are employed. Social transfers are meant to support individuals who are going through a tough period in their lives, and there needs to be a guarantee of a minimum income. Social services are helpful in ensuring that everyone who is struggling, or a member of a vulnerable group has a minimal standard of living.

The two main issues facing Romania are corruption and poverty. In terms of relative poverty rate, Romania is among the top nations in the EU in 2017 according to Eurostat data, with Serbia and Bulgaria surpassing it at 28.3%.

Roughly one-third of kids are living in poverty. In rural areas, one in two children is living in relative poverty. Compared to just 17% of children in metropolitan areas, almost 50% of children in rural areas were living in poverty in 2017.

In 2017, 81% of those in relative poverty were persistently impoverished. Poverty is three times more common in rural than in urban settings. In 2017, 38% of persons in rural areas and 11% of people living in urban areas were at risk of poverty. The problem is that after the COVID-19 pandemic and the economic inefficiency timeframe that started in 2022, the poverty levels are at all-time highs, surpassing 40% in the rural areas and 15% in the urban areas.

The most vulnerable populations in Romania include the impoverished, children and young people without parental guidance and assistance, old persons living alone or with dependents, Roma people, etc.

In order to facilitate the creation and execution of policies to address poverty and social exclusion, the government seeks to build institutional capacities at all levels. It also seeks to create a framework for tracking and assessing social inclusion and tracking the advancement of the stated goals through indicators. Through this system, national and municipal policies will be made to reflect the essential components of poverty reduction, inclusion and social involvement, and the integrated approach to social services.

Creating policies to fight poverty and promote social inclusion requires building policy-making capacity at all levels, but today's government lacks efficiency and the necessary social transfers to reduce the disparities.

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