



## Innovative development in IT Sphere in the Context of the Industry 4.0 Concept: the Case of Ukraine

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### ABSTRACT

The article presents the opinions of scientists on the issue of technologies, innovation, and investment potential in the context of the Fourth Industrial Revolution and the development of the IT sector in Ukraine. It reveals that the formation of favorable innovation and investment potential in the IT sector is influenced by certain factors, as well as specific risks and obstacles. The article outlines the importance of Industry 4.0 and the development of the IT sector in Ukraine for Ukraine and other countries. A definite link between economic growth and innovation and development of the IT sector has been identified, which remains positive only under certain conditions. The authors analyze the leading indicators of capital investment by sources of financing and types of economic activity. The article also deals with the leading indicators of innovative development of Ukraine; of the most common methods of financing startups; companies are in the lead by deal value; the cost of innovation by financing sources; total expenditures in the areas of innovation at industrial enterprises. They were revealed that startups exist in each sector of the economy, which is a favorable factor for potential investors. The main problems related to the formation of innovation, development of the IT sector, and technological potential are identified, and the ways of their solution are suggested. It has been proven that Industry 4.0 is part of the Fourth Industrial Revolution and its successful completion leads to the development of the state's innovation and investment potential, as well as the development of the IT sector only if it is well organized and generously funded.

**Key words:** Innovation, information and communication technologies, IT sector, investment in technology, Industry 4.0, R&D.

### 1. INTRODUCTION

The Ukrainian IT industry has started its active outsourcing development, which has given us a boost in the difficult times of the post-Soviet space. Then, in the late 1990s and early 2000s, the first outsourced IT companies entered the domestic market: ELEKS, SoftServe, Miratech, and others. Foreign corporations were just beginning to discover Ukraine, so outsourced only a few of their functions, usually those that did not require deep technical expertise. It is a natural stage that has also passed India, Poland, Latvia, and Romania. The modern economic development of any country in the world takes place in the era of the end of the third digital revolution, which began in the second half of the last century. The characteristic features of which are the development of information and communication technologies, automation, and robotization of production processes.

In the current market economy, the issue of forming a stable base for financing is gaining importance, since the latter ensures the development of all components of the state (infrastructure development, development, and implementation of innovative measures). Today, Ukraine undergoes a transitional phase of the formation and development of a market economy and development of the IT sector; thus; it requires significant investment in its economy by potential internal and external investors. The experience of the leading countries of the world shows that significant investments are made in the field of innovation and the IT sector. Today, innovative and IT sector development arouses the interest of investors in investing their funds in the development, modification of new goods and services; improvement of technical and technological support; establishing new innovative products, which will imply the repurposing and modernization.

The Fourth Industrial Revolution and the emergence of the IT sector began in the middle of the last century and continues

now. The latter one has a significant impact on the economy of any country in the world and is found in all spheres of life. Technology is continually changing, and innovation is emerging and spreading around the world at an incredible speed.

The main aspect of the Fourth Industrial Revolution is Industry 4.0. and the emergence of the IT sector. The world learned about Industry 4.0 in 2011 at the Hanover Industrial Exhibition. It was then that the German government proposed to use information technology in production. The use of Industry 4.0 makes the industry more competitive and attractive for investment and the development of information and communication technologies.

The hallmarks of Industry 4.0 are fully automated productions, in which all processes are managed in real-time and subject to changing external conditions. Cyber-physical systems create virtual copies of objects in the physical world, physical control processes, and make decentralized decisions. They are able to integrate into one network, interact in real-time, self-adjust, and self-study. An important role is played by Internet technologies that provide communication between staff and machines. Enterprises produce products according to the requirements of the individual customer, optimizing the production cost.

Thus, today there is competition in the world, which requires all states to be technological, innovatively, and development of the IT sector their economies. In Ukraine, there are enterprises that are capable of ensuring high rates of economic growth in the long term due to precisely a powerful, innovative component, i.e., one that is well-formed and has an impact on innovation and investment potential, which allows attracting significant funding for its development. The main problem today is the difficulty of assessing the innovation and investment potential of Ukraine, since the development of the regions is differentiated, and, accordingly, the policy in this area should also be different.

