



INNOVATIVE DEVELOPMENT OF ENTERPRISES

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ABSTRACT

The strategy of successful development of the national economic systems in recent years is closely linked to the leadership in research and development, the emergence of new knowledge, the development of high-tech production and the creation of numerous innovative products.

The development of innovative potential is not only a way of dynamic growth and success but also a means of ensuring the security and sovereignty of a country, its competitiveness in the modern world.

Key words: Innovation, Investments, IT sector, Research & Development

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1. INTRODUCTION

In 2020, the IT industry in Ukraine is waiting for the continuation of the upward development trend. The likely growth for the current year will be 15-20%. The trends in 2020 will be within the existing directions - cloud services, artificial intelligence, machine learning, cyber security. An important promising trend is state projects in the field of digitalization. And it touched already in 2021, which can not only revive the IT industry but increase the level of computer literacy of the population and the prevalence of technology as such.

Strategic goal for the formation of a highly developed knowledge-based and innovation-based socially-oriented economy in Ukraine, envisaged by the Ukraine 2020 Sustainable Development Strategy, approved by Presidential Decree No. 5 on 2015/01/12, by the implementation plans of the Association Agreement with the EU and by Ukraine's commitment to achieve the National Sustainable Development Goals by 2030.

2. LITERATURE REVIEW

Ukraine Investment and Trade Facilitation Center conducted Economic research of the regions of Ukraine. The research is implemented in order to understand what capacities in the machinery sector, creative industry sector, IT and innovation sector are available in terms of small and medium enterprises. According to the study IT and innovation are the most attractive areas of investment in the Ukrainian market.

The source of statistical information for analysis is data of the State Statistics Service of Ukraine. Regarding the determination of Ukraine's place in the global rankings, the introduction of innovations was used 2020 Bloomberg Innovation Index and Global Innovation Index 2019.

Information about support innovation projects and help Ukrainian entrepreneurs create successful companies at scale is provided by the Ukrainian Startup Fund. USF provides pre-seed and seed funding for Ukrainian startups. It funds the most promising and innovative ideas of tech startups that also demonstrate high probability for global commercial success.

The DealBook is our annual overview of the Ukrainian tech investment industry. The annual survey prepared by A Ventures Capital, there is information on investments in the IT sector, and agreements signed annually by Ukrainian companies. This allows us to analyze the current market situation in the IT sector.

3. RESULTS

Ukraine's competitive position is non-equilibrium, as reflected in several world rankings.

According to the 2020 Innovation Index presented by Bloomberg, Ukraine ranks 56rd out of 60 countries surveyed (Table 1). At the same time, the country turned out to be the worst in labour productivity (57th place), which testifies to the low level of applied technologies and production of goods with low added value and got to three outsiders in technological possibilities (57th place). At the same time, it holds the 48th place in higher education efficiency and 36th in patent activity, meaning it has the potential for development.

Table 1 Bloomberg 2020 Innovation Index [1]

2020 Rank	2019 Rank	YoY Change	Economy	Total Score	R&D Intensity	Manufacturing Value-added	Productivity	High-tech Density	Tertiary Efficiency	Researcher Concentration	Patent Activity
1	2	+1	Germany	88.21	8	4	18	3	26	11	3
2	1	-1	S.Korea	88.16	2	3	29	4	16	5	11
3	6	+3	Singapore	87.01	12	2	4	17	1	13	5
4	4	0	Switzerland	85.67	3	6	14	10	17	3	19
5	7	+2	Sweden	85.50	4	16	19	7	13	7	18
...	...										
56	53	-3	Ukraine	48.24	57	57	57	35	48	49	36
...	...										
58	NR	-	Egypt	46.29	47	38	58	46	60	51	52
59	NR	-	Kazakhstan	46.10	60	41	52	53	8	56	44
60	NR	-	Macao	46.09	59	60	2	54	34	34	57

Human resources and Employment impacts are the most substantial innovation dimensions. Ukraine scores high on Employment in knowledge-intensive activities, New doctorate graduates and Non-R&D innovation expenditures. Linkages, Innovation-friendly environment, and Finance and support are the weakest innovation dimensions. Low-scoring indicators include SMEs with product or process innovations, SMEs with marketing or organizational innovations, and R&D expenditure in the public sector.

