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THE IMPORTANCE OF USING SMART DATA TO ANALYZE SKILLS IN THE LABOR MARKET

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Abstract

The needs of the workforce are constantly changing as a result of global concerns about digitization, production automation, the introduction of new technologies and industry 4.0. Therefore, the labor market needs a continuous reassessment of labor skills in the context of digitalization and the industrial revolution. The paper will study the change in perspective of the structure of the employed population by occupational groups and in high-tech economy of Romania compared to UE27 and the most requested skills currently in online job postings in various fields, based on traditional and intelligent data from Cedefop. It is also intended to understand how the use of BigData can facilitate labor market decision-making. The analysis of the skills required in the jobs posted online from various fields in Romania, in 2020, suggests importance of digital and contextual skills having in view that in the top is ,,accessing and analyzing digital data", followed by ,,working with others" and ,,using digital tools for collaboration, content creation and problem solving".

Key words: *labor market, skills, skills matching, smart data, online job vacancies*

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JEL Classification: J2, J23, J24

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Introduction

The growing importance of the global economy, competitiveness and dynamism in the business environment, as well as the demographic aspects that indicate a shortage of labor in the future have led the state to start digital transformation agendas. The digitalisation of the economy has led to an increase in the number of sources of information on job vacancies published online.

A major challenge facing the labor market in the coming years is the digital transformation. Two major initiatives that will have a key impact in the coming years on the digital transformation in the EU are the Recovery and Resilience Mechanism and the Compass for the Digital Decade. Five of the seven digital policy areas identified in the Regulation on the Recovery and Resilience Mechanism are the subject of measures included in the National Recovery and Resilience Plan (PNRR) proposed by Romania: connectivity, human capital, e-government; digital public services and local digital ecosystems; digitalization of enterprises; investments in digital capabilities and the implementation of advanced technologies. The measures in the PNRR also address the four flagship digital initiatives outlined in the 2021 Annual Strategy for Sustainable Growth: Connecting; modernization; development; retraining and improvement. It can be deduced that in the context of the digital transformation, the development of human capital, the retraining and improvement of the workforce are the focus of both European and national documents. The four cardinal points of the "compass for the digital dimension" are skills, the digital transformation of companies, secure and sustainable digital infrastructure and the digitization of public services. The analysis of the DESI digital economy and society index, which measures the progress made towards achieving the 2030 digitalisation targets, shows that Romania is still at the beginning of the road, ranking last in the EU hierarchy (European Commission, DESI 2021). In terms of human capital, Romania ranks 26th out of 27 Member States, scoring below average for most indicators, with the exception of “ICT graduates” (4th place) and “specialists”. in the field of ICT ”(3rd place). Although Romania has a large number of graduates in the field of ICT (6.3% of graduates), there is still a shortage of ICT specialists that limits the country's ability to innovate and take advantage of digital transformation.

Another major challenge facing the labor market is industry 4.0, namely the introduction of advanced processing technologies whose main determinants are: customers and their needs, competitors, suppliers, potential companies entering the market. In fact, the fourth industrial revolution is different from the previous ones

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precisely because it integrates the physical, digital and biological universe with the help of technology (Schwab, 2017). One of the main aspects of the Industry 4.0 concept is the digitally networked systems to create a world where everything from cars to people is connected. These connected smart devices can also be called Cyber Physical Systems or CPS (Cyber Physical System) because they consist of information technology / software and mechanical and electrical physical parts. These CPSs are able to communicate with each other, for example, over the Internet. Two of the main factors leading to the development of Industry 4.0 are: shorter product life cycles, especially in the case of electronic products, and the growing demand for individual products (mass customization). Increased flexibility with fast technology leads to better results for employees, customers and the business at large.

Digitization leads to a reconfiguration of skills in the labor market, the emergence of new information about the labor market and the development of new tools that people and organizations will use to find an employee or a job. The analyzes undertaken in the article provide a characterization of the Romanian labor market through the prism of qualifications, an anticipation and a better understanding of the importance of using smart data alongside traditional data for the analysis of changes in the occupational structure according to skills.

People who feel confident that they have the necessary level of digital skills for everyday life or work have a positive perception of the effects of technology on the economy, society, quality of life and robots. In terms of socio-economic characteristics, they are highly qualified (education), employed or self-employed (occupation), young adults (age) and have frequent access to the Internet (Vasilescu et al., 2020).

