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INFORMATION AND COMMUNICATION TECHNOLOGIES SECTOR DEVELOPMENT AS A FACTOR OF FORMING CREATIVE INDUSTRIES IN THE EUROPEAN UNION COUNTRIES: EXPERIENCE OF THE STRUCTURAL TRANSFORMATION FOR UKRAINE

ABSTRACT

The purpose is to identify the key regularities of the information and communication technology sector (ICTS) development in the context of forming creative types of economic activity in the EU countries for the implementation of the European experience in Ukrainian practice of the structural modernization of the economy. Scientific methods of induction and deduction, synthesis and comparison, statistical estimation of variation features, and multiple regression analysis are used. The following scientific and methodological approach to evaluating the ICTS development in the EU countries was worked out: carrying out a comparative analysis of main trends in the social and economic development of the ICTS; evaluating the indicators of a spatial variation for major social and economic indexes of the ICTS development; determining a multiple regression equation to identify the factors having an impact on employment in this sector. In accordance with the dynamics of the main indicators of variation for the ICTS in the EU countries, the presence of spatial differentiation in output, gross fixed capital formation, general government expenditure and final consumption expenditure of households, relative homogeneity in employment were revealed. The author has substantiated the role of the ICTS in strengthening spatial asymmetries in the creative industries development in the EU countries. Such factors influencing employment in the ICTS of the EU countries as demographic situation, R&D expenditures, unemployment expenditures and frequency of internet access were identified by means of multiple regression analysis. Given the experience of the EU countries, in Ukraine, the growing influence of the ICTS on the formation of creative industries and structural modernization of the economy is connected to improving the current social and economic situation after the war, government measures for stimulating its development, overcoming the demographic crisis and growing households demand for information and communication services.

Keywords: creative industries, factors of development, sector of information and communication technologies, social and economic indicators, employment, multiple regression analysis

JEL Classification: C10, L82, L86, O10

INTRODUCTION

One of the important trends in the development of the national economy is the strengthening of the information and communication technology sector's (ICTS) influence on the functioning of its various industries. Due to the existence of direct and indirect effects, the ICTS contributes to the formation of the information society and the restructuring of the national economy, accelerates the digitalization of households, firms and the state, strengthens the openness of the country and stimulates new markets. This sector is one of the main factors in the formation of creative industries through the transformation of existing and the emergence of new economic activities, and modification of value chains. In view of this, it is necessary to identify the main trends in the evolution of the ICTS in the EU countries, taking into account its contribution to the

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development of creative industries and the structural modernization of the economy to adapt this experience to the conditions of Ukraine's economy.

LITERATURE REVIEW

The formation of scientific approaches to the elucidation of the major theoretical and methodological and applied principles of the ICTS functioning in the context of creative industries formation and the structural transformation of the economy is debatable. From the standpoint of improving operational efficiency and expanding opportunities to achieve missions by cultural institutions, H. Bakhshi and D. Throsby have identified prospective directions for the use of information and communication technologies (ICT) [1]. In view of the Internet development, E. Sanz has analysed the features of digital market formation for cultural products and generating their value [2]. Based on the use of cluster analysis methodology for creative industries in the EU countries, K. Baculakova and M. Gress emphasized the positive effect of high-tech industries and the Internet on their formation [3]. From the standpoint of the importance of creative industries in the national economy E. Martinaitytė and R. Kregždaitė have identified the main factors of their development, among which a special place belongs to technological innovations [4]. Based on the analysis of the correlations and differences between the creative and manufacturing industries T.K. Sung found that the development of the ICTS has a positive effect on the competitiveness and efficiency of firms in these industries [5].

Taking into account the impact of ICT on innovation in the creative industries M. Abbasi, P. Vassilopoulou and L. Stergioulas developed strategic guidelines for their development to maximize the benefits of major stakeholders [6]. Based on the use of peer-to-peer file-sharing methodology, A. Hervas-Drane and E. Noam structured the types of Internet influences on the international distribution of cultural goods and assessed the implications for cultural policy and cultural diversity [7]. From the standpoint of creating innovations and their importance for economic growth J. Stejskal, P. Hajek and V. Prokop have analysed the models of cooperation in the information and communication creative industries of Germany [8]. Through the formation of demand for creative goods, C. Peukert clarified the main directions of digitalization impact and development of Internet platforms on the functioning of cultural industries in the national economy [9]. The peculiarities of the nature and dynamics of the online ecosystem of entrepreneurship in the cultural and craft industries are determined by V. Chandna and M.S. Salimath [10].

Through the identification of the main trends in the development of ICT F. Li has clarified the features of the digital transformation of business models in the creative industries [11]. The functions of the digitization process during the construction of value chains in the creative industries of Sweden have been identified by D. Betzler and L. Leuschen [12]. Taking into account the processes of digitalization and development of ICT, N. Casemajor, G. Bellavance and G. Sirois have structured the key directions of changes in the goals and priorities of cultural policy (on the example of Quebec, Canada) [13]. Scientists have classified the chief factors in the development of virtual agglomerations of cultural industries in the digital economy [14]. J. Snowball, D. Tarentaal and J. Sapsed analysed and identified the types of positive effects caused by the use of digital technologies by firms in the cultural and creative industries of Cape Town (South Africa) and Brighton (UK) [15]. Due to the formation of the creative economy, the peculiarities of the structural transformation for the information and communication sector in the EU countries are evaluated and the main directions of adaptation of this experience to the social and economic situation in Ukraine are identified [16]. However, it is necessary to evaluate the main directions of the evolution of the ICTS in the economy of the EU countries from the standpoint of its importance for the formation of creative industries and justify a number of recommendations to intensify its participation in the structural transformation of the economy of Ukraine.

