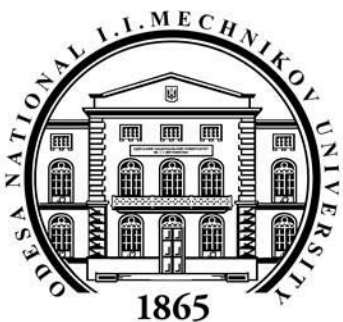


# ***Internationalization Call for Ukrainian Companies: Competitiveness through Innovation***

UKRAINIAN PEACE BEFORE THE WAR

created before 24<sup>th</sup> of February 2022



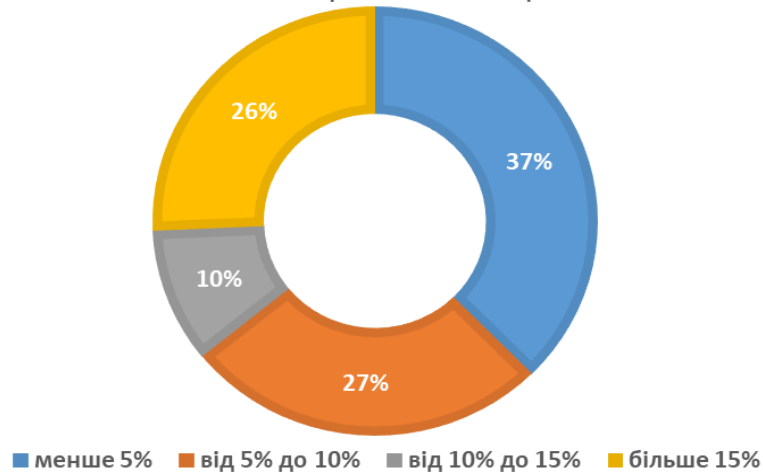
*Iryna Nyenno,*  
*Doctor of Economics, Head of the Centre "Innovation Office"*  
e-mail: [inyenno@onu.edu.ua](mailto:inyenno@onu.edu.ua)

# PLAN

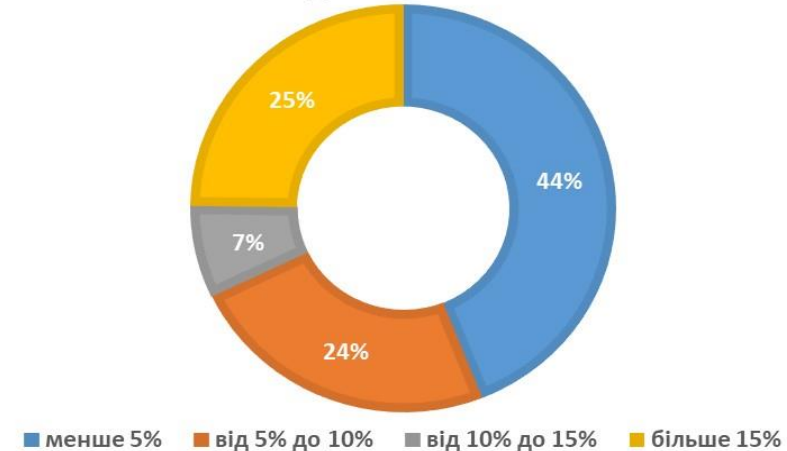
1. Global innovative competitiveness
2. Ukrainian innovative activity
3. Comparative aspects with EU innovations
4. Perspectives for innovative ecosystem
5. Industry 4.0 for Innovations

# PERCENTAGE OF COMPANY INCOME

ВІДСОТОК ВІД ДОХОДУ КОМПАНІЇ НАПРАВЛЕНИЙ  
НА ІННОВАЦІЇ У ВИРОБНИЦТВІ



ВІДСОТОК ВІД ДОХОДУ КОМПАНІЇ НАПРАВЛЕНИЙ НА  
ВЛАСНІ R&D АБО ПІДТРИМКУ ЗОВНІШНІХ R&D РОБІТ



Thus, the vast majority of respondents (37% and 44%, respectively) said that they spend less than 5% of the company's income on its own R&D, support of external R&D work and other innovative activities. It is worth noting that almost a third of respondents spend more than 15% of the company's income on innovation, own R&D or support of external R&D work.

# INDEX OF COMPANY INNOVATION

As already mentioned in the methodology, the presented study gave companies the opportunity to evaluate themselves.

