VILNIUS TECH
Vilnius Gediminas Technical University

13th International Scientific Conference

BUSINESS AND MANAGEMENT 2023

May 11–12, 2023, Vilnius, Lithuania

ISSN 2029-4441 / eISSN 2029-929X
ISBN 978-609-476-333-5 / eISBN 978-609-476-334-2
Article Number: bm.2023.976
https://doi.org/10.3846/bm.2023.976

ADVANCED ECONOMIC DEVELOPMENT

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INDICATIONS OF ADVANCED SOCIAL AND ECONOMIC GROWTH IN V4 CORPORATE PERFORMANCE FRAMEWORKS

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Received 2 February 2023; accepted 13 April 2023

Abstract. Particularly among middle-income individuals, digitization and automation provoke recurring anxieties of a significant loss of employment. This worry has revived on the European continent in recent years due to the increased use of computer technology and robotics in production. This study aims to determine the extent to which technological advancement and automation are reflected in the employment patterns of Central European nations through a comprehensive literature review and a regression analysis of Eurostat data. Incomplete information and a limited sample size are inherent challenges of this study. The conclusions of the study illustrate the significance and urgency of digital future investment.

Keywords: digitization, Industry 4.0, employment, Internet of Things, automation, corporate performance.

JEL Classification: A11, C10, O32.

Introduction

The influence of information and communication technology (ICT) in various economies and cultures has been examined throughout the past two decades, producing fresh theoretical and empirical investigations. Several of the studies mentioned below have analysed the economic impact of ICT on the economy, notably on performance parameters such as output and productivity growth at various levels of aggregation. In the literature a range of techniques and methodologies may be discovered; accordingly, in this portion, the study will address research analysing the effect of digitization on the employment landscape and its structure. Measuring the economic effect of ICT has often included integrating technological input into a standard set of manufacturing procedures (Zhang & Browne, 2012; Yumei et al., 2021). They compared ICT to conventional production factors. In recent years, an increasingly more sophisticated approach of assessing ICT and its influence on economic and social life has been found. This new perspective is reflected in the literature on so-called digital inclusion and exclusion (Abdul-Rashid et al., 2017), which provides an expanded view of the numerous dimensions of the connection between ICT and the economy. In this body of work, the nature of ICT is considered as being less essentially technological, and ICTs are described in terms of several factors that define the techniques and extent to which ICTs provide opportunities. Current EU political agenda reflects this new perspective. Here, the digitalization of society does not entail the use of technology by individuals, but rather the use of technology to affect the lives of individuals. Based on Evangelista et al. (2014), the evaluation of digitization and the automation associated with it requires essentially surpassing the conventional infrastructure and technological approach and encourages the use of more sophisticated indicators of the diffusion and utilisation of ICT across the entire sector. His ideas are supported by the research on the digital divide, which Belas et al. (2021) describe as the gap between those who have access to ICT and those who do not. According to them, the gap generated by digitization is not limited to inequalities in access, but also in the autonomy of technology usage, skills, and the rationale for which the technology is employed.

This trend of contributions emphasises the need of infrastructure and easy access to information and communication technologies for the digitalization of society. Brieger et al. (2020) asserted that the quantity and quality of these technologies' use, as well as the circumstances that enable the improvement of digital technologies,