In the final Global Innovation Index 2019 (Ukraine), Ukraine ranked 47th out of 129 countries of the world (Figure 1).

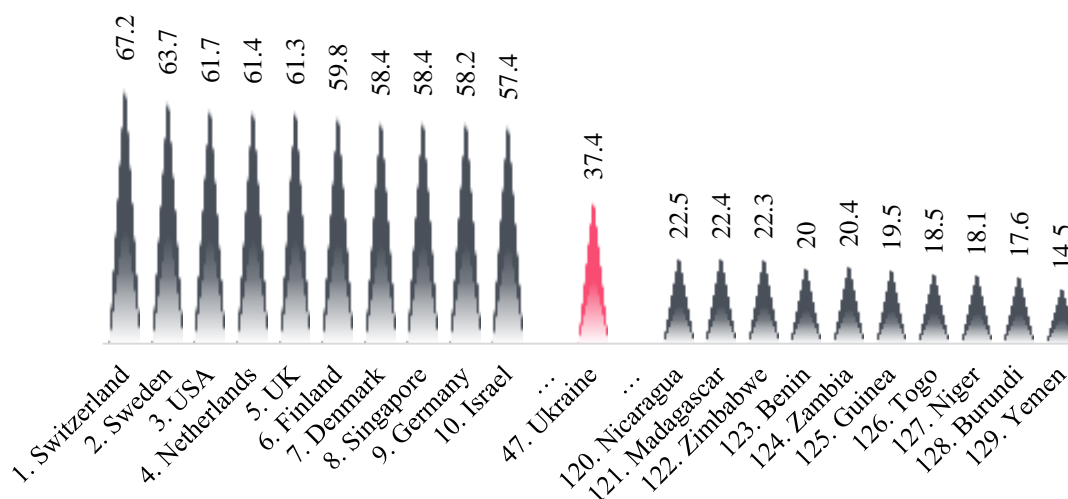


Figure 1 Global Innovation Index 2019, points [3]

The average for 2019 was 37.4 points. The highest value was in Switzerland: 67.2 points and the lowest value was in Yemen: 14.5 points.

Since 2011, innovation spending has shown a tendency to reduce the level of investment in this type of activity (Figure 2).

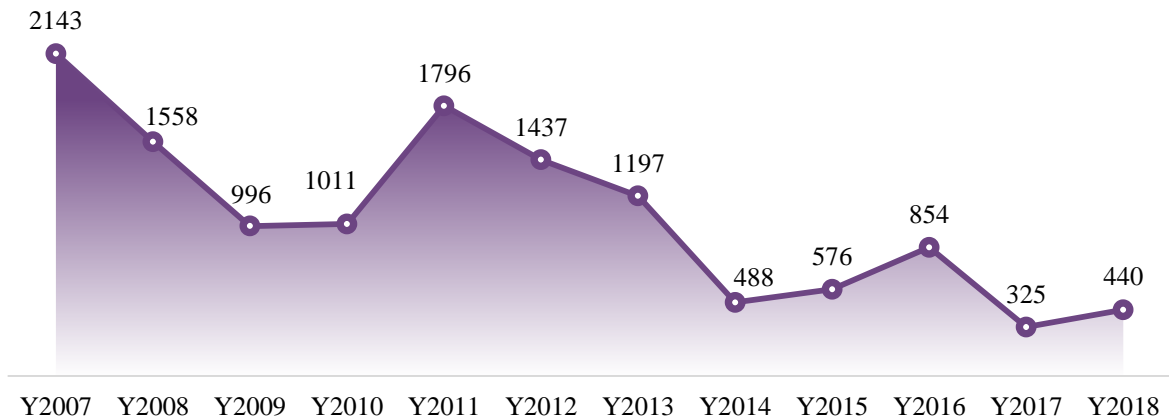


Figure 2 Total cost for innovation for industrial enterprises in Ukraine, \$ mln [5]

A sharp drop in the value for 2014vs2013 is due to an increase in the hryvnia exchange rate (from 7.99 UAH per USD in Y2013 to 15.76 UAH per USD in Y2014).