**High performance of the Innovation Index** was shown by companies **working in the fields** of pharmaceuticals, forestry, aviation and space, IT, energy, medicine, construction, biotechnology, metallurgy. **If the weakest place** in the pharmaceutical and forestry companies **is the readiness for change**, the companies in the fields of aviation and space, IT, energy, medicine, construction, biotechnology, metallurgy - **innovation in working with clients**.

**Companies operating in the transport, chemical, education and food industries** pay **the least attention to innovation**, but they all declare a high degree of readiness for change.

It should be noted that no industry was included in the group with the highest indicators of the innovation index (from 40 to 50).

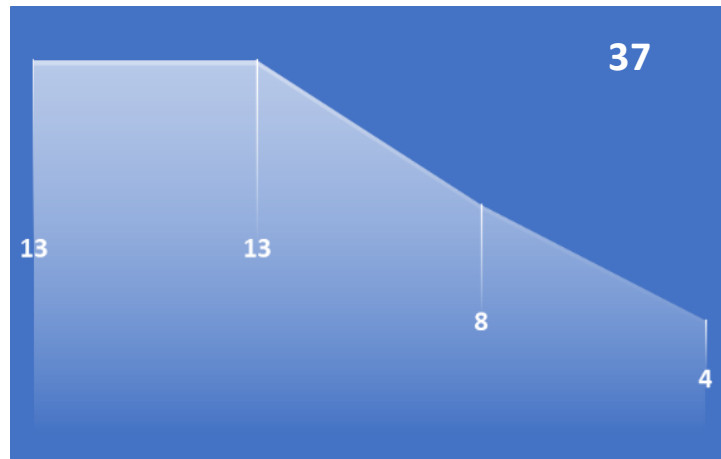
# INDEX OF COMPANY INNOVATION

Sphere of activity	Mind Innovation Index	Product innovation	Innovative business processes and work with staff	Innovation in working with clients	Willingness to change
Pharmaceutics	37	13	13	8	4
Forestry	36	10	13	8	5
Aviation and space	35	9	9	7	7
IT	34	9	10	6	7
Energy	32	9	9	6	8
Medical field	31	8	10	7	7
Construction	30	7	9	6	8
Biotechnology	30	8	9	6	7
Metallurgy	30	7	10	5	10
Engineering	29	8	8	5	8
Consulting	29	10	9	6	5
Service Industries	27	6	6	5	8
Agriculture	27	8	7	5	7
Weapons and military equipment	27	8	7	5	8
Trade	27	6	8	4	9
Nanotechnology	27	7	7	6	7
Light industry	26	6	9	3	8
Transport	25	7	7	5	7
Chemical Industry	23	5	6	4	8
Education	20	5	5	4	7
Food Industry	19	4	5	3	8

# COMPANIES WITH AN INNOVATION INDEX OF 40 TO 32.5

The companies of this group are characterized by the development and use of unique innovations for the world market. The share of innovative products in the portfolio of companies exceeds 50%, companies are actively testing new approaches and analyzing their effectiveness. This group includes - **pharmaceuticals, forestry, aviation and space, IT.**