## 2. LITERATURE REVIEW

The material world combines with the virtual and generates new approaches and business models. Manufacturers earn more and invest in improving the quality of products and services. The key to the success of the Ukrainian IT industry, like any other business, lies in qualified personnel, favorable conditions, proper management, and the ability to manage resources. Historically, Ukraine has always been a hub for software development, technology solutions for data analysis and processing. An important role here is played by the level of technical education, which has been developing in our country for decades. Today, we have about 16,000 technical majors each year and are ranked worldwide in the number of certified IT professionals. And leading Ukrainian universities, with the support of business, launch educational programs in the most promising areas of information technology - Data and Computer Science, Artificial Intelligence, Internet of Things.

The dependence and connection between technology, innovation, investment, and development of the IT sector have been the subject of research by many scholars. It is proved that investment is an authoritative source for innovation and the creation of a favorable innovation and investment climate, which in turn forms a favorable innovation and investment potential of the state.

The scientific views on the Industry 4.0 concept differ from the focus on particular features of the digitization of the economy. For example, McKinsey [1] defines Industry 4.0 as the digitization of the manufacturing sector with integrated sensors in virtually all components of the product and manufacturing equipment, ubiquitous cyber-physical systems, and analysis of all relevant data. It is managed by four clusters of breakthrough technologies. The first consists of data, computing power, and connectivity – one example is low-power broadband networks. Analytics and intelligence are second, while human-machine interaction is a third cluster, including, for example, touch interfaces and augmented reality. The fourth is digital-physical transformation: advanced robotics and 3D printing are two examples.

Szabolcs Nagy and Petro Pererva [2] indicate that there is a problem of monitoring innovation potential since the latter can be used to obtain reliable information about the company, and monitoring helps to develop short and long-term forecasts in IT sector. This monitoring should be based on scientific methodology, integrated economic analysis, planning, and forecasting, as well as the use of information and marketing technologies. Besides, monitoring principles should be applied to accurately and effectively determine the innovation potential of the enterprise in the IT sector. The opinion of the above scientists is significant and worthy of attention since an investor who invests in innovation must be confident in the solvency, liquidity, and sustainability of the enterprise, and a favorable investment climate of the state (in particular, Ukraine) must be created to protect the latter.

Andreea Maria Pecea, Olivera Ecaterina Oros Simonab, Florina Salisteanu [3] emphasize that investment in technology, R&D, and innovation are the main aspects that ensure the country's sustainable development. The scientists Yevdokimov Y., Chygryn O., Pimonenko T., Lyulyov O., Lyeonov S., Bilan Y., Štreimikiene D., Mentel G., Goncharova A. made the same conclusions [4]-[6]. When creating new products, it is necessary to provide an appropriate education for the workforce engaged in implementing these new products, protect foreign investors, and their free access to stock markets. Also, it is worth noting that investment in innovation ensures the development of the private and public sectors, which in turn improves the conditions for a comfortable life of the population of the state. Regression models have confirmed the positive link between economic growth and innovation.

Amnon Frenkel [7] states that there are certain factors that explain the backwardness of certain regions in certain

countries. Identification of these factors will help to develop an effective regional policy at the local level, which will be aimed at technological innovation, and, in turn, will lead to the development of effective state policy as a whole. The researcher asserts that today both the regions and the country as a whole should be interested in innovative development issues.

Frieder Meyer-Krahmer [8] notes that there are both innovative and non-innovative companies in each region, which in turn have different characteristics. Innovative companies make a significant contribution to the development of specific territories and regions [9]-[10]. Thanks to them, the state receives positive experience and significant financial revenues.

Gabriele Pellegrino and Maria Savona [11] argue that there are some obstacles to investing in innovation that can be both financial and non-financial constraints in the investment process. This study confirms that there are certain factors that can have a negative impact on the investment process. Besides, the study of the Gabriele Pellegrino and Maria Savona employs empirical analysis to identify companies that are interested in and not interested in innovation. One of the factors noted by A. Kulish, N. Andriichenko, O. Rieznik [12] is corruption in public authorities, which hinders investor activity in Ukraine. Restraining factors for the development of innovative activity include the shadow economy, the real scale of which in the state, according to A. Kulish, M. Petrusenko, O. Reznik, E. Kiselyova [13] is almost impossible.