Literature review on the implications of Big Data and Blockchain applications on the labor market

The main technologies transforming the business environment today are: artificial intelligence, machine learning, robotic process automation, 5G technology, blockchain and cryptocurrencies, big data and Cloud, Virtual Reality, Internet of Things (IoT) (World Economic Forum). These technologies, although they currently have low applications, will play an important role in human resource management in the future. For example, blockchain applications that are widespread in financial management are beginning to be applied in human resources in activities such as payroll. The report "Trending Tools and Technologies in HR" (APQC, 2019) mentions that in 2019, 82% of organizations

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were already at least familiar with blockchain technology, but only 11.7% were implementing blockchain technology in HR. However, interest was growing, with 74% of firms in the sample considering experimenting with or piloting blockchain. Blockchain is being applied in key human resource management activities such as payroll, recruiting, employee vetting and contract management. The main benefits of using this technology are trust, privacy, security, data integrity and transparency. The top three drivers of blockchain adoption in the UK are the need to increase transactional transparency, increase the speed of transactions by reducing clearing and settlement time, and automate or simplify the business process. A blockchain is a network made up of individual entities called nodes that each have the role of storing data and processing transactions by consensus with the majority of the network (Puchiu, Stoian, Foca, 2018). Blockchain is therefore a distributed, shared digital ledger technology where transactions are verified and recorded in a way that makes it virtually impossible for anyone to alter the information. That means people who don't already know each other can share data and make transactions, including financial transactions, without an intermediary.

The digitization of the economy has led to an increase in the number of different information sources where job vacancies are posted, such as online portals, but also websites of companies and recruitment agencies, professional networks (such as Linkedin), online job search platforms (Upwork, Uber), educational platforms, social networks (Facebook, Twitter), newspaper and notice board websites, university graduate employment promotion centers, etc. In Cedefop 2019, the online job landscape was mapped and analyzed in the 28 EU member states (including the UK) and it was observed that the share of job vacancies published online varies from under 50% in Denmark, Greece and Romania to almost 100% in Estonia, Finland and Sweden. Countries differ in the structure of the online job market: for example, in Denmark, Finland and Malta the market is dominated by a few leading portals and public services tend to be influential players, while in Greece, Ireland, Italy and the United Kingdom United are several job portals with similar power, and public employment services are less influential compared to private actors.

The increasing use of the Internet for job postings provides a rich source of real-time and detailed data about the requirements of job postings called Big Data. We can define Big Data as high-volume, high-velocity and/or high-variety information assets that require innovative and cost-effective forms of information processing and that enable improved insight, decision-making and process automation. They contain a lot of additional information about the labor market that cannot be

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obtained from statistical or administrative sources (Horton&Tambe, 2015; ETF, 2019). Recorded information typically includes specific stipulated skill needs and skill-related indicators included in advertisements, such as job titles, along with requirements for qualifications, certifications and experience, as well as other information about each vacancy, such as employer, sector economic, occupational category and geographical location of the promoted position (ILO, 2020).

Vankevich & Kalinouskaya, 2021, consider that it is very important to use new sources of information and analyze the data generated by them; to combine this data with traditional data (statistical and administrative data) to increase information about the labor market and develop tools that people and organizations will use to find an employee or a job. Statistical and administrative data are not sufficient for the analysis of qualifications and skills and Big Data analysis is needed (Vankevich & Kalinouskaya, 2021) and online job portals can serve as a source for Big Data on the labor market (CEDEFOP, 2019a; ILO, 2020; Mezzanzanica & Mercorio, 2019).

The analysis of job vacancies posted online has both advantages and disadvantages compared to the traditional methods of anticipating skills needs and matching them on the labor market, based on quantitative and qualitative analysis. Quantitative approaches usually use proxies to measure skills, such as occupations, qualifications and levels or types of education, and therefore the information obtained is useful but not sufficiently detailed about the specific skills and competences needed in the labor market. Qualitative approaches enable the identification of specific skills and competences, but are time-consuming, require significant resources and risk providing outdated information in the context of increased labor market dynamics. Among the disadvantages of analyzing jobs posted online are: lack of structure, duplication; the need for advanced data analysis skills (e.g. software, programming, coding) and the lack of representativeness that necessitates their cleaning and quality checking and other potential issues, including data privacy issues that stand in the way of their effective use. Among the advantages of analyzing jobs posted online we mention: the analysis is done almost instantly, large volume of information, in-depth information about skills and skills needs between and within establishments, low time and cost-effectiveness, and the veracity of data, since online information declared by individuals can had a higher degree of truth (ILO, 2020).

The nature and content of work has changed a lot in recent decades, and therefore new methods of job analysis are needed to see how employees adapt in this context. Job analysis focuses on understanding what employees do and can be

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defined as "the process by which one gains an understanding of the activity, purpose, and requirements of a job task" (Sanchez & Levine, 2012). Context analysis (text mining) can be a viable, current job analysis method that can illustrate what employees are doing in the broad context of work change (Berkers, Mol, Kobayashi, Kismihók, Hartog, 2019). This method makes it possible to automatically extract and analyze tasks from job vacancies posted online that have a relatively high correspondence with tasks collected using a task inventory. Content analysis does not replace current job analysis methods but rather complements them.

