

INTELLECTUAL ENTREPRENEURSHIP IN UKRAINE IN WARTIME

*Nazarenko I.L., PhD econ., associate professor
(Ukrainian State University of Railway Transport)*

*M. McKay Hoppman, bachelor
(Coastal Carolina University (Conway, South Carolina, the USA))*

In this paper we have made an attempt of statistical analysis: we extracted the types of businesses related to IE using open data on the site of State Statistics Service of Ukraine. As a result, the most significant components of IE turned out to be Information and Telecommunication (27% of the total turnover), Financial and insurance activities (27%), and Professional, scientific and technical activities (26%). Real estate transactions - 18%, percentage of Education appeared to be insignificant (1%), as well as percentage of Arts, sports, entertainment and recreation (1%).

We have outlined their problems and possible solutions.

IT sphere is the biggest and highly developed type of IE in Ukraine, rapidly growing despite the war. Its main problems are devastation of premises and equipment, power outages, while the solutions are relocation, focus on military programs, and opening offices abroad, in the EU countries. The main problems of Finance and insurance activities are credit losses, uneven inflow of new funds, and power outages. The solutions are Regulatory relaxation and Government support programs. The main problems of Professional, scientific and technical activities are the occupation of scientific and educational institutions, temporary relocation of scientists, limited access to equipment, loss of scientific information, etc. The main solutions are International projects for supporting Ukrainian scientists in Ukraine and abroad.

The real estate market decreased nearly three times during the full-scale war due to Decreasing purchasing power of people and high risks of buying property. The main solution is the state program eOselya of preferential mortgage for certain categories of citizens. The main problems of Education are devastation of premises, equipment, and brain drain. The main solutions are relocation, remote work, and international aid.

To sum it up, for IE development in Ukraine, especially during the war, we suggest the next measures. First and foremost, to implement statistical accounting by aggregating the types of activities actually related to IE, and ensure that correct data are available for each statistical period. Second, to develop special governmental program of support of IE during the war, especially of the most vulnerable activities, such as Education and Professional, scientific and technical activities. Only under these conditions will IE in Ukraine grow and become a driver of innovative change during the war and after the victory.

Key words: *intellectual entrepreneurship, statistical analysis, main branches*

ІНТЕЛЕКТУАЛЬНЕ ПІДПРИЄМНИЦТВО В УКРАЇНІ У ВОЄННИЙ ЧАС

Назаренко І.Л., к.е.н., доцент (УкрДУЗТ)

Хоппман М.МкКей, бакалавр (Прибрежний університет Кароліни (США))

У цій статті ми спробували виділити види бізнесу, пов'язані з ІП, використовуючи відкриті дані на сайті Державної служби статистики України. У результаті найбільш значущими складовими ІП виявилися інформація та телекомунікації (27% від загального

обороту), фінансова та страхова діяльність (27%) та професійна, наукова та технічна діяльність (26%). Деяко нижчим є питома вага угод з нерухомістю (18%), незначною виявилася питома вага освіти (1%), а також мистецтва, спорту, розваг та відпочинку (1%).

Ми окреслили їхні проблеми та можливі шляхи вирішення.

Так, головні проблеми ІТ-сектору – руйнування приміщень та обладнання, відключення електроенергії, а шляхи вирішення – релокація, зосередження на військових програмах, відкриття представництв за кордоном, у країнах ЄС. Основними проблемами фінансово-страхової діяльності є кредитні збитки, нерівномірне надходження нових коштів, перебої з електроенергією. Рішеннями є регуляторні послаблення та програми державної підтримки. Основними проблемами професійної та науково-технічної діяльності є окупація наукових та освітніх закладів, тимчасове переміщення науковців, обмежений доступ до обладнання, втрата наукової інформації тощо. Рішення – міжнародні проекти підтримки українських науковців в Україні та за кордоном.

За час повномасштабної війни ринок нерухомості скоротився майже втричі через зниження купівельної спроможності населення та високі ризики купівлі нерухомості. Основним рішенням є державна програма eОселя пільгової іпотеки для окремих категорій громадян. Основні проблеми освіти – спустошеність приміщень, обладнання, відтік мізків. Основні рішення – переїзд, віддалена робота та міжнародна допомога.

Для розвитку ІЕ в Україні, особливо під час війни, пропонуємо наступні заходи. Перш за все, запровадити статистичний облік шляхом агрегування видів діяльності, фактично пов'язаних з ІІ, і забезпечити наявність правильних даних для кожного статистичного періоду. По-друге, розробити спеціальну урядову програму підтримки ІІ під час війни, особливо найбільш вразливих видів діяльності, таких як освіта та професійна, науково-технічна діяльність. Лише за таких умов ІІ в Україні зростатиме і стане рушієм інноваційних змін під час війни та після перемоги.

Ключові слова: *інтелектуальне підприємництво, статистичний аналіз, основні галузі*

Introduction. The economy of Ukraine is disastrously affected by war. Its GDP has fallen by approximately a third, and material losses due to the destruction of infrastructure have exceeded US\$100 billion and are rising every day. The high inflation rate, the weakened currency and the very high unemployment rate are taking an increasing toll on Ukrainian society. The war has led to the largest economic slump in the history of our country. Compared to the same time periods in 2021, Ukraine's GDP dropped by 19,1% in the first quarter of 2022 and by 37,2% in the second quarter. From January to September 2022 it fell by 30%.

Boosting the business sector is one of the priorities of Ukraine's economic policy. Despite limited resources, the Ukrainian government is continuing the programme of granting low-interest rate loans (between 5

and 9%). Since the beginning of the war, 13,500 loan agreements worth a total of 54 billion hryvnia (around US\$1,5 billion) had been signed as of 10 October. Furthermore, the government is maintaining support for employers who would like to move their business activity from war-torn areas to safer regions of the country [1].