Stephen Ropera and Nola Hewitt-Dundas [14] found that innovation is successful only if it has three types of knowledge: technological, strategic, and market knowledge. The study has two conclusions. The first conclusion assures us that the knowledge possessed by companies has a negative rather than positive effect on the activities of companies. The second conclusion notes that the knowledge that the company receives from the investment, in particular, internal and external search, is dominant over those that the company had before the introduction of innovation. Moreover, researchers note that specific problems may arise with patents that can negatively affect the activities of the company, the region, and the country.

Ilyash, O., Dzhadan, I., Ostasz, G. [15] emphasize that scientific and technological processes of other countries are most often financed in Ukraine, while Ukraine remains the raw material base for other countries of the world. The mathematical model of correlation between the income of industrial enterprises and the main indicators of innovation potential, which is important for the development of the economy of Ukraine, is proposed.

Thus, a number of analyzed works indicate that there are certain factors that affect the formation of the innovation and investment potential of the state. In addition, a positive relationship was found between economic growth and

innovation, which can remain positive if the latter contains three types of knowledge: technological, strategic and market. Hudz O.E. [16] states that the main components of innovation and investment potential of an enterprise are market, intellectual, personnel, technological, information, interface, research, financial, organizational and managerial components. The author notes that Ukrainian enterprises have a low innovative focus, as well as technical and technological backwardness. Thus, if the management of the enterprise has decided to focus on innovative activities, then it is necessary to improve the production facilities, system logistical support, to optimize the structure of the distribution network and the distribution system, which would take into account the current needs of the market. Simultaneously with these processes, the organizational structure of management at the enterprise, as well as in the state as a whole, should be improved.

Nykytiuk T.L. and Bauliy O.V. [17] argued for the need for radical reforms to improve Ukraine's innovation and investment development. The authors note that Ukraine should now enter international markets, such as the market for effective competition or innovative monopoly.

Amosha O.I. [18] asserts that today the state's innovation and investment policy should be aimed at the formation of a viable innovation and investment potential for sustainable development of Ukraine, but it should occur gradually.

### 3. RESEARCH MATERIALS AND METHODS

The data from the State Statistics Service of Ukraine for different time periods were used to study the main indicators of technology, innovation, investment and development of the IT sector. The following methods are used: the method of comparative analysis of the most common methods of financing startups; companies are in the lead by deal value; analysis of in capital investment indicators by sources of financing and types of economic activity; determination of the main indicators of innovative development of Ukraine, the cost of innovation by sources of financing, the total amount of expenditures by the areas of innovation activity of industrial enterprises; abstract-logical method for analytical generalization and formulation of conclusions.

### 3. RESULTS

The innovation and IT market develops under unfavorable conditions. A significant number of researchers [19]-[20] who note the deterioration of fixed assets and production infrastructure agree with this statement. At the present stage of development of the Ukrainian economy, there are certain restrictions on the implementation of innovative technologies at the level of the state, region, and enterprise.

This process is conditioned by the underfunding of innovation by the state, as well as high interest rates on loans. There are risks related to long-term investing in the Ukrainian economy

and development of the IT sector in particular, high interest rates on loans and lack of funds at banks that impede investment lending in the country. To solve the above problems, it is now necessary to raise funds from outside that will be directed to the implementation and development of innovative projects.

Ukraine does not have a mechanism for investing in innovation and IT sector i.e. the issue remains unresolved. The state has some innovation and investment potential, but the state of production in the country reduces the ability to produce innovative products that would, in turn, correspond to European quality standards.

Today, innovation on development of the IT sector plays an important role in the development of the state's economy, namely the transition from the traditional to the market economy, i.e. to sustainable development. The role of innovation in the IT sector is indisputable, as it creates additional goods and services with greater added value in the country. If the government is focused on growing the economy, in particular based on innovation in the IT sector, the latter, in turn, will cause less pressure on the environment, while using resource-saving technologies and taking into account the scarcity of resources. It should be noted that if domestic investors invest in innovative technologies and development of the IT sector, it will lead to attracting additional sources of value and will also lead to economic growth of Ukraine. First, each investor (both external and internal) must be convinced of the interest of the state, the region, and the enterprise in attracting additional funds for innovations. To do this, it is necessary to analyze the current state of the Ukrainian economy to identify the strengths and weaknesses that impede the development of the IT sector in Ukraine. It is worth assessing the current situation in Ukraine, is determining its innovation and investment potential in the IT sector.