AIMS AND OBJECTIVES

The purpose is to identify the key regularities of the ICTS development in the context of forming creative types of economic activity in the EU countries for the implementation of European experience in the Ukrainian practice of the structural modernization of the economy. To do this, it is necessary to:

- carry out a comparative analysis of the basic trends in the social and economic development of the ICTS in the EU countries;
- evaluate the nature of the main macroeconomic indicator's variation of the ICTS functioning in 2008–2020 for European countries;
- identify the chief factors influencing employment in this sector in the EU countries with the help of tools of multiple regression modelling.

This will allow us to offer scientific, methodological and practical approaches to define the prospects for the development of the ICTS in Ukraine from the standpoint of determining its contribution to the structural transformation of the economy.

METHODS

The achievement of this goal involves the use of methods of induction and deduction, analysis and synthesis, and comparison to determine the chief regularities of the ICTS development in the EU countries; analyzing the variation for the main social and economic indicators in order to evaluate the nature of the spatial changes in this sector by the EU countries; multiple regression analysis to characterize the major factors influencing the ICTS employment of these countries.

To analyse the main trends in the development of the ICTS in the EU countries and Ukraine, we use statistics represented by the System of National Accounts (SNA) in the category "Information and Communication". This is due to the fact that the systematization of data for the creative industries and ICTS, which is reflected in official statistics, does not have a well-established approach. The classification of ICTS economic activities is presented by the International Standard Industrial Classification of All Economic Activities [17], the European Commission for Joint Research in ICT [18] and the Organization for Economic Co-operation and Development [19]. For creative industries, there is a sectoral classification of the Department for Culture, Media and Sport (UK) [20], EU countries [21], Ukraine [22]. According to this, the creative industries include those types of economic activity that fall under the classification of the ICTS.

RESULTS

The ICTS has a special position in the economy of the EU countries, due to the ambiguity of its impact on the development of creative industries and structural changes in the economy. In 2008–2020, the general trend is that its share in the structure of gross added value (GVA) of European countries gradually increased (Table 1). If in 2010–2014 the contribution of the ICTS to the creation of GAV was the lowest, in 2020 it increased by 0.8 % of GDP, which was based on the growth of demand for its products due to the COVID-19 pandemic. In the EU countries, where in some years the share of GAV in this sector was the lowest, its position in the national economy was influenced by the current social and economic situation, strategic development priorities, quality of institutions that stimulate business activity in the ICTS and contribute to the development of its effective ecosystem. In 2008–2020, Ireland was the leading country in terms of the contribution of the ICTS to the development of the national economy by the share of GAV, and by 2020 the growth was 2.4 times. This is due to the fact that the country is taking long-term measures to stimulate foreign investment in high value-added industries, reform the labour market and reduce the tax burden on business, an additional factor was Brexit. The situation in the ICTS in the EU countries has strengthened the position of the creative industries through the affiliation of information and telecommunications services (ITS) to them. In Ukraine, the ICTS is also considered as one of the priority areas for achieving positive structural changes in the national economy and the formation of creative industries. If in 2016 its share in the structure of GAV was 3.7 % of GDP, in 2020 – 5 %, that is, increased by 1.35 times [23].

Measures to provide state support for the development of the ICTS in the EU countries are quite differentiated. In 2008–2019, the share of expenditures on information and communication from the general budget in the EU countries was gradually reduced, it amounted to less than 1 % of general government expenditures (Table 1). If in 2008–2012 its gradual growth was recorded, then from 2013 it began to decrease. During the analysed period in the EU countries, which have one of the lowest indicators of the contribution of the ICTS to the creation of GAV, the general government expenditure on information and communication was higher than average, in Ireland – lower.

These differences in approaches to the formation of general government expenditures for this sector are due to the high degree of interest of private entities in investing in ICT, a significant level of its integration into the market relations system, state priorities for national information and communication space development and digitalization of public goods provision. In 2008–2020, the expenditures of the consolidated budget of Ukraine for communications, telecommunications and informatics amounted to 0.1 % of the expenditures of the consolidated budget, by 2020 they were slightly reduced [24]. This is in line with the general trends that have emerged in EU countries. The growth of the ICTS in the national economies of Ukraine and the EU countries in the context of the formation of creative industries is largely based on the active use of regulators of market origin, and public investment in this sector is insignificant.

In 2008–2020, there were changes in the structure of the labour market of the EU countries due to the growing share of those employed in the ICTS, and this was recorded even in those countries for which the contribution of this sector to the creation of GAV is the smallest. If on average in the EU countries the share of employment increased by 0.5 % of the

total, and GAV – by 0.7 % of GDP for the analysed period, in Ireland these figures were 1 % of the total and 9.5 % of GDP, respectively (Table 1).