The aforementioned is related to all branches of the economy, including intellectual entrepreneurship which encompasses IT industry, science, education, consulting, creative activities, etc.

As we defined in [2], intellectual entrepreneurship (IE) is a special type of entrepreneurship carried out by intellectuals who create socially-oriented complex, high-tech intellectual products, with the aim not only of obtaining economic benefits, but also of self-realization and the achievement of

spiritual and moral objectives, as well as goals for economy and society development (bettering material well-being and ensuring cultural, spiritual development, etc.).

Not only does IE create jobs and intellectual products, but also it contributes into formation of the knowledge economy in Ukraine, as a source of its innovative development. This is why, taking into account significance of IE for Ukraine, especially in the wartime, we devote this paper to its statistical analysis and outlining the main problems it faces and their solutions provided.

Analysis of recent studies. The term «Intellectual entrepreneurship» is relatively new and has been used since the 1990s by numerous scientists in different countries. The main contribution to its development was made by representatives of two scientific schools, the American one (R. Cherwitz, C. Sullivan) from University of Texas, Austin, where a structured graduate program in intellectual entrepreneurship was established, and the Polish one (S. Kwiatkowski, C. Stowe, S. Gold, L. Edvinsson, M. Kirpalani and A. Nowak) from Kozminski University in Warsaw, where in 1998 the UNESCO Chair in Intellectual Entrepreneurship was established).

In Ukraine, the first monograph on this topic was written by Kharkiv scientists G. Zadorozhnyi and O. Khomin. It is called "Intellectual entrepreneurship in the knowledge economy" [3], and reveals the content of the knowledge economy as an important modern and main basis for the prospective development of human society. It also explores a new phenomenon that arose at the turn of the century – intellectual entrepreneurship, as a special type of economic activity of entrepreneurs–intellectuals.

It should be noted that a significant impetus to the growth of the interest of researchers and, accordingly, the number of publications on IE in Ukraine was the introduction in 2014 of a new discipline to the curriculum of the master's degree in

enterprise economics - "Intellectual Business". As a result, in particular, textbooks by M. Semykina, O. Petina [4], V. Ivanova [5], and G. Tymokhova [6] were published, in which the main theoretical and methodological principles of intellectual business as a specific format of business activity were outlined.

The existing definitions of the term of IE were studied in particular in [7] and the definition of IE was clarified in the article by I. Nazarenko [2]. Business models of intellectual entrepreneurship were studied by the same scientist in [9]. In the works of G. Konstantinov and S. Filonovich [9], five main features of IE were defined, namely: intellectual fearlessness, information literacy, tolerance for information redundancy and uncertainty, ability to generate new knowledge, and motivation to create new knowledge.

The issue of developing small business in Ukraine is discussed in the works of V. Dykan, H. Obruch, A. Tolstova, and other scientists [10 – 12], while intellectual capital as a factor in ensuring the competitiveness of enterprises in the global economy is considered by Yu. Utkina [13] and other authors.

Unexplored aspects of the issue. In spite of the fact that there are a number of publications dedicated to IE, the issues of intellectual entrepreneurship in Ukraine, especially in the war, are still insufficiently studied.

The purpose of the study is statistical analysis of IE in Ukraine and outlining the main problems it faces and ways of its survival during the war.

Main body of the study. It is extremely difficult to analyze intellectual entrepreneurship in Ukraine: there are no appropriate statistical data about IE, only official statistical data on different branches of industry are available on the site of State Statistics Service of Ukraine [14]. But we have made an attempt to extract the types of businesses related to IE. The types of economic activity related to IE, singled out

according to the Ukrainian system of classification, are given below.

1. Information and Telecommunication, in particular: publishing activity; production of film and video films, television programs, publishing of sound recordings; activities in the field of radio and television broadcasting; telecommunications (electronics); computer programming, consulting and related activities; provision of information services.

2. Financial and insurance activities.

3. Real estate transactions, in particular: provision of financial services, except for insurance and pension provision; insurance, reinsurance and non-state pension provision, except for mandatory social insurance; auxiliary activities in the fields of financial services and insurance; real estate transactions.

4. Professional, scientific and technical activities, in particular: activities in

the fields of law and accounting; activities of the main departments (head offices); management consulting; activities in the fields of architecture and engineering; technical tests and research; scientific research and development; advertising activity and market research; other professional, scientific and technical activities; veterinary activity.

5. Education.

6. Arts, sports, entertainment and recreation, in particular: activities in the field of creativity, art and entertainment; functioning of libraries, archives, museums and other cultural institutions; organization of gambling; activities in the field of sports, organization of rest and entertainment.

Turnover of enterprises by their size, by type of economic activity related to IE in 2010 – 2021 is given in the Table 1.

Table 1. Turnover of enterprises by their size, by type of economic activity related to IE, mln. UAH (extracted from [14])

Branches related to IE	Years	Big enterprises	Medium enterprises	Small enterprises	Total amount
1	2	3	4	5	6
Information and Telecommunication	2010	32793,5	n/d*	20492,3	n/d
	2015	38495,5	36229,7	66754,5	141479,7
	2016	39808,6	44269,0	90973,3	175050,9
	2017	42601,0	55567,7	118635,1	216803,8
	2018	51259,8	n/d	n/d	n/d
	2019	62702,8	74050,1	198112,4	334865,3
	2020	68004,7	n/d	n/d	n/d
Financial and insurance activities	2010	10263,4	n/d	13306,7	n/d
	2015	n/d	n/d	13946,9	n/d
	2016	n/d	n/d	18846,4	n/d
	2017	-	45797,7	21963,9	67761,6
	2018	n/d	n/d	24246,6	n/d
	2019	7889,2	73160,0	24572,9	105622,1
	2020	15893,0	75148,4	27412,7	118454,1
Real estate transactions	2010	n/d	15200,7	26606,7	n/d
	2015	n/d	n/d	53987,5	n/d
	2016	n/d	30642,9	66058,8	n/d