#### 4. EXPERIMENTAL

According to the World Economic Forum in the Global Competitiveness Report 2017-2018, Ukraine ranked 81st among 137 countries surveyed, rising to four positions. So, in terms of technology and innovation, Ukraine came in 74th place, earning 3.5 points through the development of the IT sector. Thus, according to research by WEF experts, only 52% of the population of our country uses the Internet, and only 1.4% of the population has access to 4G mobile communication.

According to the components of the indicator that characterizes the efficiency of markets – a key factor in the investment growth (industrialization) – Ukraine ranks 101st in the efficiency of commodity markets among 137 countries, 120 – in the efficiency of financial markets and 86 – in the efficiency of the labor market. Based on the readiness for adaptation of technology and innovation, it is ranked 81st,

including through the development of the IT sector. At the same time, our country ranks 118th in terms of Market Institutions and the 90th in terms of business development. Among the factors that are important for the development of industry, favorable ones are the size of the open market (Ukraine ranks 47th in terms of market capacity) and education (our country ranks 35th) [21].

However, now on the global stage, Ukraine remains a minor player with huge potential. The significant share of the global IT market is in the United States (36.8%), followed by China (11.3%) and the United Kingdom (5.8%). As stated in the Top Lead directory, in terms of market volume, we are competing with Romania and Poland, significantly behind India and China. Putting yourself in the position of an American, Ukraine will still be an attractive point of IT business development among developing countries. First, the labor markets in Poland and Romania are already substantially “overheated” (if a team of 10 people is needed, you can go there, but there will be problems at the level of 50-100 people). Secondly, taxation is very beneficial in Ukraine. Third, competence and cultural affinity place Ukrainian developers far above Indian. Capital investment by sources of financing is presented in (Table 1).

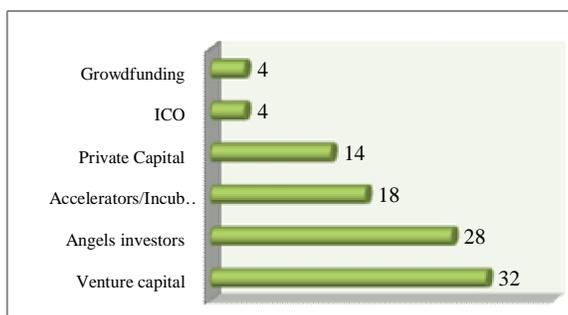
**Table 1:** Capital investment by sources of financing for 2014-2018<sup>1</sup> (million UAH) [24]

| Year                                       | 2014             | 2015             | 2016             | 2017             | 2018             |
|--|------------------|------------------|------------------|------------------|------------------|
| Sources of financing                       |                  |                  |                  |                  |                  |
| <b>Total</b>                               | <b>219,419.9</b> | <b>273,116.4</b> | <b>359,216.1</b> | <b>448,461.5</b> | <b>578,726.4</b> |
| including from                             |                  |                  |                  |                  |                  |
| state budget                               | 2,738.7          | 6,919.5          | 9,264.1          | 15,295.2         | 22,814.1         |
| local budgets                              | 5,918.2          | 14,260.0         | 26,817.1         | 41,565.5         | 50,355.5         |
| own funds of enterprises and organizations | 154,629.5        | 184,351.3        | 248,769.4        | 310,061.7        | 409,585.5        |
| bank loans and other loans                 | 21,739.3         | 20,740.1         | 27,106.0         | 29,588.9         | 44,825.4         |
| foreign investors                          | 5,639.8          | 8,185.4          | 9,831.4          | 6,206.4          | 1,795.5          |
| household funds for housing                | 22,064.2         | 31,985.4         | 29,932.6         | 32,802.5         | 34,645.7         |
| other sources of financing                 | 6,690.2          | 6,674.7          | 7,495.5          | 12,941.3         | 14,704.7         |

The research results coincide with the findings of some studies that determined that capital investment by the source of financing is variable, but there is a tendency to decrease in this indicator (in some studies [22]), an increase in this indicator indicates the country's economic growth. If this

indicator continues to decrease, it will lead to a decrease in the financing of important sectors of the economy including the IT sector this opinion is also shared by researchers [23] who state that a decrease in foreign capital inflows will decrease the capitalization of the domestic stock market, which in turn will lead to an “investment hunger” in the financial and credit institutions that will reduce lending to the real economy. Considering the main components, the state budget funds increased by 149.16% compared to the previous period, local budget funds increased by 121.15%, own funds of enterprises and organizations increased by 132.10%, loans from banks and other loans tended to increase by 151.49% compared to the same period last year, household funds for housing construction increased by 105.62%, other sources of financing increased by 113.63%. Therefore, compared to the previous period, namely in 2017, these figures increased by an average of 128.86%.