Table 1. Main trends of the ICTS development in the EU countries. Notes: * – European Union (27 countries) and countries with the lowest value; ** – countries with the highest value; GAV – gross added value, GGE – general government expenditure, GFCF – gross fixed capital formation; FCEH – final consumption expenditure of households. (Source: calculated based on [25])

| Indicator | Country | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|------|
| GAV of information and communication, % of GDP | European Union* | 4.2 | 4.3 | 4.1 | 4.1 | 4.1 | 4.1 | 4.1 | 4.2 | 4.2 | 4.3 | 4.4 | 4.5 | 4.9 |
| | Greece* | 3.3 | 3.6 | 2.8 | 2.8 | 2.7 | 2.7 | 2.4 | 2.5 | 2.6 | 2.7 | 2.7 | 2.8 | 3.1 |
| | Cyprus* | 2.9 | 3.0 | 3.2 | 3.2 | 3.2 | 3.8 | 4.2 | 4.2 | 5.1 | 5.7 | 5.7 | 6.2 | 6.9 |
| | Lithuania* | 3.0 | 3.5 | 3.3 | 2.8 | 2.7 | 2.9 | 2.8 | 3.1 | 3.2 | 3.3 | 3.3 | 3.5 | 3.7 |
| | Austria* | 3.0 | 2.9 | 2.9 | 3.0 | 3.0 | 3.0 | 3.1 | 3.1 | 3.2 | 3.2 | 3.3 | 3.4 | 3.5 |
| | Ireland** | 6.8 | 7.5 | 8.4 | 8.2 | 8.8 | 9.4 | 9.8 | 8.7 | 9.2 | 10.6 | 12.1 | 14.4 | 16.3 |
| GGE on communication, % of the total GGE | European Union* | 0.093 | 0.086 | 0.107 | 0.101 | 0.141 | 0.099 | 0.068 | 0.069 | 0.060 | 0.060 | 0.069 | 0.064 | ... |
| | Greece* | 0.009 | 0.039 | 0.006 | 0.004 | 0.001 | 0.002 | 0.008 | 0.006 | 0.014 | 0.015 | 0.0195 | 0.037 | ... |
| | Cyprus* | 0.356 | 0.363 | 0.364 | 0.348 | 0.324 | 0.329 | 0.292 | 0.338 | 0.333 | 0.331 | 0.292 | 0.303 | ... |
| | Lithuania* | 0.328 | 0.089 | 0.386 | 0.346 | 0.392 | 0.375 | 0.477 | 0.604 | 0.114 | 0.137 | 0.125 | 0.284 | ... |
| | Austria* | 0.104 | 0.090 | 0.096 | 0.093 | 0.079 | 0.076 | 0.077 | 0.091 | 0.104 | 0.108 | 0.134 | 0.105 | ... |
| | Ireland** | 0.086 | 0.071 | 0.061 | 0.025 | 0.027 | 0.036 | 0.038 | 0.042 | 0.044 | -0.085 | 0.054 | 0.049 | ... |
| Employment in information and communication, % of the total | European Union* | 2.5 | 2.6 | 2.5 | 2.6 | 2.6 | 2.6 | 2.7 | 2.7 | 2.7 | 2.8 | 2.9 | 2.9 | 3.0 |
| | Greece* | 1.9 | 1.8 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.1 | 2.0 | 2.0 | 2.2 | 2.2 | 2.2 |
| | Cyprus* | 2.3 | 2.3 | 2.4 | 2.5 | 2.5 | 2.6 | 2.7 | 2.7 | 2.7 | 2.8 | 3.0 | 3.2 | 3.3 |
| | Lithuania* | 1.7 | 1.7 | 1.8 | 2.0 | 2.2 | 1.9 | 1.8 | 2.0 | 2.1 | 2.1 | 2.3 | 2.7 | 2.9 |
| | Austria* | 2.4 | 2.4 | 2.4 | 2.5 | 2.5 | 2.5 | 2.6 | 2.6 | 2.7 | 2.7 | 2.8 | 2.9 | 3.0 |
| | Ireland** | 3.4 | 3.8 | 3.5 | 3.6 | 3.8 | 3.8 | 3.7 | 3.7 | 3.8 | 4.0 | 3.9 | 4.0 | 4.4 |