At the same time, the cost structure reflects the following trends (Figure 3):

- the largest share of costs during 2007-2018 is the purchase of equipment and software;
- since 2017, a significant increase in the share of internal scientific research has been evident.

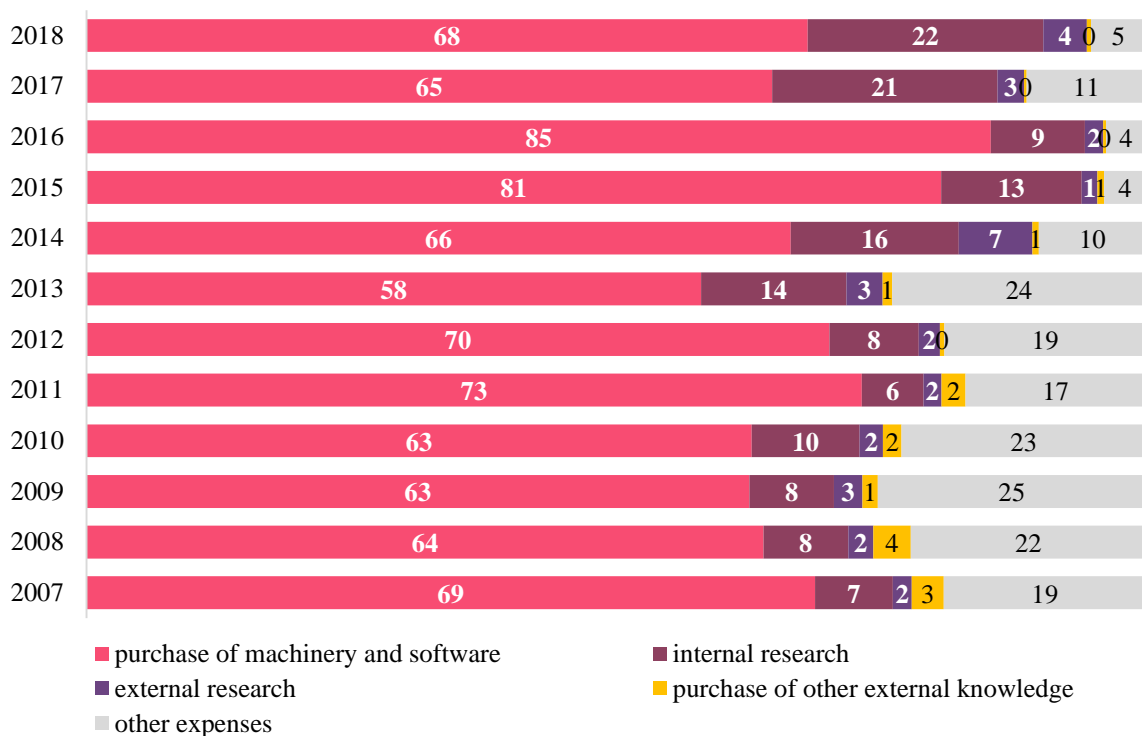


Figure 3 The cost structure for innovation activity of Ukraine, % [5]

This means that Ukraine continues to buy finished products mainly, but seeks to develop its innovations. The cost structure is as follows [6]:

- purchase of machinery and software (about 70%) is the acquisition of progressive (new technological basis) machinery, equipment and other means of production and equipment, taking into account the integrated software needed to implement new or improved technological processes, machinery and equipment, which do not improve production capacity but are required for new products (e.g. additional moulding and packaging machines), whether purchased separately or as a dock tomers commercial secrets;

- research and development costs (about 10%) are actual research and development costs (at cost) in the reporting period, regardless of the source of funding, including both current and capital expenditures (excluding the amount of depreciation and amortization charges, complete restoration of fixed assets). Expenditure on the execution of works (services) not related to research and development, as well as paid services to the population, are not included in the specified amount of expenses.