Obviously, the IT industry in Ukraine is one of the most attractive for investors. The question is when choosing a strategy because each time there is a different order of action. It is now a global trend for business ecosystems when consumers, suppliers and competitors are partners in the business model. And those who have learned how to manage collaboration will reap the most significant benefits with minimal financial investment. Today, a significant amount of investment is directed to startups. The peculiarity of the startup is that its investment attractiveness is determined by the experienced investor at the very beginning of the project development. Potential startup investors can use several ways to make their investments. A joint venture with mutual funds and other investment funds specializing in investments in similar projects is considered as a familiar way. Another common way is to participate in “pools”, members of which invest only for one purpose - buy out promising startups. It is believed that collective responsibility significantly mitigates potential risks and balances potential profits. Consider the most common methods of financing startups in 2019 (Fig. 1)

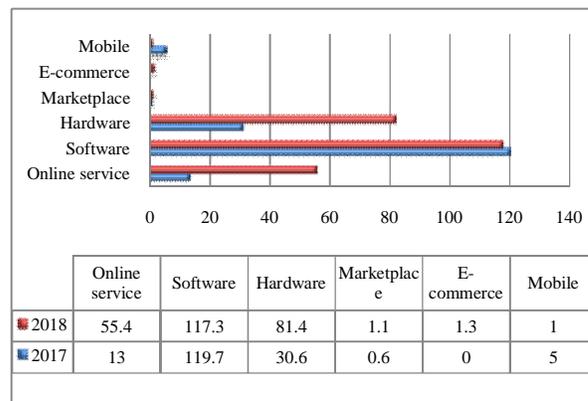


**Figure 1:** The most common methods of financing startups in the IT sector in 2019 (%) (built using data [25])

The analyzed data show the most common method of financing stratagem is venture capital -32%, angels

investors-28%, accelerators/incubators-18%, private capital-14%, ico-4%, growdfunding-4%.

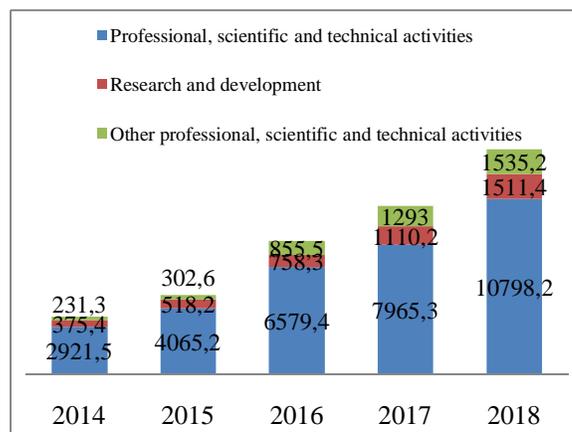
Consider companies that are leading the IT sector in the value of transactions (Fig. 2)



**Figure 2:** IT companies are in the lead by deal value for 2017-2018 (million \$)(built using data [26])

The analyzed data show Software (117,3 million \$) and Hardware (81,4 million \$) companies are in the lead by deal value in 2018. Online service companies in 2018 concluded deals at a higher cost than in 2017; the difference is \$ 42.4 million. The marketplace in 2018 concluded \$ 0.5 million. More than in 2017, amounting to \$ 1 million. E-commerce deals in 2018 worth \$ 1.3 million more than in 2017. Mobile has improved its 2018 transaction value by \$ 4 million. compared to the same period in 2017.

Since it is necessary to analyze the size of investment in the innovation component, we propose to consider a capital investment by types of economic activity for 2014-2018 (Fig. 3).



**Figure 3:** Capital investment by type of economic activity for 2014-2018 (million UAH) (innovative component) (built using data [27])

The analyzed data show that capital investment in professional, scientific and technical activities in 2014-2018

have an upward trend – in 2015 they increased by UAH 1,143.7 million or 139.15% compared to 2014, in 2016 by UAH 2514.2 million or 161.85% compared to the same period of 2015, in 2017 increased by UAH 1385.9 million or 121.06% compared to 2016, and in 2018 increased by UAH 2832.9 million or 135.57% compared to the same period in 2017.