| Output of information and communication, % of the total | European Union* | 4.5 | 4.8 | 4.6 | 4.5 | 4.6 | 4.6 | 4.6 | 4.7 | 4.8 | 4.8 | 5.0 | 5.1 | 5.5 |
| | Greece* | 3.7 | 3.9 | 3.7 | 3.7 | 3.6 | 3.5 | 3.3 | 3.4 | 3.6 | 3.6 | 3.5 | 3.6 | 4.0 |
| | Cyprus* | 4.1 | 4.0 | 4.4 | 4.6 | 5.3 | 6.5 | 6.8 | 7.4 | 8.3 | 8.7 | 8.8 | 10.5 | 11.6 |
| | Lithuania* | 3.0 | 3.5 | 3.1 | 2.6 | 2.5 | 2.6 | 2.7 | 2.9 | 3.1 | 3.2 | 3.4 | 3.5 | 3.9 |
| | Austria* | 3.5 | 3.6 | 3.5 | 3.5 | 3.5 | 3.6 | 3.6 | 3.7 | 3.8 | 3.7 | 3.8 | 3.9 | 4.1 |
| | Ireland** | 10.2 | 11.5 | 13.5 | 13.3 | 16.3 | 18.1 | 18.5 | 16.5 | 14.9 | 16.2 | 18.1 | 18.5 | 21.1 |
| GFCF of ICT equipment, % of the total | European Union* | 3.6 | 3.4 | 3.6 | 3.5 | 3.6 | 3.6 | 3.6 | 3.7 | 3.7 | 3.6 | 3.6 | 3.3 | 3.4 |
| | Greece* | 5.6 | 6.0 | 6.4 | 6.1 | 6.9 | 6.3 | 6.9 | 8.4 | 8.0 | 8.5 | 10.4 | 10.5 | 12.2 |
| | Cyprus* | 3.0 | 4.3 | 3.7 | 3.7 | 3.8 | 4.1 | 4.0 | 5.1 | 2.6 | 2.3 | 2.3 | 2.1 | 2.0 |
| | Lithuania* | 4.7 | 6.3 | 8.4 | 7.9 | 8.0 | 6.1 | 5.2 | 5.5 | 5.6 | 6.0 | 5.9 | 6.0 | 6.9 |
| | Austria* | 5.7 | 5.2 | 5.8 | 5.5 | 5.6 | 5.0 | 4.6 | 5.4 | 5.1 | 5.1 | 5.2 | 5.0 | 5.1 |
| | Ireland** | 2.4 | 3.3 | 3.9 | 6.9 | 5.1 | 5.5 | 4.4 | 3.0 | 2.3 | 1.9 | 3.4 | 1.0 | 1.6 |
| FCEH on communications, % of the total | European Union* | 2.9 | 3.0 | 2.9 | 2.8 | 2.8 | 2.7 | 2.6 | 2.5 | 2.5 | 2.5 | 2.4 | 2.4 | 2.6 |
| | Greece* | 3.6 | 4.4 | 4.5 | 4.1 | 4.1 | 3.6 | 3.4 | 3.4 | 3.8 | 3.9 | 3.8 | 3.8 | 4.9 |
| | Cyprus* | 3.0 | 3.2 | 2.6 | 2.7 | 2.7 | 2.8 | 2.8 | 2.9 | 2.8 | 2.6 | 2.5 | 2.5 | 2.9 |
| | Lithuania* | 2.2 | 2.8 | 2.6 | 2.3 | 2.5 | 2.6 | 2.4 | 2.6 | 2.8 | 2.8 | 2.7 | 2.6 | 2.9 |
| | Austria* | 2.3 | 2.3 | 2.1 | 2.0 | 2.0 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 1.9 | 2.1 |
| | Ireland** | 3.1 | 3.3 | 3.0 | 2.9 | 2.8 | 2.7 | 2.8 | 2.8 | 2.6 | 2.5 | 2.5 | 2.4 | 2.9 |
| FCEH on communications, current prices, euro per capita | European Union* | 400 | 390 | 400 | 400 | 390 | 380 | 370 | 370 | 380 | 390 | 390 | 390 | 390 |
| | Greece* | 550 | 650 | 620 | 540 | 520 | 440 | 410 | 410 | 450 | 480 | 470 | 490 | 530 |
| | Cyprus* | 520 | 500 | 410 | 430 | 430 | 430 | 430 | 450 | 450 | 450 | 450 | 460 | 440 |
| | Lithuania* | 150 | 160 | 150 | 150 | 170 | 190 | 190 | 210 | 240 | 260 | 270 | 280 | 300 |
| | Austria* | 430 | 420 | 400 | 400 | 400 | 390 | 390 | 400 | 410 | 410 | 430 | 440 | 440 |
| | Ireland** | 600 | 550 | 500 | 480 | 460 | 460 | 490 | 500 | 490 | 480 | 500 | 480 | 540 |