Table 1 (the ending)

1	2	3	4	5	6
	2017	n/d	n/d	n/d	n/d
	2018	n/d	42167,6	97256,9	n/d
	2019	n/d	48367,9	n/d	n/d
	2020	n/d	n/d	n/d	n/d
	2021	n/d	43500,4	n/d	n/d
Professional, scientific and technical activities	2010	92920,6	26554,2	32046,0	151520,8
	2015	114089,9	33969,7	58628,0	206687,6
	2016	n/d	38967,5	72319,3	n/d
	2017	n/d	n/d	86929,5	n/d
	2018	n/d	56960,8	n/d	n/d
	2019	n/d	72498,8	n/d	n/d
	2020	n/d	n/d	137076,6	n/d
Education	2010	n/d	n/d	995,1	n/d
	2015	-	845,4	2256,3	3101,7
	2016	-	898,9	2992,6	3891,5
	2017	-	n/d	n/d	n/d
	2018	-	n/d	n/d	n/d
	2019	-	1899,7	8005,9	9905,6
	2020	-	n/d	n/d	n/d
Arts, sports, entertainment and recreation	2010	n/d	1174,5	1307,5	n/d
	2015	1979,4	1716,9	3259,2	6955,5
	2016	n/d	2396,8	4667,3	n/d
	2017	n/d	n/d	n/d	n/d
	2018	n/d	4149,3	n/d	n/d
	2019	n/d	3835,4	n/d	n/d
	2020	n/d	n/d	n/d	n/d
TOTAL	2010	n/d	n/d	94754,3	n/d
	2015	n/d	n/d	198832,4	n/d
	2016	n/d	n/d	255857,7	n/d
	2017	n/d	n/d	n/d	n/d
	2018	n/d	n/d	n/d	n/d
	2019	n/d	273811,9	n/d	n/d
	2020	n/d	n/d	n/d	n/d
2021	n/d	n/d	n/d	n/d	

*n/d – no data in Statistical Reports

Unfortunately, as we can see in the Table 1, there is significant lack of statistical data which does not allow analyzing the branches related to IE. The only possible

option to see its structure is presented in fig.1 (for medium enterprises in 2019), because the data of all the components (types of economic activity) are available.

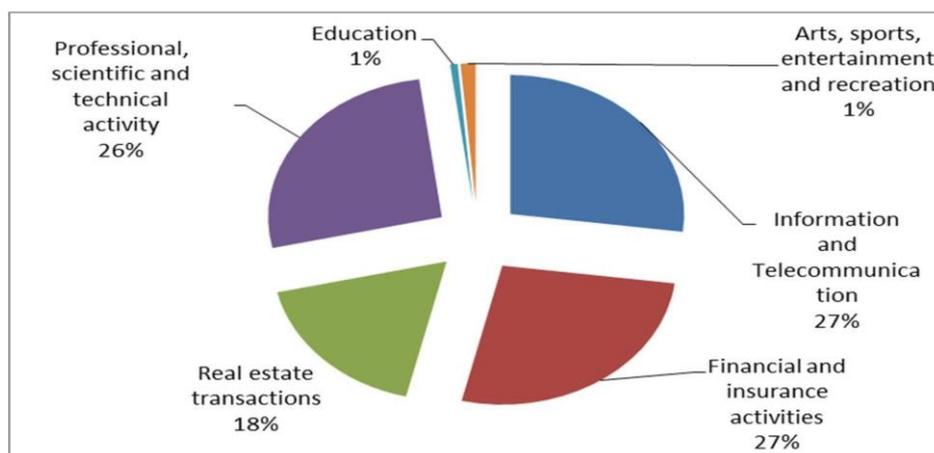


Fig.1. Structure of turnover of medium enterprises related to IE in 2019, %

According to fig.1, the most significant components of IE (medium enterprises) in 2019 were Information and Telecommunication (27% of the total turnover), Financial and insurance activities (27% of the total turnover), and Professional, scientific and technical activities (26% of the total turnover). Percentage of Real estate transactions is a bit lower (18%), and percentage of Education appeared to be insignificant (1%), as well as percentage of

Arts, sports, entertainment and recreation (1%).

Apart from the above-described attempt of analysis, we have made another attempt, based on Indicators of activities of business entities for special aggregates given on the site of State Statistics Service of Ukraine (made according to European Commission Regulation № 251/2009 of 11.03.2009).

We extracted the aggregates related to IE from [15] and placed them in table 2.

Table 2. Indicators of activities of business entities for special aggregates in 2010–2021 (extracted from [15])

Aggregates related to IE	Years	Number of active business entities, units	Number of persons employed, thsd. persons	Turnover of business entities, mln. UAH
1	2	3	4	5
1. Information and communication technologies (26.1+26.2+26.3+26.4+26.8+95.1+46.5+58.2+61+62+63.1)	2010	53643	250,3	68393,7
	2011	51611	250,4	82502,2
	2012	62896	250,1	96126,0
	2013	81461	266,0	101816,8
	2014	108661	273,8	118716,6
	2015	109712	245,1	157882,8
	2016	123440	252,8	206869,9
	2017	140183	267,5	263376,4
	2018	166715	294,3	335705,0
	2019	196239	331,5	392757,4
	2020	223018	355,8	464128,5
2021	269897	401,7	613830,1	
2. Production using high technologies (21+26+30.3)	2010	2352	126,0	23737,7
	2011	2246	130,7	32324,9
	2012	1549	132,6	34820,6