Investment in research and development over the analyzed period is not an exception, as they also increased in 2015, having increased by UAH 142.80 million or 138.04% compared to 2014, in 2016 by UAH 240.10 million or 146.33% compared to the same period of 2015, in 2017 increased by UAH 351.9 million or 146.41% compared to 2016, and in 2018 also increased by UAH 401.20 million or 136.14% compared to the same period in 2017.

In turn, investment in other professional, scientific and technical activities increased during 2014-2018: in 2015 they increased by UAH 71.3 million or 130.83% compared to 2014, in 2016 by UAH 552.9 million or 282.72% compared to the same period of 2015, in 2017 increased by UAH 437.50 million or 151.14% compared to 2016, and in 2018 also increased by UAH 242.20 million or 118.73% compared to the same period of 2017. Thus, during the analyzed period a considerable part of investment went to professional, scientific and technical activities.

**Table 2:** Main indicators of innovative development of Ukraine for 2014-2018 [28]

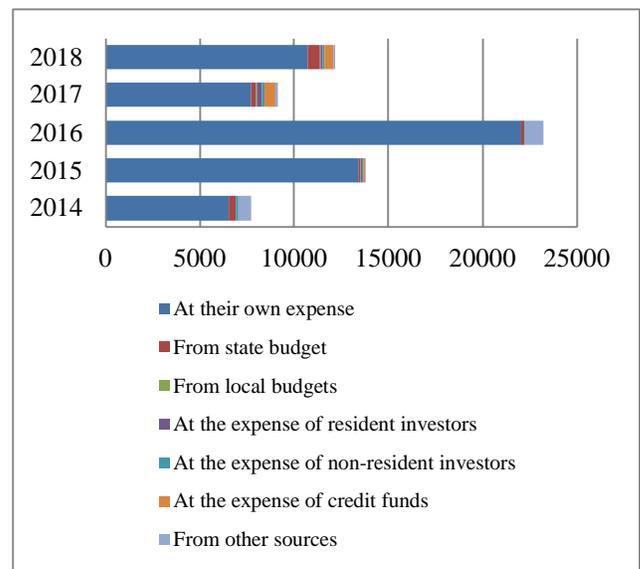
Today, the basis of Ukraine’s competitiveness in the innovation field is human capital, as well as the knowledge

| Indicators   | 2014    | 2015     | 2016     | 2017     | 2018     |
|--|---------|----------|----------|----------|----------|
| Number of organizations that carried out R&D, units  | 999     | 978      | 972      | 963      | 950      |
| Number of employees engaged in R&D, persons  | 136,123 | 122,504  | 97,912   | 94,274   | 88,128   |
| Internal expenses for the implementation of the R&D, million UAH                               | 9,487.5 | 11,003.6 | 11,530.7 | 13,379.3 | 16,773.7 |
| Costs of innovation in the areas of innovation activity of industrial enterprises, million UAH | 7,695.9 | 13,813.7 | 23,229.5 | 9,117.5  | 12,180.1 |
| Number of new technological processes implemented at enterprises, units                        | 1,743   | 1,217    | 3,489    | 1,831    | 2,002    |
| Number of innovative products (goods, services) introduced into production, units              | 3,661   | 3,136    | 4,139    | 2,387    | 3,843    |

and results of research. Their effective implementation is the main competitive advantage (Table 2).

The analysis shows that the number of organizations carrying out R&D in Ukraine tended to decrease and amounted to 950 units in 2018, which is 49 units less than in 2014. This has led to a reduction in the number of employees engaged in the R&D in 2018 by 47,995 compared to the same period of 2014. At the same time, internal R&D expenditures increased as the number of persons involved in R&D decreased and the number of organizations engaged in R&D amounted to UAH 16773.7 million in 2018, which is by UAH 7286.20 million more than in 2014.

Innovation expenditures had variable dynamics, with the largest amount being spent in 2016, which amounted to UAH 15533.60 million more than in 2014 and by UAH 11049.40 million more compared to the same period in 2018. The number of innovative products introduced in production in 2018 is 3,843 units, which is by 182 units more than in 2014, and by 1,841 units more than the number of new technological processes implemented at enterprises. This demonstrates the interest of Ukrainian enterprises in the development and implementation of innovative technologies and products in their activities. It would be advisable to consider in more detail the cost of innovation by financing sources (Figure 4).