This indicates not only higher productivity in the ICTS of Ireland compared to other EU countries, but also a high demand for labour and staff shortages. In Ukraine, there was a tendency to increase the share of employees in the ICTS, in 2012 it was 1.5 % of the total, in 2020 – 1.8 % [calculated on the basis of 23]. This is lower than the EU average and corresponds to the level of a country like Greece. Structural changes in the labour market for the ICTS have a positive impact on the labour market for creative industries in both Ukraine and the EU, which is based on the long-term trend of increasing demand for highly qualified professionals in this sphere.

In 2008–2020, the position of the ICTS in the development of the national economy of the EU countries increased in terms of output, averaging up to 1 % of total output, in Ireland – up to 10.9 %, Cyprus – up to 7.5 %, respectively (Table 1). In Ukraine, the share of the ICTS output corresponded to the overall figure for the EU countries, tended to gradually increase in the analysed period, in 2020 it was about 4.2 % of total output [calculated on the basis of 23]. Indirectly, this had a positive impact on the formation of creative industries in Ukraine and EU countries, as it contributed to their growth in such economic activities as information and telecommunications. In the future, the ICTS will play the role of a kind of catalyst for the development of creative industries, determining its structural features in the EU countries and Ukraine.

In 2008–2020, the process of gross fixed capital formation in the ICTS in European countries was relatively stable, averaging 3.6 % of the total (Table 1). Moreover, by 2020, Greece has gradually increased the share of accumulation of gross fixed capital of the ICTS, according to this indicator, it took a leading position, and in Ireland, it was gradually reduced. The main reasons for the existence of such differences are the peculiarities of institutional changes in the investment processes of the EU countries, related to the stimulation of the ICT development, and the speed of digital transformation of production. In Ukraine, in 2013–2020, the share of the cost of ICTS fixed assets is also growing, and capital investment in this sector was fluctuating, averaging 4.5 % of the total annually [calculated on the basis of 23]. The impact of the ICTS on the formation of creative industries and the change in the structure of the economy in Ukraine and the EU countries from the point of view of gross fixed capital accumulation was marked by positive trends but depended on the intensity of ICT implementation and the existing investment climate.

The activity of the ICTS affects the structure and nature of household consumption of its products. According to table 1 in 2008–2020 the structure of final consumption expenditure of household (FCEH) on communications in the EU countries did not change significantly, in 2008–2012 their share was slightly higher, in 2013–2020 it decreased by 0.2 % of the total. During these years, FCEH per capita in the EU countries were relatively stable, the peculiarity is that their differentiation by country depended on the level of their socio-economic development. In 2020, this was virtually unaffected by the negative social and economic effects of the COVID-19 pandemic. The main reasons for this were the affordability of networking, the development of customer-oriented digital ecosystems, increasing competition in the market of information and communication services, and the formation of an information and communication culture by households.

In Ukraine, in 2010–2019, the structure of total expenditures on communications per average household per month did not change significantly, except for the crisis of 2014–2017, it amounted to 2.8 % of total aggregate expenditures. In 2020, due to the transition to remote working, their share increased by 0.6 % and reached 3.4 % of total expenditures [calculated on the basis of 23]. In absolute terms, the total communication expenditures per Ukrainian household per month fluctuated, from € 5.41 in 2015 to € 10.52 in 2020, respectively [calculated on the basis of 23]. The impact of the ICTS on the development of creative industries in Ukraine and the EU countries is associated with the emergence of new communication channels that increase household access to various creative content, the formation of new models of interaction based on different types of digital platforms, growing demand for information communication services against the background of cheaper usage fees. In view of the consumer sentiment of households, the ICTS serves as a stimulator for the development of creative industries and changes the structure of consumption.

We propose to evaluate the peculiarities of the ICTS development in the EU countries in 2008–2020 on the basis of the dynamics for a number of variation indicators (Table 2). In these years, we have recorded an increase in the values of the scope of variation, sample variance and coefficient of variation for GAV in the ICTS. If by 2017 the value of the coefficient of variation was less than 33.3 % (which indicated the homogeneity of the population), then in 2018–2020 – already higher. This indicates that in the EU countries the development of this sector depended on the level of social and economic well-being, the speed of innovation based on ICT, qualitative changes in the infrastructure of information and communication services and the formation of digital competencies of consumers.

The strengthening of structural disparities in the EU countries in terms of GAV in the ICTS (% of GDP) aims to improve the competitive position of countries, increase the efficiency of economic resources using and transform the environment of interaction between government, firms and households. In addition, this means that the ICTS affects the formation of creative industries and structural modernization of the economy in different ways in the EU countries. In order to achieve positive structural changes in the economy of Ukraine, it is expedient not only to improve the investment climate and

create favourable conditions for the intensification of business processes in the ICTS but also to stimulate demand for products in this sector. It will also strengthen the trans-sectoral potential of Ukrainian creative industries by expanding opportunities for the development of creative entrepreneurship and partnerships with the state.

Table 2. Indicators of variation of the main trends in the ICTS development in the EU countries. Notes: GAV – gross added value-added, GGE – general government expenditure, GFCF – gross fixed capital formation; FCEH – final consumption expenditure of households. (Source: calculated based on [25])