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would play a crucial role in the digitalization and automation of society. In these studies (Bumukozkan & Karabult, 2018; Cantele & Cassia, 2020), human capital plays a pivotal role in explaining phenomena associated with automation and digitization. According to this study, those with higher levels of education are more ready to learn and adopt new technologies and are also more flexible in terms of work. Quantity and quality of digitalization were also influenced by demographic variables like age structure and urbanisation. This is because ICT is more ubiquitous among young people, and network economics may make it easier for urban residents to embrace. The adoption of new technologies usually demands the reorganisation of firms, and organisations with a higher proportion of competent personnel can implement information technology more effectively. Research by the OECD and EUROSTAT indicates that employees aged 55 to 65 lack appropriate ICT skills (Virglerova et al., 2017; OECD, 2012). In the context of this study, the elderly population and the digitally unskilled workforce represent the most vulnerable section of the labour force, which is at risk of getting disengaged during the recession and being unemployed for a lengthy period of time (Cheng et al., 2022). According to Du et al. (2017) and Elkington (1994), who studied the impact of new technologies, the major prerequisite for maintaining employment is the ability to utilise these technologies. In addition, these results suggest that the adoption of digital technology has a replacement effect on low-skilled employment and a complementing effect on skilled occupations. The research indicates that ICTs have both negative and positive effects on employment, working conditions, and pay, and that these effects are not equally distributed across the workforce and economy. In their study, Wong and Ngai (2021) determined the extent to which various jobs in the United States may be automated. In this study, the relative probability of automation was used to classify three categories of occupations: low risk up to 30%, medium risk between 30% and 70%, and high risk beyond 70%. On this premise, they expected two waves of automation, the first of which would target high-risk occupations. During the second wave, human labour will maintain a competitive advantage for tasks requiring a higher degree of consciousness. Due to them, occupations requiring creative and social intelligence are less susceptible to substitution by digital technology. They also say, based on their data, that the substitution effect of automation in services is lower than in manufacturing and that the employment structure will change as more people migrate from agriculture and industry to services. Economists believe that the positive effects of digitization include the emergence of new industries, markets, price reductions, and income benefits, while emphasising the need to increase worker credentials. This effect of digitization is noticeable in economies that can take use of ICT's potential, although these new technologies do not have a preponderant impact on labour-saving here (OECD, 2012). Due to a research by Vatamanescu et al. (2021), males frequently undertake tasks that are vulnerable to automation, whereas females perform jobs that involve social responsibilities and are less susceptible to automation. In case of the research conducted by the World Economic Forum, millions of jobs would be lost as a result of the digitization associated with Industry 4.0. Based on this analysis, the fourth industrial revolution might disrupt established business structures and the labour market over the next five years. In addition, the World Economic Forum predicts that the transition would result in a net loss of nearly 5 million jobs in 15 of the world's major developed and developing countries (Federal Ministry for Economic [FME], 2017). On the basis of the aforementioned study, several professionals focus on ICT and digitalization of the economic difficulties that define the present economic trend. The objective of this article is to assess the effect of technical advancement and automation on the employment structure in a number of nations. In this section, the author discusses the research that have been conducted on the topic under inquiry, from which conclusions will be formed. Here is how the paper is separated: The content and methodology of this study situate it within a corpus of knowledge primarily focused with digitization, employment, and Industry. 4.0. In addition to a factual study, this section provides a graphical and visual examination of the issues. Deep learning-based computer vision algorithms, cognitive data fusion methods, and data visualisation tools are essential components of cyber-physical manufacturing systems based on digital twins in almost all V4 industrial sectors, according to the study's findings. In these nations, future visions of how cloud computing and remote sensing technologies, immersive visualisation tools, and cyber production systems can function in virtual enterprises and immersive 3D environments are proposed using virtual modelling and simulation tools, digital twin modelling, and neural network algorithm systems.

1. Materials and methods

Digitization is described as the widespread adoption of digital technologies that produce, process, and disseminate data (International Telecommunications Union [ITU], 2017). This transformation is not a one-time occurrence, but a long-term process that occurs in so-called digitalization waves, which are driven by technical innovation and the distribution of knowledge. Each of the three waves of digitalization illustrates the acceptance of new technology with diverse effects on the economy and the lives of individuals.

As was established earlier, technical progress, adaptation, and economic impact do not occur concurrently. The acceptance of technology into daily life and the workplace is accelerating, and firms are undergoing reorganisation in which new technologies are applied to boost efficiency. The following Table 1 (ITU, 2017) depicts the inclusion of wave-specific digitalization technologies throughout time.