Table 2 (the ending)

1	2	3	4	5
	2013	1562	128,9	35714,0
	2014	1558	118,0	40349,0
	2015	1639	107,8	50496,3
	2016	1449	104,1	57800,2
	2017	1467	103,9	69176,4
	2018	1528	96,6	76145,3
	2019	1610	96,7	75375,8
	2020	1640	89,6	79118,6
	2021	1685	88,1	94741,3
3. Information sector (58.1+59.1+59.2+60+63.9)	2010	16872	88,3	21365,4
	2011	14785	86,4	23505,6
	2012	12763	76,2	20050,7
	2013	14267	76,4	18472,3
	2014	15981	70,4	17076,9
	2015	16779	64,4	18378,2
	2016	16386	64,3	22210,1
	2017	17052	71,7	28865,7
	2018	18853	74,6	37096,7
	2019	21375	78,4	46574,6
	2020	22608	71,0	43981,4
2021	25081	74,4	58146,5	
4. Services using high technologies (53+58+60+61+62+63+72)	2010	58022	439,6	75002,0
	2011	56380	422,2	84638,9
	2012	69005	426,5	101646,1
	2013	89028	436,9	104385,5
	2014	116907	428,5	114366,7
	2015	118615	385,2	151824,1
	2016	131707	386,7	185466,5
	2017	148904	403,9	228502,2
	2018	176048	428,8	293579,8
	2019	207251	459,5	353923,4
	2020	237276	473,1	415907,6
2021	286783	521,9	551100,2	
5. Intelligent market services (50+51+68+69+70+71+73 +74+77+78+80+81+82)	2010	227836	955,4	133137,0
	2011	184427	902,6	256949,3
	2012	195014	907,9	296352,0
	2013	214654	897,2	269012,7
	2014	241560	860,4	278117,7
	2015	257717	811,2	364621,5
	2016	247180	797,0	457369,7
	2017	243421	779,5	550157,0
	2018	252855	783,7	643051,2
	2019	269638	849,4	703506,0
	2020	272918	816,6	628596,8
2021	274545	823,9	803556,9	
6. Creative industries (31.12+32.13+32.20+58.11+ 58.13+58.14+58.19+58.21+ 58.29+59.11+59.12+59.13+ 59.14+59.20+60.10+60.20+ 62.01+62.02+63.91+70.21+)	2010	76441	244,5	49113,2
	2011	68036	240,8	53833,1
	2012	78438	242,1	66545,6
	2013	97062	252,0	71006,8
	2014	123943	265,0	75818,3
	2015	125704	248,3	103255,5

Table 2 (the ending)

1	2	3	4	5
+71.11+72.20+73.11+73.12	2016	134652	262,5	138469,8
+74.10+74.20+74.30+85.52	2017	149511	283,1	176778,1
+90.01+90.02+90.03+90.04	2018	175254	309,2	234762,8
+91.01+91.02)	2019	205500	351,7	286146,9
	2020	230743	360,0	333867,7
	2021	276276	409,2	451364,8

Turnover of business entities of aggregates related to IE is presented in Fig.2.

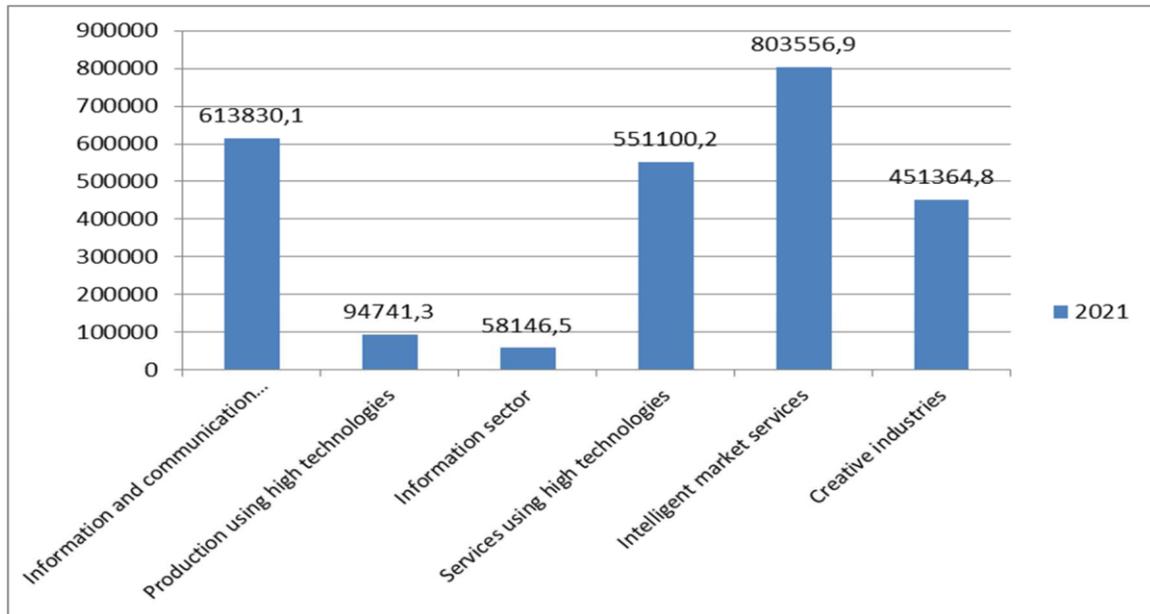


Fig.2. Turnover of business entities of aggregates related to IE in 2021, mln. UAH

As we can see, the «Intelligent market services» aggregate has the biggest turnover (803556,9 mln UAH), the «Services using high technologies» aggregate – a slightly lower turnover (551100,2 mln UAH), and the «Creative industries» aggregate occupies the third place (451364,8 mln UAH).