| Indicator | Type of variation | 2008 | 2009 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|--------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|
| GAV of information and communication, % of GDP | Scope of variation | 3.9 | 4.6 | 5.4 | 6.1 | 6.7 | 7.4 | 6.2 | 6.6 | 7.9 | 9.4 | 11.6 | 13.2 |
| | Sample variance | 0.8066 | 0.9706 | 1.3006 | 1.4965 | 1.5881 | 1.8383 | 1.5198 | 1.6553 | 2.1962 | 3.0374 | 4.4990 | 6.2527 |
| | Coefficient of variation | 21.62 | 22.78 | 26.80 | 28.59 | 29.19 | 31.29 | 28.29 | 28.76 | 32.29 | 36.95 | 42.39 | 46.48 |
| GGE on communication, % of the total GGE | Scope of variation | 0.7033 | 0.3449 | 0.3447 | 0.3912 | 0.4077 | 0.4739 | 0.6015 | 0.3305 | 0.4160 | 0.2720 | 0.3005 | 0.7033 |
| | Sample variance | 0.0203 | 0.0067 | 0.0088 | 0.0116 | 0.0106 | 0.0102 | 0.0137 | 0.0043 | 0.0054 | 0.0035 | 0.0051 | 0.0203 |
| | Coefficient of variation | 103.12 | 77.68 | 97.96 | 93.80 | 99.38 | 101.13 | 117.39 | 83.29 | 93.39 | 66.39 | 82.03 | 103.12 |
| Employment in information and communication, % of the total | Scope of variation | 3.2 | 3.1 | 3.0 | 2.80 | 2.7 | 2.7 | 2.5 | 2.5 | 2.8 | 2.3 | 2.7 | 2.5 |
| | Sample variance | 0.6338 | 0.6380 | 0.5487 | 0.5312 | 0.5260 | 0.5426 | 0.5435 | 0.5473 | 0.5805 | 0.4834 | 0.4703 | 0.4582 |
| | Coefficient of variation | 29.95 | 29.30 | 26.45 | 25.62 | 25.06 | 24.93 | 24.34 | 23.91 | 24.27 | 21.62 | 20.90 | 20.11 |
| Output of information and communication, % of the total | Scope of variation | 7.2 | 8.0 | 10.7 | 13.8 | 15.6 | 15.8 | 13.6 | 11.7 | 13.0 | 14.8 | 15.0 | 17.4 |
| | Sample variance | 1.8041 | 2.3404 | 3.2812 | 5.4311 | 7.0536 | 7.4200 | 5.7686 | 4.7115 | 5.8275 | 7.6080 | 8.6055 | 12.8523 |
| | Coefficient of variation | 30.81 | 32.32 | 39.77 | 49.74 | 55.23 | 56.06 | 48.95 | 43.11 | 47.11 | 52.31 | 53.64 | 59.85 |
| GFCF of ICT equipment, % of the total | Scope of variation | 5.6 | 4.9 | 6.0 | 6.0 | 5.2 | 5.3 | 7.5 | 6.8 | 7.5 | 10.0 | 9.5 | 11.7 |
| | Sample variance | 2.3001 | 2.0132 | 2.5546 | 2.2522 | 1.9323 | 2.2492 | 2.8804 | 2.8424 | 2.4575 | 3.2916 | 4.0527 | 5.8496 |
| | Coefficient of variation | 33.28 | 32.45 | 34.37 | 33.72 | 31.51 | 33.13 | 38.54 | 39.38 | 38.16 | 43.16 | 50.03 | 61.19 |
| FCEH on communications, % of the total | Scope of variation | 3.8 | 3.9 | 3.7 | 3.7 | 3.9 | 3.4 | 3.2 | 3.2 | 3.3 | 3.3 | 3.3 | 4.1 |
| | Sample variance | 0.5456 | 0.6139 | 0.5499 | 0.5460 | 0.6072 | 0.4851 | 0.4779 | 0.5106 | 0.4982 | 0.4772 | 0.4490 | 0.7704 |
| | Coefficient of variation | 24.89 | 25.68 | 25.15 | 25.42 | 27.36 | 25.22 | 25.094 | 25.97 | 26.24 | 26.12 | 25.80 | 29.84 |
| FCEH on communications, current prices, euro per capita | Scope of variation | 580.0 | 560.0 | 640.0 | 650.0 | 680.0 | 710.0 | 810.0 | 800.0 | 770.0 | 730.0 | 780.0 | 600.0 |
| | Sample variance | 23545 | 24013 | 25784 | 25698 | 24934 | 25269 | 29043 | 27216 | 26715 | 25095 | 28433 | 19360 |
| | Coefficient of variation | 39.84 | 41.59 | 41.57 | 41.24 | 41.24 | 42.05 | 43.66 | 41.44 | 40.18 | 38.34 | 39.99 | 34.28 |

According to the dynamics of variation indicators, the ICTS public funding in the EU countries had its own national characteristics (Table 2). What they had in common was that the approaches to structuring the general government expenditures on communications depended on the state priorities and market conditions. This is due to the fact that the ICTS has significant potential for self-development in market conditions, which is based on the existence of various organisational and legal forms of entrepreneurship, active introduction of innovations, the dynamism of the various industries emergence, the use of business models based on data, creating digital platforms for the interaction of sellers and buyers. In the EU countries, at the state level, they use other approaches to stimulate the development of the ICTS, related to the formation

of communication quality standards, licensing, and provision of information security. In view of the variability of ICTS budget funding in the EU countries, its impact on the formation of creative industries in this area is limited, one of the effective mechanisms is project financing of this type of economic activity from the EU structural funds. In Ukraine, it is advisable to rely on this experience, and consider the contribution of the ICTS in the formation of creative industries through the market mechanism, state regulation of these industries is associated with building the appropriate institutional environment and cooperation with EU funds.

The analysis of variation indicators by the structure of employment in the ICTS of the EU countries revealed a trend towards smoothing spatial differences in 2008–2020 (Table 2), the studied population became more homogeneous. The situation on the labour market for the ICTS shows the similarity of its evolutionary processes, caused by the growing demand for ICT professionals in the EU countries, the expansion of opportunities for the use of non-standard forms of employment and staff mobility. These trends are a kind of indicator that the ICTS labour market in the EU is highly competitive. We should also expect positive changes in the labour market for creative industries in European countries, which is due to the growing demand not only for professionals in this sector but also for related professions connected with the development and creation of interaction between individuals and relevant technical devices. Based on the experience of structural transformations of the ICTS labour market in the EU countries, it can be argued that the configuration of employment for creative industries will change in Ukraine as well.