Methodology

The analyzes undertaken in this study are based on Cedefop data: Cedefop Skills Forecast and Skills in online job advertisement. The estimation and forecasting engine made by the Cedefop center of the European Commission within the project on "Medium-term forecast of the demand and supply of qualifications at the level of 2030" represents the most comprehensive and robust tool of the demand and supply of qualifications both at the EU level and and at the level of each member state, including Romania. This forecast engine allows both the analysis of the period 2015-2020 in Romania, from the perspective of qualifications, as well as the detailed forecast of developments up to the horizon of the 2030s. Also, the use of the engine allows carrying out comparative analyzes at the same level of detail between Romania and the EU as a whole and between Romania and any EU member state at the same level of detail. The projection methodology has a modular approach, with the following main elements: a) demand (need for skills and qualifications), with attention to employment (jobs); b) supply, focuses on available skills and competences, the number of economically active people and the qualifications they possess; c) imbalances, obtained by comparing the modules analyzed within the two components, supply and demand. Based on CEDEFOP data, the article will analyze the change in the structure of the employed population by occupational groups and the demand for replacement and the increase in employment in the high-tech economy at the horizon of the 2030s, as well as the most requested skills in online job ads in Romania in Skills in 2020.

Results

In this section, the skills required in the labor market resulting from traditional methods of analysis and the analysis of jobs posted online will be presented.

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The largest percentage increase in total job demand between 2018-2030 is for the occupational groups: Specialists (76%), Service and Sales Workers (67%) and Machine and Plant Operators (57%) and the lowest for skilled agricultural workers. Total demand is determined by the sum of the net change (jobs abolished/newly created) and the replacement demand resulting from the replacement of people who leave a job for various reasons, especially as a result of retirement. Most jobs will appear as a result of the replacement demand, namely 3403 thousand jobs. The number of jobs resulting from the difference between newly created and terminated jobs is only 800 thousand, which illustrates that the potential for new job creation remains low in the analyzed interval. An important increase of 52% is also forecast in the case of the occupational group of public workers, which illustrates the increased need for digitization of public services, in order to increase their access and transparency, which has achieved marginal progress so far, with systemic problems related to quality being reported and accessing public services. Moreover, Romania is behind the member states in terms of acquiring digital skills. In the case of skilled workers in agriculture and fishing, the largest share of the replacement request is recorded, at 58%, due to the significant share of this occupational group in total employment. The share of net change is forecast to be negative in three occupational groups, Skilled Agricultural and Fisheries Workers, Armed Forces and Craftsmen and Related Trades which means that the number of jobs lost increases compared to those created, the share of the sum of jobs created/lost decreasing in these occupational groups by 31%, 10% and 4% respectively. In past industrial revolutions, as new skill needs arose, traditional crafts and trades either became obsolete or their nature changed radically. The emergence of the fourth industrial revolution (industry 4.0), with the ubiquitous penetration of digital technologies in business and social activities, will have a similar impact.

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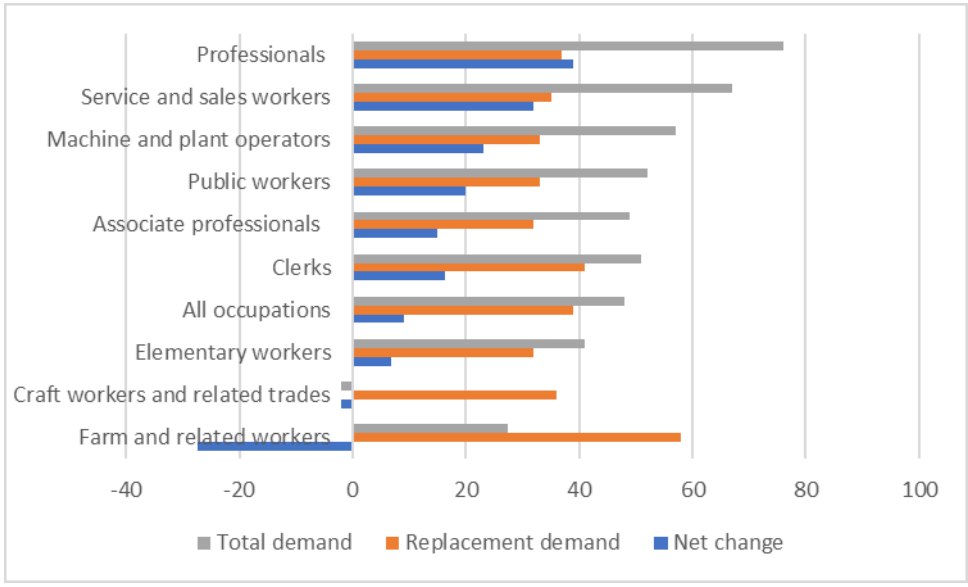