# INDEX OF COMPANY INNOVATION

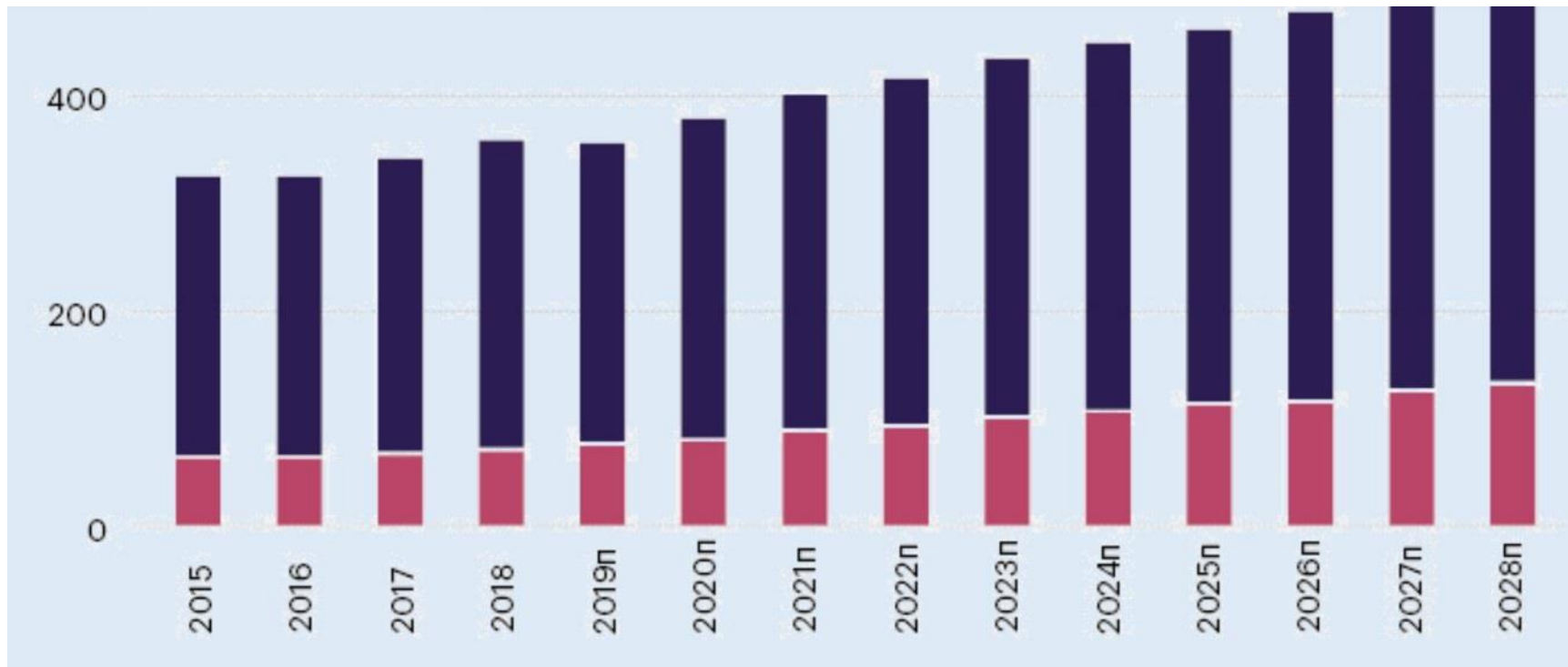


These companies are working on the innovation of their product and are paying attention to changing approaches to working with staff and automating business processes. At the same time, this group of companies does not focus on changing approaches to working with clients.

**The pharmaceutical industry has become the leader of the Innovation Index.** The weakest link in this area is a willingness to change. These companies have a high level of uniqueness of their innovations that contribute to sustainable development, as well as a high level of manufacturability of business processes and work with staff.

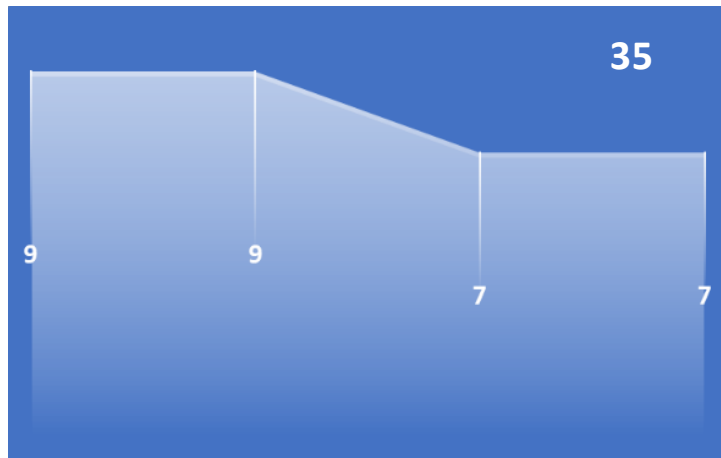
# INDEX OF COMPANY INNOVATION

The growth rate of the pharmaceutical market in Ukraine is significantly ahead of the European average. According to Fitch Solutions, sales of pharmaceutical products in 2019 in Europe as a whole will grow by 1.8% to \$ 367.3 billion. A similar figure for Ukraine - growth of 9.5% to \$ 3.4 billion. Analysts expect This gap will continue in the coming years: by 2023, pharmaceutical sales in Europe will grow by 21.6% to \$ 438.6 billion, while in Ukraine - by 36.4% to \$ 4.26 billion.