In 2008–2020, there was a tendency to increase the heterogeneity of the analysed population in such components of the ICTS as the structure of output (% of total) and gross fixed capital formation (% of total) in the EU countries, based on the upward dynamics of variation indicators (Table 2). This indicates the spatial differentiation of approaches to the implementation of ICT in different sectors of the national economy, the existence of differences in the intensification of activities in the ICTS and adaptation to changes. The foundations have been laid for strengthening the asymmetry of creative industries' development due to the different speeds of structural changes in the ICTS. According to the experience of EU countries, one of the functions of the ICTS in Ukraine will be the replacement and adaptation of existing technological organisations in the creative industries and the intensification of its participation in the structural modernization of the economy.

In the analysed period, the structure of the FCEH for communication in the EU showed a slight increase in household behaviour differences by the magnitude of the scope of variation and sample of variance, the value of the coefficient of variation increased, but the studied population remained homogeneous (Table 2). In 2008–2020, the dynamics of variation indicators for FCEH for communications at current prices per capita was fluctuating, demonstrating the heterogeneity of the studied population. These trends indicate that in the EU countries there are changes in consumer preferences in the ICT services market, which is based on improving the social and economic situation in some national economies, the development of networking systems of government, firms and households and increasing the level of digital literacy. For EU households, the evolution of the ICTS will generate a set of signals about the importance of communication expenditure due to the need of solving personal and professional problems. For the creative industries of European countries, this will create the preconditions for unlocking their potential through the production of high-tech creative products, the use of digital marketing to promote them, the introduction of flexible forms of employment. Similar trends related to changes in household expenditure on communications, which are also typical for Ukraine, they indirectly increase the demand for creative industries in the national market.

To determine the factors influencing the development of the ICTS in the EU countries, we use the tools of multiple regression modelling. Employment in the field of information and communication (Y , thsd. people; the ICTS) will be considered as a dependent variable that determines the progressive changes in this sector. This is due to the fact that employment trends directly reflect the nature of the development of the ICTS, its position and role in the formation of creative industries, changes in the structure of the national economy. As independent variables we take such as: X_1 – population, unit; X_2 – general expenditure on R&D, mln. euro; X_3 – expenditure on unemployment, mln. euro; X_4 – frequency of Internet access, daily, % of individuals. Statistical data for the identification of a multiple regression model is taken for 29 EU countries in 2008–2019, the sample size is 208 units. According to this, the following multiple linear regression equation was obtained (Table 3). The main parameters estimation of the equation shows that it is adequate for Fisher's criteria and Student's t -test, the absence of auto-correlation according to the Durbin-Watson test.

With a probability of 99.31 % (Y), it can be said that the number of people employed in the field of information and communication in the EU countries depends on the demographic situation (X_1), R&D expenditure (X_2), unemployment expenditure (X_3) and the level of individuals Internet involvement (X_4). In view of the multiple regression equation parameters, it is appropriate to interpret them as follows: if the population in the country increases by 10,000 people, we can expect an increase in employment in the field of information and communication by an average of 0.086 thsd. people; if

the general expenditure on R&D increases by 1 mln. euros, the number of people employed in the field of information and communication will increase by an average of 0.0067 thsd. people; if the expenditure on unemployment increases by 1 mln. euros, the number of people employed in the field of information and communication will decrease by an average of 0.0017 thsd. people; if the share of individuals who use the Internet every day will increase by 1 %, the number of people employed in the field of information and communication will increase by an average of 0.3883 thsd. people.

Table 3. The Sample Regression Functions and Reporting Regression Results for Employment in Information and Communication. Notes: * – the slope parameters and intercept; ** – the regression. (Source: calculated based on [25])

| Variables | Intercept and slope parameters | Standard error* | t-statistic | Confidence interval, 95 % | | DW, 99 % |
|---------------------------|--------------------------------|----------------------|-------------|---------------------------|------------|----------|
| | | | | low-level | high-level | |
| Y-meet | -18.8823 | 5.5477 | -3.4037 | -29.7557 | -13.3346 | 2.032 |
| variable X ₁ | 0.0000086 | 0.0000002 | 53.9840 | 0.0000083 | 0.0000088 | d=1.623 |
| variable X ₂ | 0.0067 | 0.0001 | 45.1181 | 0.0064 | 0.0069 | d=1.725 |
| variable X ₃ | -0.0017 | 0.0003 | -6.4438 | -0.0022 | -0.0014 | |
| variable X ₄ | 0.3883 | 0.0803 | 4.8338 | 0.2309 | 0.4687 | |
| Regression statistics | | Analysis of variance | | | | |
| R | 0.9965 | | df | SS | MS | F |
| R ² | 0.9931 | Regression | 4 | 25610480.92 | 6402620.23 | 12264.03 |
| Normalized R ² | 0.9930 | Residual | 343 | 179068.22 | 522.06 | |
| Standard error** | 22.8487 | Total | 347 | 25789549.13 | | |

Accordingly, the increase in the number of people employed in the field of information and communication in the EU countries will have a positive impact on the development of the ICTS, due to the influence of socio-demographic factors, enlarged R&D spending and expanded use of the Internet. Taking into account the experience of the EU countries, in Ukraine, the growth in the number of employees in the ICTS is associated with overcoming the demographic crisis, increasing spending on innovation and the number of Internet users. In turn, this will create a favourable environment for the emergence of creative industries and structural modernization of the economy in the EU countries and Ukraine on the basis of expanding cooperation with the ICTS to integrate digital technologies into production.