- purchase of other external knowledge (3%) is the acquisition of new technologies that are used to implement technological innovations, given the acquisition by the company: exclusive property rights to inventions, utility models, industrial designs, licenses, licensing agreements for the use of these objects; trade secrets (formulas, calculations, plans, drawings, non-patented inventions, etc.; instructions, description, requirements, data, methods and techniques); projects; technologies in disassembled form; trademarks (trademarks acquired in connection with an enterprise innovation); another engineering, consulting services (excluding research and development) purchased from third-party organizations, individuals, etc. (eliminating products, samples, machines, apparatus, components or spare parts, tools, etc. acquired with documents).

- other costs (about 20%) are preparation of production for the introduction of innovations: production designing, different types of works on preparation of production for the launch of new products, the introduction of new methods of their creation. Production design work related to technological equipment, production organization and initial stage of production. These may include the design of an industrial object (sample), other design work aimed at specific production processes and methods, technical specifications, operational features (properties) necessary for the production of technologically new products and the implementation of new processes. These works are not part of the R&D and are usually in the initial stages of a project to create new products or processes.

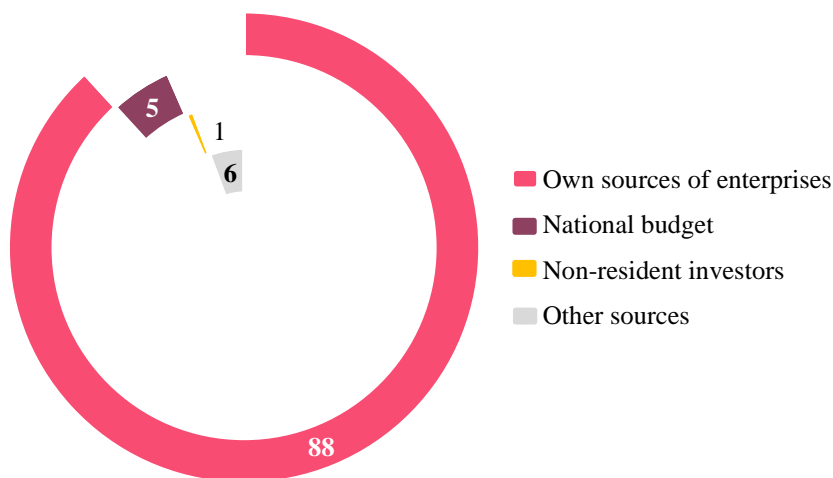


Figure 4 Sources of financing for innovative activity of industrial enterprises, % [5]

At the same time, the share of active, innovative enterprises in the total number of industrial enterprises is 16,9% in 2018 and approximately stable throughout 2007-2018.

The share of innovative enterprises (innovators) in the total number of industrial enterprises - changed from 11.5% in 2007 to 15.6% in 2018. The share of realized innovative products (goods, services) in the total sales of goods (goods, services) of industrial enterprises changed from 6.7% in 2007 to 0.8% in 2018.

By type of economic activity, the most significant funds for innovation activity were spent by enterprises for the production of machinery and equipment, for the production of other vehicles and for food production enterprises.

950 organizations performed research and development (from now on - R&D) during 2018 in Ukraine. 48.1% of which belonged to the public sector of the economy, 37.0% - entrepreneurship, 14.9% - higher education (Figure 5). At the end of 2018, enterprises and organizations engaged in research and development were 88.1 thsd. persons (including part-time and civil servants), of which 65.4% were researchers, 9.7% are technicians, 24.9% are support staff (Figure 6).