Table 1. Technology Incorporation Process (source: own elaboration according to ITU (2017))

Technology Innovation	Develo-pment	Adapt-ation	Economic impact
PC, Communi-cation devices...	1950–1975	1960–2000	1990–2010
Internet, Cloud...	1970–1990	1995–Present	2005–Present
IoT, Robotics, AI	1980–Present	2010–Present	2020–Future

The digitization process proceeded in three rounds. The first wave of digitization is typically associated with the introduction and adoption of what are now considered advanced technologies, such as information systems, systems for automating data processing, monitoring technologies, and telecommunications technologies such as broadband and voice communication technology, which enable remote access to information.

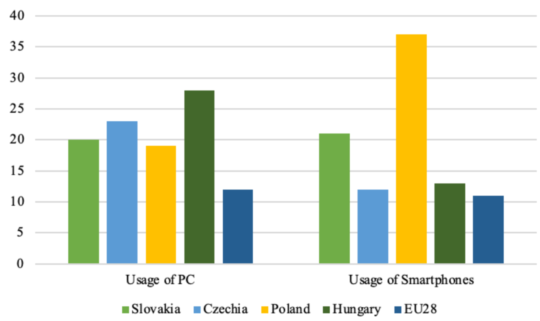

Figure 1. Modifying employee usage of digital technology (source: own elaboration according to Eurostat)

From 2009 to 2022, Figure 1 depicts the changes in the number of employees who utilise the information and communication technologies characteristic of the first wave of digitization, namely the use of a personal computer and a telephone, in the workplace. As seen in the graph, Central European nations have undergone a large wave of digital technology adoption. 50.42 percent of workers in Slovakia routinely use PCs, followed by 48.83 percent of workers in the Czech Republic, 47.17 percent of workers in Hungary, and 45.61 percent of workers in Poland, according to figures from 2022.

However, the use of PCs in each of these nations is lower than the average for the European Union, where 56.06 percent of jobs employ this technology. The second crucial technology accompanying the initial wave of digitization is voice communication devices. In the period of 2017 to 2022, the prevalence of this technology in the workplace was high, with the Czech Republic in the lead, where telephones were used as part of the job in 97.51% of workplaces, followed by Slovakia with 94.74%, Poland with 94.65%, and Hungary with just 90.81%. In Poland, where voice communication device usage has increased by as much as 37.09% over the previous eight years, the first wave of digitalization technology has been accepted at a rapid rate. Considered the second wave of digitization include technology such as the growth of the Internet and related platforms, including search engines and market portals. These platforms provide business-to-consumer and business-to-business networking for the purchase, distribution, and delivery of goods. This increase in Internet use has led to the expansion of so-called cloud computing. The introduction of new services and applications, such as online retail, distant learning, and social networks, is expected to be the driving force behind the beginning of the second wave of digitization. Digital economies are characterised by the proliferation of innovative product and service-based businesses.

Through a new market for local online content in local languages, the emergence of these companies and digital platforms generates new job opportunities. This digitisation wave is also characterised by the emergence of new job opportunities in the manufacturing, distribution, and administration of digital sector goods and services (ITU, 2017). In occupations associated with the expansion of digital services, competent personnel complement capital equipment. Alternatively, the second wave of digitization has a deleterious effect on employment. This negative impact may manifest itself in the reduction of employment that digital technology might cause. The third wave of digitization entails the deployment of a number of technologies designed to improve the quality of information processing and decision-making in order to further automate routine commercial and government procedures. 2010 is considered the beginning of the third digital wave. Within the context of Industry 4.0, this digitization wave represents the aggregation of mature, sophisticated technologies that may be used to adapt to new needs and value chains in order to increase efficiency and capitalise on new opportunities for product development and distribution.

Big Data Analysis, the Internet of Things (IoT), robots, 3D printers, and artificial intelligence are the most significant technologies. According to the aforementioned research (Gajanova et al., 2020; Grewal et al., 2021), digitization might lead to capital-labour substitution, or the replacement of personnel in automated places with ICT-based enhancements. Digital technologies allow for the automation of standardizable, repetitive activities. Using ICT technology, these jobs may be accomplished more effectively. These technologies also provide the nearly costless migration of a variety of responsibilities across international borders. By employing these technologies, nations run the danger of being supplanted by employees from other areas of the globe with lower labour costs or a higher ICT level (Isensee et al., 2020).