**Figure 4:** Costs of innovation by the source of funding for 2014-2018 (built using data [29])

The analysis shows that the most funding for innovation comes from own funds, i.e., from enterprises and organizations. This indicator has a variable upward trend, i.e. in 2018, it amounted to UAH 10742,00 million, which is by UAH 2,685.00 million less than in 2015, but by UAH 3037.90 million more than in the same period in 2017. In

addition, in 2018, about UAH 639.1 million was spent on innovation from the state budget, which is the highest indicator within the analyzed period.

During the analyzed period, the largest financing of the innovation sphere was at the expense of local budgets. In 2017, this indicator amounted to UAH 95.60 million. It is worth noting that in 2017, expenditures for innovation were as follows: UAH 273.1 million at the expense of resident investors; UAH 107.80 million funds of non-resident investors; UAH 594.40 million from credit facilities and UAH 115.20 million from other sources of financing. This trend is explained by the introduction of decentralization processes in Ukraine, as local governments are interested in the development of their regions, and the management of enterprises, institutions and organizations seek to innovate thereby increasing their profits. According to the analysis, in 2014 and 2016 there are no such items of expenditure on innovation as local budget funds; funds of resident investors; credit funds. This is explained by the fact that the processes of decentralization were unregulated. The study of the total volume of costs by areas of innovation activity of industrial enterprises is important when considering the formation of innovation and investment potential of Ukraine (Table 3).

**Table 3:** Total amount of expenditures by industrial activity innovation and IT trends for 2014-2018 (million UAH) [30-31]

| Indicators                                    | 2014    | 2015     | 2016     | 2017    | 2018     |
|---|---------|----------|----------|---------|----------|
| Costs of innovation                           | 7,695.9 | 13,813.7 | 23,229.5 | 9,117.5 | 12,180.1 |
| <i>including by areas</i>                     |         |          |          |         |          |
| Research and development                      | 1,754.6 | 2,039.5  | 2,457.8  | 2,169.8 | 3,208.8  |
| including internal R&D                        | 1,221.5 | 1,834.1  | 2,063.8  | 1,941.3 | 2,706.2  |
| external R&D                                  | 533.1   | 205.4    | 394.0    | 228.5   | 502.6    |
| Acquisition of other external knowledge       | 47.2    | 84.9     | 64.2     | 21.8    | 46.1     |
| Purchase of machinery, equipment and software | 5,115.3 | 11,141.3 | 19,829.0 | 5,898.8 | 8,291.3  |
| Other expenditures                            | 778.8   | 548.0    | 878.4    | 1,027.1 | 633.9    |

According to the research, the highest share in the cost of innovation is the purchase of machinery, equipment, and software. This indicator has a variable tendency since its growth can be traced during 2014-2016. In 2017, it decreased further and amounted to UAH 5,898.80 million, and in 2018 it increased again to UAH 8291.30 million. Among the R&D

expenditures, the internal R&D index significantly exceeded the external R&D expenditures and amounted to UAH 2706.20 million in 2018. The cost of acquiring other knowledge is unstable, these figures are rising, falling, and reached UAH 46.10 million in 2018. Other expenses in 2018 decreased by UAH 393.20 million as compared to 2017. All these processes, which are currently taking place in Ukraine, have a negative impact on the economy of the state. Thus, there is a link between economic growth, innovation, and investment, but it is mainly negative in our case.

## 5. DISCUSSION

The role of the information technology market is growing day by day, so exploring this industry economy and tracking the dynamics of its development an urgent question. Exploring the Innermany researchers in the IT market in Ukraine are receiving far less attention compared to the marketexport of ICT. At the same time, the volume of the IT internal market is an important economic indicator thatshows how much information technology has been developed in the country relative to other countries. Ukraine is one of the leaders in the number and quality of developers in Central and Eastern Europe and occupies a leading position positions in the world in the number of certified IT specialists.

Today, in addition to the creative potential of the people who create artificial intelligence, introduce new technologies, create innovative products, the issue of capital investment remains essential for the sustainable development of Industry 4.0. The latter is a fundamental condition for the development of a young project and an exciting idea. In order to achieve success, it is necessary to interact with investors who will be interested in investing funds for the project.