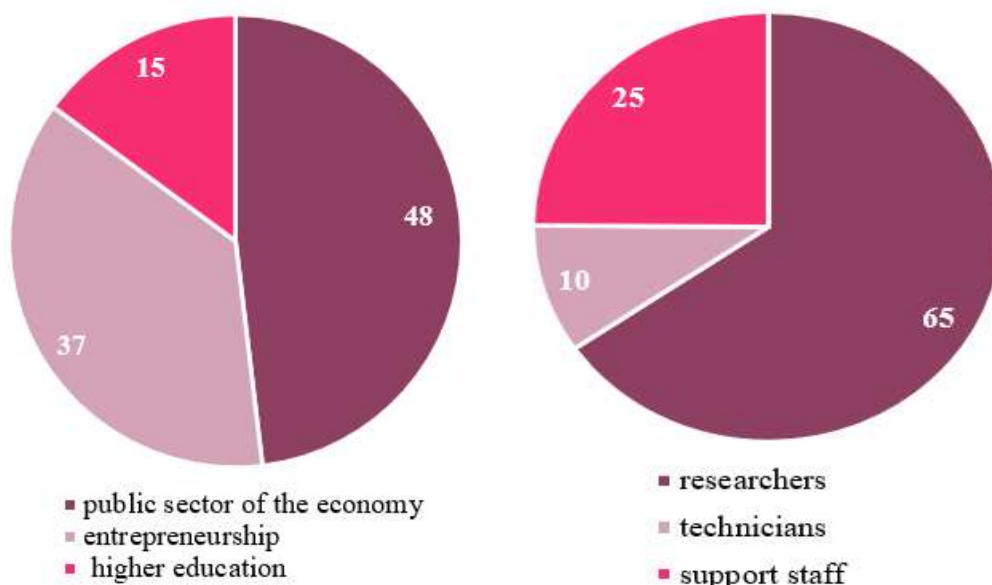


Figure 5 R&D share by type of activity, % [5] **Figure 6** R&D share by performers, % [5]

In 2018, the share of R&D performers (researchers, technicians and support staff) in the total employed population was 0.54%, including researchers - 0.35%. According to Eurostat data, in 2017, the highest share among EU Member States was in Sweden (3.33%), Austria (3.16%), Denmark (3.06%) and Germany (3.02%); the lowest – in Romania (0.5%), Latvia (0.51%), Malta (0.55%), Cyprus (0.56%), Bulgaria (0.75%), Croatia (0.86%), Lithuania and Slovakia (both 0.88%) [6].

The share of doctors of sciences and doctors of philosophy (Candidates of Sciences) among the R&D performers was 29,3% and among researchers - 44,7%.

More than half of the total number of PhDs who have carried out R&D work in public sector organizations, 35% in higher education, 5% in the business sector.

In 2018, 44.7% of the researchers were women, of whom 41.3% had a PhD. The share of women researchers in the social sciences (65.8%), medical (65.2%) and humanities (60.3%) was higher than the average and lower in the technical sciences (34.1%).

In 2018, the total expenditures for the implementation of R&D by the organizations' resources amounted to \$606 mln, including labour costs - \$309 mln, other current expenses -

\$269 mln, capital expenditures - \$28 mln, of which expenses for the purchase of equipment - \$21 mln.

The most substantial amount of funds for research and development comes from the budget (37.1%), from domestic customers (30.5%) and foreign sources (21.7%) (Figure 7).

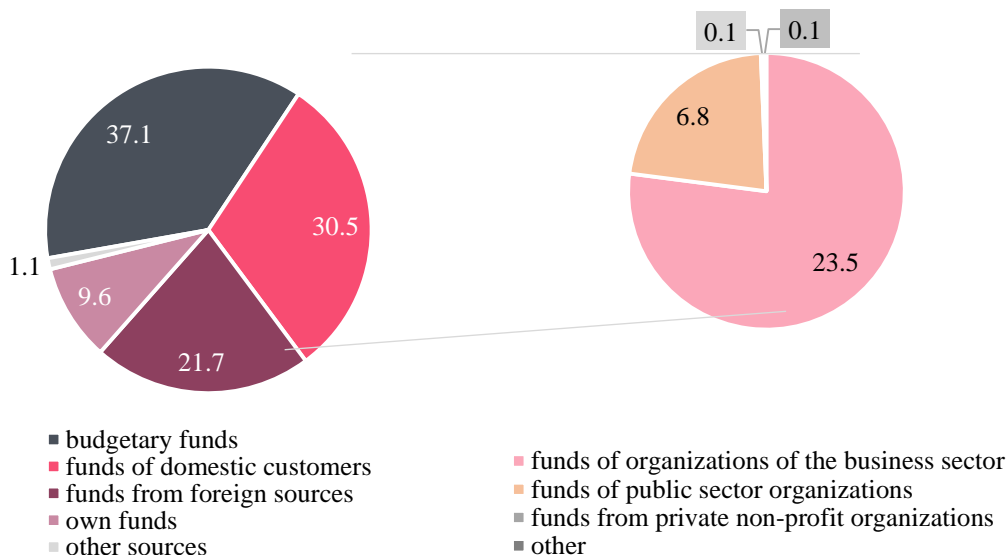


Figure 7 Allocation of total R&D expenditures by funding sources, % [5]