This research intends to analyse the degree to which technological innovation and automation are reflected in the employment patterns of Central European states. In this section, the application of the theoretical material offered in prior sections is emphasised. A regression analysis will be performed on panel data from Slovakia, the Czech Republic, Hungary, and Poland. For observations, the years 1999 through 2022 were chosen. Since data on some factors for this time period have been continuously published since 2009, a significant number of observations will be excluded. The period of the evaluation was shortened to eight to nine years by eliminating inadequate observations. Therefore, it should utilise 34 observations. It should be recalled that the COVID-19 pandemic contributed significantly to the need for the implications of the most recent digital trends, as it can also be viewed as a catalyst for a more digital era, when people were forced to use computers and similar devices, especially when working from home. The theoretical half of the study examines the unequal impacts on employment in various industries, as well as the divergent effects on male and female employment. Based on this information, authors will observe, in addition to the year-over-year change in overall employment, employment in the service sector and in the industry (which will be further classified by gender) (which will be further categorised by gender). As the contribution of the primary sector to the formation of GDP in economically developed nations is low, the authors of this article will explore the influence of the third chapter's aspects on the secondary and tertiary sectors. In this section, the article will first describe the current employment situation in each of the examined economic sectors.

Initial sector – Employment in the primary industry has been falling for quite some time in the Visegrad Four states. In 2000, 18.69% of all occupations in Poland were in agriculture, followed by 6.65% in Slovakia, 6.31 in Hungary, and 5.0% in the Czech Republic. Since 2000, when agriculture accounted for a very large proportion of employment, the number of individuals engaged in this industry has declined significantly.

Secondary sector – Based on observations since 2000, it is possible to identify a modest reduction in employment in the industrial sector in all countries except Poland, where employment climbed by 0.48 per cent. Among the observations, between 2000 and 2008, there was a slight growth in industrial employment in every nation except Hungary.

Compared to the primary and secondary industries, the tertiary sector or service sector is enjoying job growth. Employment in this sector has been on the rise in all four V4 countries for a very long time, with the largest representation in Hungary, where 64.55 percent of the workforce was employed in services in 2016, and the smallest representation in Poland, where 58.13 percent of the workforce was employed in this sector. Total EMPL Gr (Employment Gender Change), which measures the change in employment from one year to the next, will be the key explanatory variable. Authors mapped work in the secondary sector and employment in the tertiary sector as additional explanatory variables, and the article will also monitor the effect on the employment of men and women separately. This investigation utilised statistical analysis, specifically regression analysis of panel data for the given time period and with the factors listed below (Table 2, Table 3).

Table 2. Descriptive statistics of the explanatory variables (source: own elaboration)

	CZ	HU	PL	SK
Minimum	−2.00%	−2.60%	−3.90%	−3.00%
Average	0.24%	0.92%	0.50%	0.77%
Maximum	1.80%	5.30%	4.40%	3.80%

In this section, the study will apply explanatory variables chosen based on the theoretical knowledge and literature presented in earlier sections (Jayarathna et al., 2022). The study employs the following particular factors:

Infrastructure – This category of indicators includes information on available ICT infrastructure and access to essential information and communication technologies. It consists of five subgroups: fixed line subscriptions per 100 people, mobile phone subscriptions per 100 residents, international internet bandwidth per internet user, percentage of households with computers, and percentage of households with internet access.