At first sight, judging from the names of the aggregates, table 2 seems to contain true types of activities related to IE, with all the necessary statistical data. However, this issue needs deeper investigation and clarification. Let us analyze the components of the aggregates and reveal whether they are really related to IE.

Each aggregate encompasses certain components marked with the codes given in table 2, according to the Classification of types of economic activity in Ukraine (KVED) [16]. Having checked them on the

site [16], we found some activities which appeared to be double counted or not related to IE.

For instance, «production of electronic components and circuit boards, magnetic and optical data carriers, computers and peripheral equipment, communication equipment, etc.» is included into both aggregates «Information and communication technologies» and «Production using high technologies»; «publication of books, periodicals and other publishing activities» and «software release» are included into both aggregates «Information and communication technologies» and «Services using high technologies»; «activities in the field of photography, design, provision of translation services; other professional, scientific and technical activities» are included in

«Intelligent market services» and «Creative industries» aggregates.

Besides, there are some activities which cannot be related to IE, namely:

- postal and courier activities, such as collection, transportation and delivery of letters and parcels under various conditions, local delivery and courier services (a component of «Services using high technologies»). Obviously, these are quite unusual activities to be counted as IE, as they do not have any relations to IE;

- provision of a wide range of general support services, such as internal and external cleaning of buildings of all types, cleaning of industrial equipment, washing of trains, buses, aircraft, etc., cleaning of tank cars, disinfection or liquidation measures in buildings, trains, on ships (a component of «Services using high technologies»). Undoubtedly, these are inappropriate activities to be counted as IE, as they are not related to IE anyhow.

To sum it up, we should say that these 6 aggregates must have been compounded without thorough research, as their composition is quite controversial, contains some inappropriate activities which in no way can be named «creative», «intelligent» or «using high technologies». We see the solution in extracting those inappropriate activities and double counted ones from the aggregates. Unfortunately, it is hardly possible, due to the absence of statistical data on the numerous components of these 6 aggregates in sources by State Statistics Service of Ukraine. Therefore, the data presented in Table 2 can give only vague information about the situation in IE in Ukraine.

This is why, for further research of IE in Ukraine, we chose the most important activities related to IE and analyzed their problems and possible solutions. They are given in fig.3.

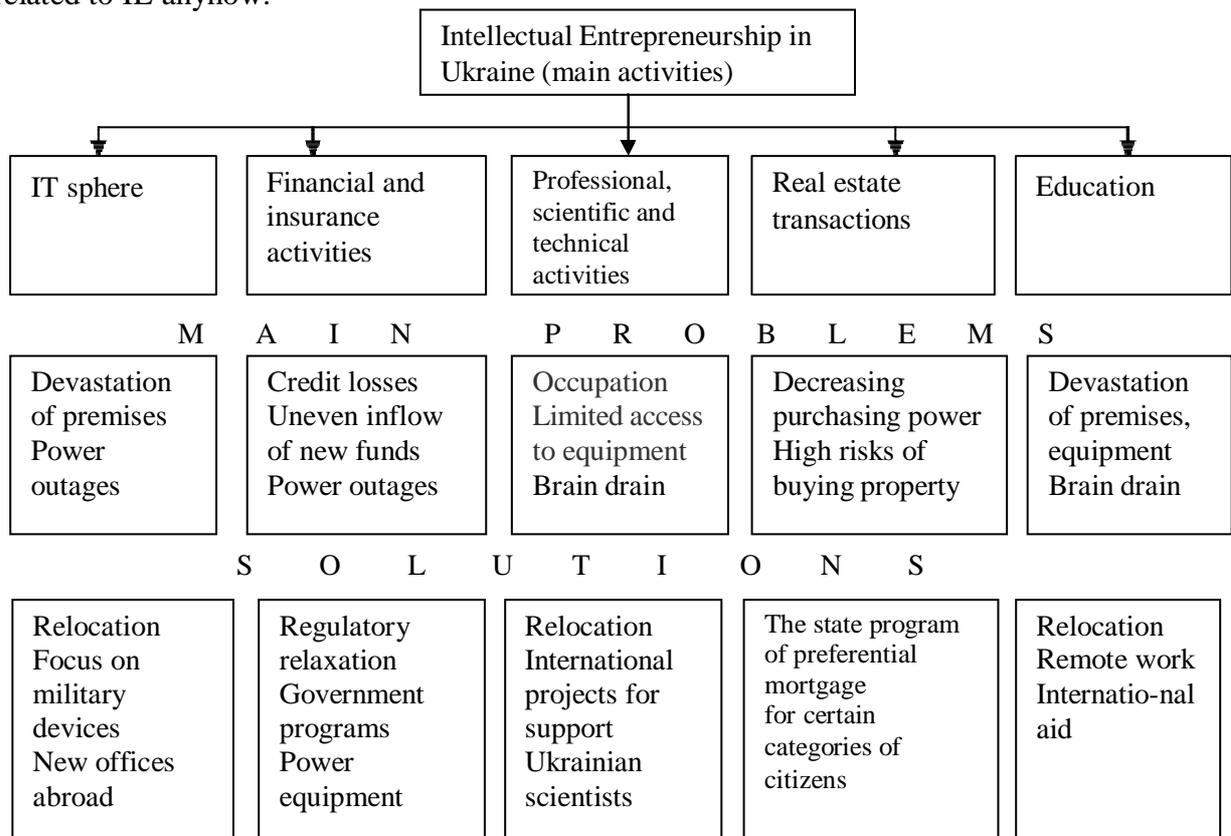


Fig.3. Main activities related to IE in Ukraine: problems and solutions (developed by the authors, placed in order from the most to the least significant according to the turnover)

IT sphere. The rapidly growing IT sector is one of the most interesting and attractive industries in Ukraine with over 4000 tech companies and more than 200 thousand high-skilled IT professionals. It is also diverse – from nanotechnologies and blockchain to Artificial Intelligence and game development. 18 Ukrainian companies are listed among 100 TOP Outsourcing companies by the International Association of Outsourcing Professionals [17].