Figure no. 1 Change in the structure of jobs by occupational groups and replacement demand 2018-2030 (%)
Source: author processing, Cedefop data, Cedefop Skills Forecast

The analysis of the skills required in the jobs posted online in various fields in Romania, in 2020, suggests that the skills of accessing and analyzing digital data (36.7%), working with others (31.7%), are at the top in while resource allocation and control and promotion, selling and buying have the lowest values of 6.3% and 7.7%. It is also observed that digital skills and contextual skills are at the top of the hierarchy, those skills that compete in solving the problem, respectively the skills to deduce, frame and apply.

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Figure no. 2: Most requested skills in online job ads in Romania in Skills in 2020 (ESCO level 2) (%)

Source: author processing, Cedefop data, Skills in online job advertisements

The comparison of employment growth in the high-tech economy in Romania and the EU27, period 2020-2030, highlights a maximum for Romania in high-tech production and a minimum for the EU27 for the same indicator. Employment growth in high-tech occupations will be 4.5% in Romania, while in the EU27 it will be 9.3%. The increase in employment in the high tech economy indicates the increase in the share of "high technology occupations", the increase in the technological intensity of the entire country and the share of people employed in science, engineering and information and communication technology professions.

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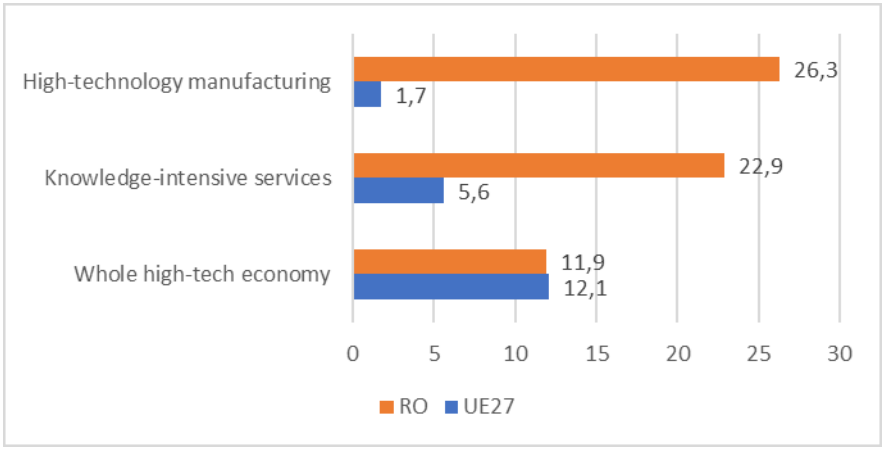

Figure no. 3 Employment growth of high-tech economy in Romania compared to EU27 in 2020-2030
Source: author processing, Cedefop data, Cedefop Skills Forecast

Conclusion

Romania has experienced a decline in the number of employees since the turn of the century as a result of high inactivity rates among the working-age population (15-64 years old), the large number of people working in subsistence agriculture, and significant out-migration of the labor force. On the other hand, the extent of early school leaving has also affected the competitiveness of the labor force in Romania. Therefore, it is necessary to make the use of human capital more efficient, and in this sense, researchers and political decision-makers are looking for new sources of information to help achieve a better correspondence between the demand and supply of qualifications on the labor market. The nature and content of work has changed a lot in recent decades, and therefore, in addition to traditional methods, new job analysis methods are needed to see how employees adapt in this context. The use of Big Data and Blockchain applications leads to transparency, increasing the speed of transactions and automating or simplifying the business process. Online job portals can serve as a source of Big Data on the labor market. Looking ahead to the 2030s, the highest total job growth is projected for specialist sectors and service and sales workers, and the lowest for skilled workers in agriculture and fisheries, who also have the lowest new employment opportunities. From the analysis of the skills required in jobs posted online from various fields in

Romania, in 2020, it follows that the skills to access and analyze digital data are at the top, imposing the need to intensify the process of acquiring them by the workforce. In the period 2020-2030, the growth of employment in high-tech production, in percentage terms, will be 16 times higher compared to that recorded at EU27 level, highlighting the importance of training on topics related to advanced processing technologies and new models of business. There is a need to improve the digitization of businesses by raising awareness of the relevance and benefits of adopting digital technologies, promoting digital interactions and stimulating businesses to engage in transnational innovative value chains.

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