Utilization – This category represents the level of information and communication technology usage. It includes the percentage of Internet users, the number of active fixed broadband customers per 100 residents, and the number of active mobile broadband subscribers per 100 residents. Individuals employing the Internet refers to persons who use the Internet for any reason and from any place over the previous three months, regardless of the device and network they utilised. The indicators included in knowledge on the average number of years spent in school and the gross enrolment ratio at the secondary and postsecondary levels. The phrase average years of schooling refers to the average number of completed years of education among the population of a nation, ignoring the number of years spent repeating grades. The gross enrolment ratio indicates the total number of students enrolled at a certain level of education, independent of age.

The price of labour – Labour plays one of the most significant roles in economies, whether from the perspective of companies when it is represented by the price of labour, which encompasses not only pay and fees to employees, but also charges that belong to employers' social security contributions. It is a crucial aspect in determining competitiveness. The pay that employees make for their employment is just a piece of the expenses linked with them. Thanks to the per-employee expenditures that can be compared via tax, 32 levy burden, and salary in the country, capacity expansion decisions made by investors are significantly influenced. The authors of this study use the price of labour as one of the key regressors, anticipating that as the price of labour increases, the demand for labour and, hence, employment would decrease.

Human capital – Human capital is one of the measures of the economic value of employees' knowledge. This policy enhances the essential role of labour in production. Based on human capital, workers may be compared, as their quality may be raised by education, skills, and experience. Greater staff proficiency is beneficial to the economy as a whole. Human capital was employed to evaluate the link between higher education and employment in the applied section of this study. In observations, authors include the change in the proportion of the 25-to-64-year-old population with at least a high school diploma or involvement in retraining or training programmes.

Demand – For the purposes of this study, the demand variable will be measured as the GDP growth rate at constant prices. The demand for products and services created by the factors of production in a nation has a considerable influence on employment. A country with more outputs will have a greater demand for the goods and services generated by its production factors. The authors of the study expect this regressor to have a positive impact on job growth.

Population growth – The model will measure population growth as a percentage increase. According to Kliestik et al. (2020), a rise in employment affects population growth. They found that employment and population growth are positively associated by analysing the EU28. In this study, it is anticipated that the questioned variable will have a beneficial impact on employment.

Table 3. Description of chosen variables (source: own elaboration)

The name of the variable	Description of the variable	Source of the data
Total_ EMPL_GR	Change in employment (%)	Eurostat
EMP_S_T	Change in employment (%) – Service	Eurostat
EMP_S_M	Change in employment (%) – Service (Men)	Eurostat
EMP_S_W	Change in employment (%) – Service (Women)	Eurostat
EMP_I_T	Change in employment (%) – Industry	Eurostat
EMP_I_M	Change in employment (%) – Industry (Men)	Eurostat
EMP_I_W	Change in employment (%) – Industry (Women)	Eurostat
INF	Index of infrastructure of the ICT	ITU
USAGE	Index of usage of the ICT	ITU
SKILL	Index of skills connected to the ICT	ITU
LC (Labour Costs)	Growth of the work price (%)	OECD
DEMP	Growth of the demand (%)	OECD
HC_T	Change of human capital (%)	OECD
HC_M	Change of human capital (%) (Men)	OECD
HC_W	Change of human capital (%) (Women)	OECD
POPP	Growth of the population	Eurostat

Before generating the econometric model based on regression analysis of panel data, the Variance Inflation Factor was used to assess for multicollinearity (VIF). By emphasising the significance of individual variables, the reciprocal relationship between the explanatory variables may present obstacles. After doing the multicollinearity test, it can be concluded that INF and USAGE are related 0.9162 times. This number is judged high and may render the estimation impossible to implement. According to Lu et al. (2022), the problem of multicollinearity might exist with the same trend of time series trends and can be remedied by removing one of the dependent variables. In the first model, the INF variable is eliminated, whereas the USAGE variable is eliminated in the second model. Based on a better coefficient of determination (0.596746), the authors picked a model that will in the future provide a more complete explanation for the specific variable.