During the war, Ukrainian IT specialists have globalized the business, have changed the type of activity, and even have managed to attract millions of investments. IT has become one of the most persistent industries. In 2022, Ukrainian IT specialists were able to cover almost 44% of all service exports. In the first 10 months of 2022, Ukrainian IT earned \$6.5 billion, which is 0,5 billion more than in the corresponding period of 2021.

Companies had to move because of the great war danger. On this basis, Western Ukraine becomes a new technological hub. It should be noted that about 7.000 specialists were mobilized – this is about 2.5%. 57.000 (20%) went abroad. But 228.000 people from the IT sphere remain in Ukraine. At the same time, professionals who left the country continued to work. Large Ukrainian companies have opened more than 30 offices abroad: in Poland, Germany, Switzerland, Croatia, Romania, Bulgaria, Hungary, and the Czech Republic.

Some corporations and individual developers even had to change the focus of inventions. A large number of Ukrainians threw all their forces and opportunities at the development of military devices and equipment. The projects attracted not only the Ukrainian army but also foreign investors (volumes of investments – from \$50 to \$250 million for each project) [18].

Finance and insurance activities. Despite the war, the financial sector operates smoothly: payments are made on time, and clients have unhindered access to their own funds. However, the consequences of war

reduce the growth rate of demand for banking services and cause additional credit and operational losses for banks.

Confidence in the banking system is preserved. As a whole, it has remained highly liquid, and according to some indicators, liquidity has reached record levels. In addition to preserving the trust of depositors in banks, this is facilitated by regular and significant receipts of government payments to the bank accounts of the population. At the same time, the inflow of new funds to the sector is uneven: the main volumes are deposited in current accounts in state banks.

During the second half of the year, the share of deposits in hryvnia accounts of the population decreased, so the term structure of funding is deteriorating. This does not create immediate risks for the banking system, but weakens the resilience of individual banks to possible sharp changes in depositor sentiment.

Continuity of payments and operation of the retail network, even despite interruptions in the supply of electricity, contributed to maintaining trust in banks. Banks have already developed and are implementing measures that will make it possible to maintain the continuity of work even in conditions of long blackouts. Strengthening their own resistance to operational risks, banks experience significant losses, in particular due to the costs of additional equipment in branches.

Credit losses continue to be the biggest risk for the financial sector. Banks have already suffered significant credit losses, but far from all realized and expected credit losses have been recognized [19].

The total assets of insurers compared to the beginning of 2022 almost did not change and amounted to UAH 65.7 billion. During the martial law, insurers increased the amount of liquid assets - from UAH 14.9 billion to UAH 17.2 billion.

The Green Card became the driver of insurance business support. During the war, this type of insurance increased by 76% (up to UAH 1.5 billion in the structure of the

insurance portfolio as of July 1, 2022). In the first half of the year in Ukraine, 44% (7,6 billion UAH) of insurance premiums went to car insurance.

In general, risk insurers showed high profitability [20].

Professional, scientific and technical activities. According to Deputy Minister of Education and Science of Ukraine for European Integration report, the main problem in conducting scientific research is the occupation of scientific institutions and educational institutions by Russian invaders, temporary relocation of scientists, limited access to equipment, loss of scientific information, etc. The scientific infrastructure has also suffered. In particular, 68 scientific institutions were partially damaged, 2 were completely destroyed, and there is no information about the condition of 9 such institutions located in the occupied territory. About 15% of the research infrastructure of higher education institutions and scientific institutions was also damaged [21].

Almost half of the scientists changed their place of residence. 47,2% remained in Ukraine and did not change their place of residence because of the war, 38,1% are in Ukraine, but have changed their place of residence. 14,6% of scientists are abroad. An important detail: in this case, it is not about the fact that all those who left are employed, but only about migration.

When asked whether it is possible to engage in scientific activity to the same extent as in the pre-war period, 72,9% answered that they could not afford it. Among the main reasons, the scientists named lack of interest, apathy, security factor, the specifics of the work, which involves staying at the workplace (for example, if a person has moved, he does not have access to the laboratory), and technical reasons (interruptions with the Internet and communication, blackouts etc.) [22].

Real estate transactions. The real estate market decreased nearly three times during the full-scale war. In 9 months of 2022, notaries certified 224,000 real estate

contracts. This is 2,7 times less than last year. The number of home purchase transactions is starting to grow little by little, but it is still less than a third of last year's figures. The situation improved slightly in the third quarter, but 2022 was a bad year for the real estate market. The vast majority of transactions concern the purchase and sale of apartments and residential buildings (28%) and land plots or shares (38%). For comparison: in 2021, the share of contracts for the purchase and sale of apartments and residential buildings was 36%, and land plots and shares - 31% of the total number of certified transactions. Purchases of apartments and residential buildings fell almost 3,5 times in 2022: from 218,000 to 63,000 deals. The situation with the purchase and sale of land plots and shares is better: the number of transactions for 2022 has only halved [23].

To help those people who lost their apartments due to the war, Ukrainian government has implemented the program eOselya. This is a state preferential mortgage with a rate of 3%, for up to 20 years and the minimum first payment is not less than 20% of the amount. At the first stage, the service is available to contract servicemen, defenders of Ukraine, security forces and their family members, as well as doctors, teachers, scientists working in the public and communal sectors [24].