The peculiarity of the startup is that its investment attractiveness is determined by the experienced investor at the very beginning of the project development. Startups exist in each of the sectors of the economy, which is a favorable factor for potential investors. By investing in startups already at this stage, the likelihood of getting a return will be much higher, and the timing of its receipt will be much shorter.

Currently, in Ukraine, the major part of innovation is an investment, in particular in intellectual capital, according to which there is no clear legislation. A significant problem is the lack of resources in this area, which requires resource investment, which is a derivative of the previous problem and entails an inability to withstand foreign capital competition. Investing always requires significant expenditures, so the problem of financial security for domestic companies is most important. The main source of compensation is the budget. Developed countries of the world are trying to avoid budget financing for innovative investments, including IT products because in the event of a failure, it will not affect the internal financial stability of the enterprise. The main problems for attracting investment in innovation and the development of

the IT sector are also: institutions, the state of development of clusters, “environmental sustainability”, protection of intellectual property rights, development of broadband Internet, innovation environment. Given the above problems, in order to build an effective innovation model in the IT sector in Ukraine, it is necessary to attract more foreign investments, especially in the regional economy, to clearly set innovation priorities, to develop strategic plans to improve the investment attractiveness of each sector, different companies, and organizations, create a controlled public policy in the field of innovation investment and IT, create financial instruments to support innovation other businesses, to update the regulatory framework in the country, and to develop and implement measures to stimulate innovation in the country as a whole, particularly in the IT sector, which will lead to its economic growth.

## 6. CONCLUSION

As Industry 4.0 is part of the Fourth Industrial Revolution, it is well known that the latter only ends successfully if it is: a) well organized and b) generously funded. This should be taken care of by those to whom the revolution can bring the greatest dividends. The main advantages in the transition to a new technological way will be those enterprises, corporations and even states that, before others, introduce not the individual components listed above (and related), but, to a large extent, all of them. Insufficient funding for technology, innovation and development of the IT sector causes a negative impact on Ukraine’s economic growth. Foreign and domestic investors are interested in investing in our country, but they are faced with a number of threats and risks that slow down the decision to invest in our territories or counterbalance the desire to invest. The main problems in Ukraine include imperfect legal framework, mistrust in the judicial system, monopolization of markets, high-interest rates on loans, instability of national currency, and high level of corruption. However, the military conflict with Russia remains the main obstacle to investment in innovation. The research conducted shows that our country has innovation and investment potential, in particular, new innovative technologies are being introduced at enterprises and new innovative products are being developed, and funds are being invested in the purchase of new machines, equipment, and software.

It should be noted that the industry contributes 4.0 emergence of new technologies, in particular, such as artificial lekt interests-and robotics, the Internet of things virtual and augmented reality, additive technology, accounting blockchain, and technology, biotechnology, etc. Today, the leading countries of the world are on the path of introducing new technologies: Germany, the USA, South Korea, China, Japan, Sweden, and others, that is, they are already on their way to Industry 4.0. Ukraine is far behind and needs to

improve both its current structure of production and capacity development.

The IT sector continues to be one of the most dynamic segments of Ukraine's economy. It is a source of foreign exchange earnings for countries and an alternative to emigration for the educated, able-bodied people between the ages of 22 and 33 and thus forms the middle class in terms of income in Ukraine.

Today it is not enough to pay attention to improving the institutional and infrastructural support of innovative activities. An effective mechanism should be developed to introduce innovation and IT development in the economy of Ukraine. For example, this could be the creation and settlement of the latter in the field of public-private partnership, as well as improving the legislative framework. It is worth developing and implementing an investment policy in the country, which would be aimed at improving Ukraine's image in the international rankings and in the global economic arena, and also aimed at developing the IT sector of Ukraine. The field of IT services (especially IT outsourcing) will remain the main driver of positive change in the next 5-6 years. There is great potential here to create your own smart products based on the developments of Ukrainian companies. Significant IT contributions can also be made in the development of government projects such as, say, e-government

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This research will be relevant for scientists whose sphere of interest is the formation and research of technology, development of the IT sector, innovation and investment potential of Ukraine. Moreover, this research can be used to develop a regulatory framework in the future, practical measures and tools that, in turn, will be aimed at developing a strategy for the development of the Ukrainian economy through the formation of its information economy.

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