2. Results

As part of the inquiry, authors have picked the least-squares strategy for regression and will utilise precise estimations. We shall be able to handle the possible consequences of heteroscedasticity and autocorrelation with the aid of robust estimators. Using Whit's test to check the presence of heteroskedasticity, it is possible to reject the homoscedasticity hypothesis for the model's components. Whit's test result's p-value is 0.218960. Based on this conclusion, the authors do not reject the null hypothesis that the variance of the model's random component is homoscedastic. The Durbin-Watson statistic will then be applied to investigate the occurrence of autocorrelation. Due to the small sample size, this test cannot be done; thus, the authors will infer that their model's residuals are autocorrelated. The normal distribution of residuals is one of the essential assumptions behind this approach's validity. This assumption will be validated by assessing the normality of residuals, allowing us to reject the null hypothesis that residuals are normally distributed. The p-value of 0.20365 obtained after evaluating the normality of the residuals suggests that the authors do not reject the null hypothesis of a normal distribution; hence, normality is observed. The last test administered is the RESET test. It may be concluded from this test that the model's specs are correct. This test's p-value of 0.761 suggests that this model is well defined, so authors do not reject the null hypothesis on the accuracy of the model specification. As part of the task, there will be picked the same regression procedure for variables such as:

EMP S T – total employment in services.
EMP S M – employment of men in services.
EMP S W – employment of women in services.
EMP I T – total employment in industry.
EMP I M – employment of men in industry.
EMP I W – employment of women in industry.

The rate of human capital pertaining to the observed group, namely men and women, must be used to

Table 4. Results of regression analysis (First part) (source: own elaboration)

	Total_EMPL_Gr		EMP_S_T		EMP_S_M	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Con	1.149	0.784	−1.342	0.835	9.200	0.205
INF	0.647	0.065	0.447	0.392	−0.055	0.646
SKILL	−0.653	0.042	−0.089	0.870	−0.922	0.211
LC	−0.318	0.017	−0.236	0.004	−0.189	0.260
DEMP	0.504	0.060	0.284	0.055	0.211	0.253
POP	0.608	0.585	0.802	0.549	−0.449	0.772
HC	1.133	0.383	0.7801	0.484	0.301	0.742
R squared	0.596746					

Table 5. Results of regression analysis (Second part) (source: own elaboration)

	EMP_I_T		EMP_I_M		EMP_I_W	
	Coefficient	P-Value	Coefficient	P-Value	Coefficient	P-Value
Const	−1.558	0.875	3.842	0.670	−2.33	0.874
INF	1.256	0.035	0.946	0.078	1.223	0.141
SKILL	−1.018	0.364	−1.368	0.196	−0.886	0.559
LC	−0.563	0.006	−0.441	0.024	−0.692	0.014
DEMP	1.102	0.0001	1.010	0.0006	1.021	0.004
POP	1.322	0.409	1.468	0.379	0.338	0.882
HC	2.681	0.095	2.344	0.043	2.122	0.296
R squared	0.580487		0.553007		0.409920	

Table 6. Results of regression analysis (Third part) (source: own elaboration)

	EMP_S_W	
	Coefficient	P-Value
Con	−8.037	0.160
INF	0.596	0.209
SKILL	0.512	0.306
LC	−0.289	0.070
DEMP	0.460	0.030
POP	1.230	0.134
HC	1.209	0.043
R squared	0.370152	

characterise these unique employment rates. Following the update that eliminates the correlation between the model's regressors, the formal notation for this model will be as follows (see also Tables 4–6):

$$EMP = \alpha + \beta 1LC + \beta 2HC + \beta 3DEMP + \beta 4POPP + \beta 5INF + \beta 6SKILL + \varepsilon it. \quad (1)$$

3. Discussion

In this empirical study, the authors analysed the effect of several factors on the evolution of total employment, employment in the services sector, and employment in industry. Using this method, they were able to identify some of the factors that influenced employment in Central European countries from 1999 to 2017 (Wong & Ngai, 2021). The analysis supported the theory regarding the diverse effects of digitalization on the selected economic sectors. When total employment, total industry employment, and male industry employment are included, the ICT infrastructure indicator is statistically significant. There is a positive association between infrastructure development and economic growth in all circumstances, with the most effect being shown in the industrial sector, where a one-unit increase in the index results in a 1.256% increase in employment (Gajanova et al., 2020). This indicator has the weakest impact on employment growth, with a one-unit increase resulting in a 0.647% increase in employment. In the remaining data, infrastructure had no statistically significant influence on employment (Nagypal, 2014).