In 2018, 22.4% of total expenditures were spent on basic research, which was 91.9% funded by the budget. The share of expenditures for the implementation of applied research was 21.3%, which was 58.1% financed from the budget and 23.6% - at the expense of business organizations. 56.3% of the total expenditures were earmarked for the implementation of scientific and technical (experimental) developments, which were 36.1% financed by foreign firms, 32.1% by organizations of the business sector and by 12.5% at their own expense. Almost half of the expenditures on basic scientific research were in the field of natural sciences, 24.8% - technical, 8.7% - agricultural. 37.8% of spending in the area of technical sciences, 23.2% - natural sciences, 12.9% - medical and agricultural expenditures are directed to the implementation of applied scientific research. Most (88.9%) of the costs of scientific and technical (experimental) development are in the field of technical sciences.

According to the Startup Ranking service, Ukraine is in 43rd place (250 startups), ahead of Estonia, as well as Lithuania, Latvia, Slovenia, Slovakia and even some new industrial countries. The first place in the ranking is occupied by the USA (46951 startups), the second - India (6633), the third - Great Britain (4996), Brazil closes the top ten (1079 startups) [6].

The rating of hardware startups includes 35 Ukrainian companies that already have a finished product or its prototype. Among the developments that won first places: RAWR - a smart collar for dogs; SolarGaps - smart blinds; Cardiomo - a miniature cardiograph; Heartin Fit - T-shirt with ECG monitor; CLAP - smart home system; EMwatch - smartwatch to deal with stress; Senstone - a pendant for translating voice memos into the text; UBreez - a smart air quality meter; Kray Technologies - drones for the agricultural sector; Profeed - a system for managing the process of feeding animals [6].

Table 2 shows the most significant investments in Ukrainian startups 2019.

Table 2 Most substantial investments in Ukrainian startups 2019 [6]

Startup	Attracted investment 2019	Essence of a startup
Gitlab	\$268 mln	A platform for collaboration between developers and maintenance professionals. Now the company has about 100 thsd corporate clients around the world, including Ask Media Group, Charter Communication, Goldman Sachs, Delta Air Lines, Ticketmaster, Nvidia and others.
Grammarly	\$90 mln	An online service that checks grammar and spelling in English.
People.ai	\$60 mln	The platform for the sales department based on artificial intelligence, about 50 large companies are in the startup's clients.
Very Good Security	\$35 mln	SaaS-solution that allows corporate clients not to store sensitive data on their servers, but to transfer control over them to VGS.
Ajax Systems	\$10 mln	Ukrainian manufacturer of professional security systems
MyCredit	\$3 mln	A fast online lending service with a client base of more than 500,000 customers.
PromoRepublic	€2 mln	The company helps small, medium-sized businesses and marketers create content for social networks.
Dorian	\$2 mln	Dorian is working on an interactive storytelling application where viewers can influence story development.
Allright.io	\$1,5 mln	An online school for learning English for children from 4 to 12 years old.
RetargetApp	\$1,5 mln	RetargetApp is developing a solution that automates advertising campaigns. The client only needs to clarify the purpose of the campaign and its budget: RetargetApp will analyze statistics, find the best options, create campaigns and then optimize them.
AxDraft	\$1,1+ mln	Develops products for entrepreneurs and companies in the field of jurisprudence.
SolarGaps	€1 mln	Produces smart shutters that generate solar energy.
Liki24.com	\$1 mln	Ukrainian platform for the search and delivery of medicines

According to the DealBook of Ukraine, 2019 [2] edition (annual review of the Ukrainian technology investment industry), in 2018 the Ukrainian technological sector attracted \$ 323 mln in venture capital investments, which is four times more than in 2016, and by 22% - than in 2017. Total for 2013–2018 \$ 1 bln was invested in Ukrainian technology companies, making Ukraine one of the most investment-attractive countries in Central and Eastern Europe.