Due to the war, we can expect a deterioration in the position of the ICTS in the Ukrainian economy due to the "brain drain", a decrease in demand for products, obstacles in the logistics and energy supply system, and a reduction in investment. Given that the ICTS includes computer programming, consulting and information services, the basis of which is remote employment, access to the Internet and the use of remote services to work on joint projects, the war is likely to have a weaker impact on its main social and economic indicators, it will affect the structural modernization of Ukraine's economy.

DISCUSSION AND CONCLUSIONS

Thus, the development of the ICTS has a positive impact on the formation of creative industries and the structural modernization of the economy in EU countries. Based on the analysis of the major social and economic indicators of the ICTS for these countries, it is established that structural changes in it are caused by the social and economic situation, current conditions of investment and innovation, features of infrastructure for information and communication services and digital skills. The following scientific and methodological approaches to the evaluation of the ICTS as a factor in the formation of creative industries in the EU countries are proposed: a comparative analysis of the ICTS development on the basis of existing statistics; spatial variation assessment of the key indicators of ICTS development; construction of a multiple econometric equation to specify the factors that affect the activities in this sector.

The analysis of the peculiarities of ICTS activity main indicators variation in the EU countries revealed the existence of spatial differentiation in production, accumulation of gross fixed capital, general government expenditures and final consumption expenditure of households on communication, and relative homogeneity in employment. The reason for this is the differences between national economies, government strategies to stimulate its development and consumer behaviour of households. From this point of view, the role of the ICTS as a factor in the formation of creative industries in the EU countries is to strengthen the spatial asymmetries of these industries' development. On the basis of the multiple regression

equation, the factors influencing employment in the ICTS of the EU countries are specified. Accordingly, the development of the ICTS as a factor in the formation of creative industries in Ukraine will depend on the peculiarities of the structural transformation of the national economy, state priorities for reforming the country and consumer sentiment of households. In view of the experience of EU countries, strengthening the influence of the ICTS on the formation of creative industries in our country is associated with improving the current socio-economic situation, government measures to stimulate its development, overcoming the demographic crisis and increasing household demand for information and communication services. Despite the negative influence of the war in Ukraine on the formation of the creative industries, the ICTS will continue to maintain its leading position in the structure of the economy. Prospects for further research are connected with the determination of ICTS evolution in the context of creative industries formation in the economy of Ukraine.

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СЕКТОР ІНФОРМАЦІЙНО-КОМУНІКАЦІЙНИХ ТЕХНОЛОГІЙ ЯК ЧИННИК ФОРМУВАННЯ КРЕАТИВНИХ ІНДУСТРІЙ У КРАЇНАХ ЄВРОПЕЙСЬКОГО СОЮЗУ: ДОСВІД СТРУКТУРНОЇ ТРАНСФОРМАЦІЇ ДЛЯ УКРАЇНИ

Метою є специфікація основних закономірностей розвитку СІКТ у контексті становлення креативних видів економічної діяльності в країнах ЄС для імплементації європейського досвіду в українську практику структурної модернізації економіки. Використано методи індукції та дедукції, синтезу та порівняння, статистичного оцінювання варіації ознак, багатофакторного регресивно-кореляційного аналізу. Запропоновано такий науково-методологічний підхід до оцінювання розвитку СІКТ як чинника формування креативних індустрій у країнах ЄС: проведення порівняльного аналізу тенденцій соціального й економічного розвитку СІКТ; оцінка характеру просторової варіації основних соціально-економічних показників розвитку СІКТ; побудова багатофакторного регресійно-кореляційного рівняння для специфікації чинників, які впливають на зайнятість у цьому секторі. Згідно з динамікою основних індикаторів варіації для СІКТ, у країнах ЄС виявлено існування просторової диференціації у виробництві продукції, нагромадженні основного капіталу, видатках загального бюджету та кінцевих споживчих видатках домогосподарств на комунікацію, відносну однорідність у сфері зайнятості. Обґрунтовано роль СІКТ у посиленні просторових асиметрій у розвитку креативних індустрій у країнах ЄС. За допомогою багатофакторного регресійно-кореляційного аналізу специфіковано чинники, які впливають на зайнятість у СІКТ країн ЄС: демографічна ситуація, видатки на НДДКР, видатки на безробіття та інтенсивність користування індивідами мережею Internet. З огляду на досвід країн ЄС посилення впливу СІКТ на формування творчих індустрій в Україні пов'язане з поліпшенням поточної соціально-економічної ситуації після війни, заходами держави зі стимулювання його розвитку, подоланням демографічної кризи та зростанням попиту домогосподарств на інформаційно-комунікаційні послуги.

Ключові слова: креативні індустрії, чинники розвитку, сектор інформаційно-комунікаційних технологій, соціально-економічні показники, зайнятість, багатофакторний регресивний аналіз

JEL Класифікація: C10, L82, L86, O10