Education. The war in Ukraine has resulted in more than 6 million Ukrainians fleeing to neighboring countries. This includes nearly 665,000 students (16% of total number of enrolled students) and over 25,000 educators (6% of total educators in the country). Another 8 million Ukrainians are displaced internally.

The main problem the Ukrainian education system faces now is displacement of students and educators. Displacement has had a significant impact on education service delivery, along with the damage and destruction of educational facilities. As of May 6, 2022, according to the Ministry of Education and Science of Ukraine (MoES),

1,635 schools and universities (5% of total) have been damaged from the war and 126 have been destroyed.

Current efforts of the education system are aimed at sustaining student enrollment and service delivery. There are various online schooling initiatives to maintain access to education during the war, both for students within Ukraine and refugee students outside Ukraine, though there are significant gaps in coverage [25].

In these tough times real help was given by European Universities and organizations, which provided Ukrainian students and teachers with equipment, monetary and non-monetary aids and preferential opportunities to take part in additional international scientific and educational projects.

Conclusions and prospects for further research. It is extremely difficult to analyze intellectual entrepreneurship in Ukraine due to the absence of this term in statistics and, consequently, corresponding statistical data. But we have made an attempt to extract the types of businesses related to IE using open data on the site of State Statistics Service of Ukraine. Unfortunately, a significant lack of statistical data appeared. The only possible option to see its structure was a turnover for medium enterprises in 2019 of the branches related to IE. As a result, the most significant components of IE turned out to be Information and Telecommunication (27% of the total turnover), Financial and insurance activities (27%), and Professional, scientific and technical activities (26%). Percentage of Real estate transactions is a bit lower (18%), and percentage of Education appeared to be insignificant (1%), as well as percentage of Arts, sports, entertainment and recreation (1%).

In addition to this, we have made another attempt, based on Indicators of activities of business entities for special aggregates given on the site of State Statistics Service of Ukraine (made according to European Commission Regulation №

251/2009 of 11.03.2009). We extracted the aggregates related to IE, but after deeper investigation of components of these aggregates, we found some activities which appeared to be double counted or not related to IE.

This is why we have chosen the most significant activities related to IE and outlined their problems and possible solutions.

The first one - IT sphere - is the biggest and highly developed type of IE in Ukraine, rapidly growing despite the war. Its main problems are devastation of premises and equipment, power outages, while the solutions are relocation, focus on military programs, and opening offices abroad, in the EU countries.

The second one is Finance and insurance activities. Despite the war, the financial sector operates smoothly, and risk insurers showed high profitability. The main problems are credit losses, uneven inflow of new funds, and power outages (which entail significant additional expenses for buying power equipment). Other solutions are Regulatory relaxation and Government support programs.

The third one - Professional, scientific and technical activities, whose main problems are the occupation of scientific and educational institutions, temporary relocation of scientists, limited access to equipment, loss of scientific information, etc. The main solutions are International projects for supporting Ukrainian scientists in Ukraine and abroad.

The fourth one - Real estate transactions. The real estate market decreased nearly three times during the full-scale war due to Decreasing purchasing power of people and high risks of buying property. The main solution is the state program eOselya of preferential mortgage for certain categories of citizens.

The last one - Education. Current efforts of the education system are aimed to sustain student enrollment and service delivery. The main problems are devastation

of premises, equipment, and brain drain. The main solutions are relocation, remote work, and international aid.

To sum it up, for IE development in Ukraine, especially during the war, we suggest the next measures. First and foremost, to implement statistical accounting by aggregating the types of activities actually related to IE, and ensure that correct data are available for each statistical period. Second, to develop special governmental program of support of IE during the war, especially of the most vulnerable activities, such as Education and Professional, scientific and technical activities. Only under these conditions will IE in Ukraine grow and become a driver of innovative change during the war and after the victory.

The results obtained in the paper can be used in further research in this realm.

REFERENCE

1. Matuszak S. A struggle to survive. Ukraine's economy in wartime (18.10.2022). Available at: <https://www.osw.waw.pl/en/publikacje/osw-commentary/2022-10-18/a-struggle-to-survive-ukraines-economy-wartime#:~:text=The%20ongoing%20war%20in%20Ukraine,and%20are%20rising%20every%20day>
2. Nazarenko I. Intelektualne pidpriemnytstvo yak napriamok formuvannia ekonomiky znan v Ukraini [Intellectual entrepreneurship as a direction of formation of the knowledge economy in Ukraine] (2015) // *Trends and innovations in the modern economy: Collective monograph* / by general. ed. O. Ivanilov. Kharkiv. 228 p. Pp. 176 – 189.
3. Zadorozhnyi H., Khomyn O. Intelektualne pidpriemnytstvo u ekonomitsi znan [Intellectual entrepreneurship in the knowledge economy: monograph] (2008). Kharkiv. KhNU named after V.N. Karazin. 171 p.
4. Semykina M., Petina O. Intelektualnyi biznes [Intellectual business]: Study guide for full-time and part-time students of economics majors (2015). Under the editorship M. V. Semikina. – Kirovohrad: KNTU. 141 p.
5. Ivanova V. Intelektualnyi biznes [Intellectual business]. Textbook (2017). Sumy: 327 p.
6. Tymokhova H. B. Intelektualnyi biznes [Intellectual business]. Education manual for university students (2018). National Ukrainian Acad. - Kyiv. 314 p.
7. Shevchenko L. Universytety yak subiekty intelektualnoho pidpriemnytstva [Universities as subjects of intellectual entrepreneurship]. Available at: http://nbuv.gov.ua/j-pdf/tipp_2014_1_9.pdf.
8. Nazarenko I. Biznes-modeli intelektualnoho pidpriemnytstva [Business models of intellectual entrepreneurship] (2016). *Priorities of the development of the national economy in the context of European integration and global challenges: monograph* / by general. ed. O. Ivanilov. Kharkiv. 429 p.
9. Konstantynov H., Filonovich S. Intelektualne pidpriemnytstvo, abo Pryntsypy nabuttia konkurentnoi perevahy v novii ekonomitsi [Intellectual entrepreneurship, or Principles of acquiring a competitive advantage in the new economy cypc]. Available at: <http://grusha.org.ua/blog/>
10. Dykan O.V. (2017). Rozvytok malogho biznesu v Ukraini: problemy ta shljakhy zabezpechennja [Development of Small business in Ukraine: problems and ways of providing]. *Bulletin of Economics of Transport and Industry*, vol. 57, pp. 58-66.
11. Obruch Gh.V., Ivanjuta B.L., Zhuravljov K.V. (2018). Problemy i perspektyvy rozvytku malogho ta serednjogho pidpriemnytstva v Ukraini [Problems and prospects of development of small and medium-sized enterprises in Ukraine]. *Bulletin of Economics of Transport and Industry*, vol.61, pp. 53–62.
12. Tolstova A.V., Kybaljchych S. (2017). Problemy rozvytku malogho biznesu v Ukraini [Problems of development of small business in Ukraine]. *Bulletin of*