According to a sampling of statistics, the population's ICT-related competence contributes to a drop in total employment. Increasing the population's knowledge of information and communication technology results in a 0.653% loss in total employment. Except for male employment in the service sector, the wage rate was statistically significant in every finding. A one percent increase in labour expenses translates in a 0.318% drop in overall employment. Based on chosen statistics, the price of labour has the greatest impact on the employment of women in the industry. A 1% increase in labour expenses correlates to a 0.692% loss in employment in this instance (Valaskova et al., 2021). With the exception of the effect of male employment in services, the variable indicating GDP per capita growth, which reflects the increased demand for labour, was statistically significant across all variables. Increasing demand has a positive relationship with employment in all cases, with the highest employment gain occurring in the industrial sector, where employment increases by 1 percentage point for every 1 percentage point rise in demand (Vatamanescu et al., 2021). Human capital has a good connection with female service sector employment, total industrial employment, and male industrial employment, according to chosen statistics. The employment gain related with an increase in human capital is largest for total employment in industry, where a 1% increase in the variable leads in a 2.681% boost in employment. The variable reflecting population increase in Central Europe was statistically insignificant in connection to the job sectors authors analysed.

Conclusions

This study's major purpose was to examine how technological progress and automation impact and are reflected in the employment structures of the Visegrad Group nations, namely Poland, Hungary, the Slovak Republic, and the Czech Republic, which was achieved through regression analysis, which confirmed that digitization and its different dimensions have different impacts in sectors of the economy. At the beginning of the practical section, the authors of the article evaluated the present employment patterns in specific sectors, where it is feasible to discern a major reduction in the primary sector while the service sector employs more people with time. The authors described the variables utilised in the ensuing regression analysis in the next portion of the practical section. The goal of the regression analysis was to examine the influence of digital technology and other factors on employment, both globally and in specific economic sectors, as well as by gender.

Based on the regression analysis, the authors discovered that the various aspects of digitalization had varying effects on various economic sectors. Consistent with beliefs and previous research on the issue, this study demonstrates that infrastructure has a mostly positive effect on employment. In addition, it was shown that the population's ICT competence negatively impacted employment, suggesting that digital technology may replace human labour. Similarly statistically significant were the variables GDP and labour price, with an increase in GDP enhancing employment and an increase in labour price logically diminishing it.

This empirical investigation validated the veracity of the governments' perspectives on the approaching digitalization, which are progressively spending in education to create human capital. This characteristic correlates favourably with employment. In conclusion, it is challenging to identify the exact impact of digitalization and automation on employment. According to the findings, employees should invest more in human capital and attend school or retraining programmes in order to have appropriate knowledge and complement capital equipment. Due to the research, governments should encourage the development of ICT infrastructure in order to raise the competitiveness of businesses and, consequently, employment.

This research may be utilised to offer an overview of how digitalization may contribute to the growth of various business sectors. The COVID-19 pandemic exemplifies the significance of digital gadgets in such circumstances. As a result, it is vital to accept and develop these technologies to a greater and greater degree, as they have the potential to improve the quality of life, employment, and other aspects of society. It is vital to utilise its applications actively. It is evident from this research that investments are required in a number of areas, particularly schools. The study's application to only four countries can be viewed as a restriction, yet from the standpoint of their similarity, the countries can be ranked rather precisely. The topic of a broader probe, such as the entire European Union, is brought up for additional examination.

Funding

This paper is an output of the project NFP313010BWN6 "The implementation framework and business model of the Internet of Things, Industry 4.0 and smart transport".

Disclosure statement

There are no financial, professional or personal conflicts of interest to disclose.

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