Since 2019 Ukrainian startups have become more actively supported by the state and entrepreneurs. Listed below are some programs:

1. Since January 1, 2019, for the first time in the history of Ukraine's independence, the Fund of the Ministry of Economic Development for the Inventions Support has been

operating. It selects startups at the pre-seed and seed stages on a competitive basis, and provides two-stage financial support [6]:

Stage 1: Provision of services for a startup up to UAH 500K (\$19 thsd.): development of presentation materials, development of a business model, industrial design testing, preparation of a patent application and consulting services;

Stage 2: Attraction up to UAH 2 mln (\$77 thsd.) investment.

2. UNSF gives grants to Ukrainian startups in the amount of \$ 25 – 75 thsd. The Ukrainian Startup Fund provides funding to companies in the early stages of their development (pre-seed and seed). The Foundation funds promising and innovative ideas for technology startups that demonstrate the high potential of global commercial success. The fund does not receive a share in the company, and there is no need to return funds [7]

3. Residence of Startups supports a program for creative industries and startups. This is a public initiative to support progressive entrepreneurs, innovation developers, and startup founders

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In Ukraine, there are offices of many prominent international IT companies, such as Samsung, Boeing, Ericsson, Huawei, Oracle, Siemens. About 45% of such representative offices are US company offices, followed by European companies. Kyiv remains the most popular location for R&D; such centres also operate in Dnepropetrovsk, Lviv, Odessa, Kharkov and Vinnitsa. Some research centres operate directly in the country, while other companies prefer out staffing.

In recent years, more than 100 R&D centres of world-famous companies have been opened in Ukraine. New R&D [6]:

1. The Japanese e-commerce company Rakuten, which owns the Viber messenger (acquired Viber for \$ 900 mln in 2014), is expanding its presence in Ukraine. In particular, it opens an R&D centre in Kyiv, and also develops an existing office in Odesa.

2. In 2018, the newest Center for Space Research and Development was opened in the city of Dnipro, the cradle of Ukrainian cosmonautics. This is the first result of private cooperation between the USA and Ukraine in the space sector.

3. Google has officially opened a development centre in Ukraine. An international company is opening a research centre based on the Kyiv office of CloudSimple, which Google bought in November 2019. Google's Ukrainian office is the third of eight Google1 offices in Central and Eastern Europe with an R&D centre. The other two offices of the company with an R&D centre are located in Poland and Hungary.

4. CONCLUSIONS

After the pandemic in Ukraine and the world, innovation has slowed down the pace of their healthy development; however, it will remain the most developing industry in the Ukrainian economy.

It is difficult to predict what specific losses the Ukrainian IT industry will suffer. The main concerns of companies in the IT market were:

1. Delay in the IT equipment supply, which, to a large extent, is either entirely manufactured in China, or depends on supplies from China.

2. The inhibitory effect of the situation in the global economy on investments.

3. Weakening demand for certain goods/services.

At the same time, Ukrainian companies have already adapted to the existing barriers and found effective ways to deal with:

1. Companies weakened dependence on Chinese suppliers partially began to purchase equipment of the American and another assembly. In addition, in the short term, China's logical supply chains will recover soon.

2. Ukrainian companies cannot directly influence the activity of investments; however, it is assumed that in 1-2 quarters, the investments will increase, at least, to the level of the end of Y2019.

3. On the one hand, companies that create solutions for Telecom, Fintech or E-commerce areas should keep their orders, because it is expected that the demand for these services will not decrease much. On the other hand, companies that provide their services to grocery customers (for example, algorithms for GPS trackers installed in the cars, or separate solutions for manufacturers of mobile phones, etc.) will suffer certain losses. Indeed, in a crisis, the demand for such things as cars/phones will not proliferate, and, as a result, IT companies will receive fewer orders.

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