Economics of Transport and Industry, vol. 60, pp. 55-62.

13. Utkina Y.M. (2016). *Intelektualnyi kapital yak faktor zabezpechennia konkurentostiikosti pidpriemstv v hlobalnii ekonomitsi* [Intellectual capital as a factor in ensuring the competitiveness of enterprises in the global economy]. *Bulletin of Economics of Transport and Industry*, vol.56, pp. 58–67.

14. Diialnist subiektiv velykoho, serednoho, maloho ta mikropidpriemnytstva (2021). [Activity of large, medium, small and micro-entrepreneurship entities]. *Statistics Ukraine* /Edited by M. Kuznetsova. State Statistics Service of Ukraine. Kyiv, 2022. 117 p. Pp. 29 – 32.

15. Indicators of activities of business entities for special aggregates (Commission Regulation (EC) № 251/2009 of 11.03.2009) in 2010–2021. Available at: <https://www.ukrstat.gov.ua/>

16. Klasyfikatsiia typov ekonomichnoi diialnosti v Ukraini. [Classification of types of economic activity in Ukraine] (KVED). Available at: <https://evrovektor.com/kved/2010/>.

17. Leading IT destination. Available at: <https://ukraine.ua/invest-trade/it-ukraine/>

18. Povaliaieva O. Ukrainian IT Adaptation to War. (13.01.2023) Available at: <https://good-time-invest.com/blog/ukrainian-it-adaptation-to-war/>

19. Finansovyi sektor stiiki ta prodovzhuie pratsiuvaty bezperebiino popry posylennia ryzykiv – Zvit pro finansovu stabilnist. (27.12.2022). [The financial sector is stable and continues to operate smoothly despite increased risks - Financial Stability Report]. Available at: <https://bank.gov.ua/ua/news/all/finansoviy-sektor-stiikiy-ta-prodovjuye-pratsiyuvati-bezperebiyno-popri-posilennya-rizykiv--zvit-pro-finansovu-stabilnist>

20. Z pochatku viiny z rynku pishly 5 strakhovykiv (23.09.2022). [Since the

beginning of the war, 5 insurers have left the market]. Available at: <https://finclub.net/ua/news/z-pochatku-viiny-rynok-zalyshylo-5-strakhovykivuchasnykiv-sehmentu-nonlife.html>

21. Nauka u voiennyi chas: vidbuvsia onlain-zakhid shchodlo innovatsiinoho i tekhnolohichnoho rozvytku dlia zdobuttia peremohy ta vidnovlennia Ukrainy (21.05.2022). [Science in wartime: an online event was held on innovative and technological development for the victory and restoration of Ukraine]. Available at: <https://mon.gov.ua/ua/news/nauka-u-voyennij-chas-vidbuvsya-onlajn-zahidshodo-innovacijnogo-i-tehnologichnogo-rozvitku-dlya-zdobuttya-peremogi-ta-vidnovlennya-ukrayini>

22. Shulikin D. Naukovtsi pid chas viiny: vyiavyty potreby i vporatys. [Scientists at War: Identifying Needs and Coping]. Available at: <https://svit.kpi.ua/2022/06/27/>

23. Pikalenko D. Rynok nerukhomosti v 2022 rotsi – yak ukraintsi kupuvaly zhytlo pid chas viiny [The real estate market in 2022 - how Ukrainians bought housing during the war] (04.01.2023). Available at:

<https://progroshi.news/news/neruhomist/rinok-neruhomosti-v-2022-roci-yak-ukrajinci-kupuvali-zhitlo-pid-chas-viyni-3638.html>

24. Pilhovyi kredyt vid derzhavy na nove zhytlo dlia zakhysnykiv, vchyteliv ta medykiv: v Dii dostupna posluha yeOselia (21.12.2022). [Preferential loan from the state for new housing for defenders, teachers and doctors: eOselya service is available in Diya]. Available at: <https://www.kmu.gov.ua/news/pilhovyi-kredyt-vid-derzhavy-na-nove-zhytlo-dlia-zakhysnykiv-vchyteliv-ta-medykiv-v-dii-dostupna-posluha-ieoselia#>

25. Education: Impact of the War in Ukraine (18.05.2022). Available at: <https://reliefweb.int/report/ukraine/education-impact-war-ukraine-may-2022>