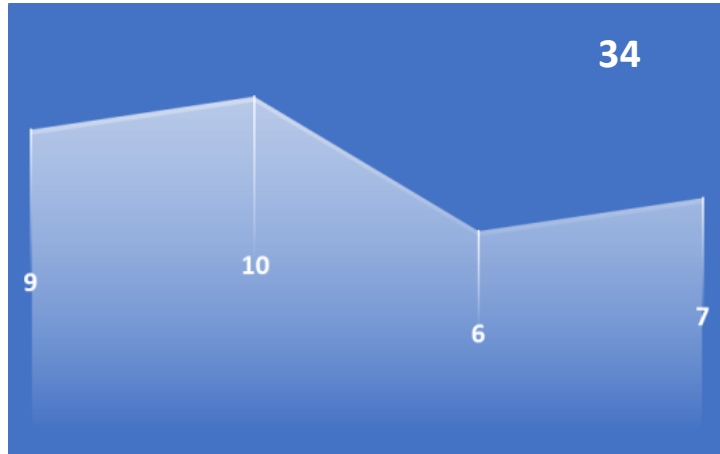
# INDEX OF COMPANY INNOVATION



**The aviation and space industry** closed the top three.

These companies have a high level of uniqueness of their innovations (products) that contribute to sustainable development, as well as an average level of manufacturability of business processes and work with staff and readiness for change.

# INDEX OF COMPANY INNOVATION



**IT companies** close the group that received the highest rankings.

These companies are characterized by a high rate of innovative business processes and work with staff, but at the same time they demonstrate their inflexibility in working with customers.

# INDEX OF COMPANY INNOVATION

Fitch Solutions refers Ukraine to the category of high-reward markets, ie markets with high potential. Analysts see two main factors for the growth of Ukrainian pharmacy.

The first is expanding public access to health services.

The second is the harmonization of regulatory documents between the regions of Europe, which will help reduce administrative costs and facilitate the approval, registration and launch of products.

For Ukrainian pharmaceutical companies, the Fitch Solutions report is good news. Domestic pharmacy is focused on the segment where the greatest growth is expected - available generic drugs. The business is already preparing for a breakthrough, in particular, attracting funds from international and domestic investors.

# INDEX OF COMPANY INNOVATION

The report cites the example of Yuri Pharm, which in June 2019 raised an EBRD loan of 25 million euros to expand its capacity to produce cancer drugs. And the Ukrainian-related IT company Viseven has attracted investment from venture capital AVentures Capital. The amount of the deal has not been disclosed, but AVentures typically invests up to \$ 1.5 million in IT companies. Viseven creates software for pharmaceutical companies, including mobile applications.

This year, the pharmaceutical company Darnitsa has started searching for strategic partners abroad and in Ukraine. The shareholders intend to transform it from a Ukrainian company into an international one. To do this, the company is carrying out a digital transformation: completely translates into digital the life cycle of drugs, introduces cloud storage services and electronic document management. For the last three years Darnitsa received five positive conclusions on compliance with GMP (good manufacturing practice) requirements from regulatory authorities in European countries. In addition, Darnitsa is ready to invest up to \$ 100 million in investments in foreign pharmaceutical startups.

# WHICH BUSINESS REPRESENTATIVES DO NOT HAVE ENOUGH TO INVEST IN UKRAINIAN R&D



# THE GLOBAL INNOVATION INDEX (GII) 2021

**49<sup>th</sup>** Ukraine ranks 49th among the 132 economies featured in the GII 2021.

**The Global Innovation Index (GII) ranks world economies according to their innovation capabilities. Consisting of roughly 80 indicators, grouped into innovation inputs and outputs, the GII aims to capture the multi-dimensional facets of innovation.**

The following table shows the rankings of Ukraine over the past three years, noting that data availability and changes to the GII model framework influence year-on-year comparisons of the GII rankings. The statistical confidence interval for the ranking of Ukraine in the GII 2021 is between ranks 43 and 53.

**Rankings for Ukraine (2019–2021)**

	<b>GII</b>	<b>Innovation inputs</b>	<b>Innovation outputs</b>
<b>2021</b>	49	76	37
<b>2020</b>	45	71	37
<b>2019</b>	47	82	36

- Ukraine performs better in innovation outputs than innovation inputs in 2021.
- This year Ukraine ranks 76th in innovation inputs, lower than last year but higher than 2019.
- As for innovation outputs, Ukraine ranks 37th. This position is the same as last year but lower than 2019.

**3<sup>th</sup>** Ukraine ranks 3rd among the 34 lower middle-income group economies.

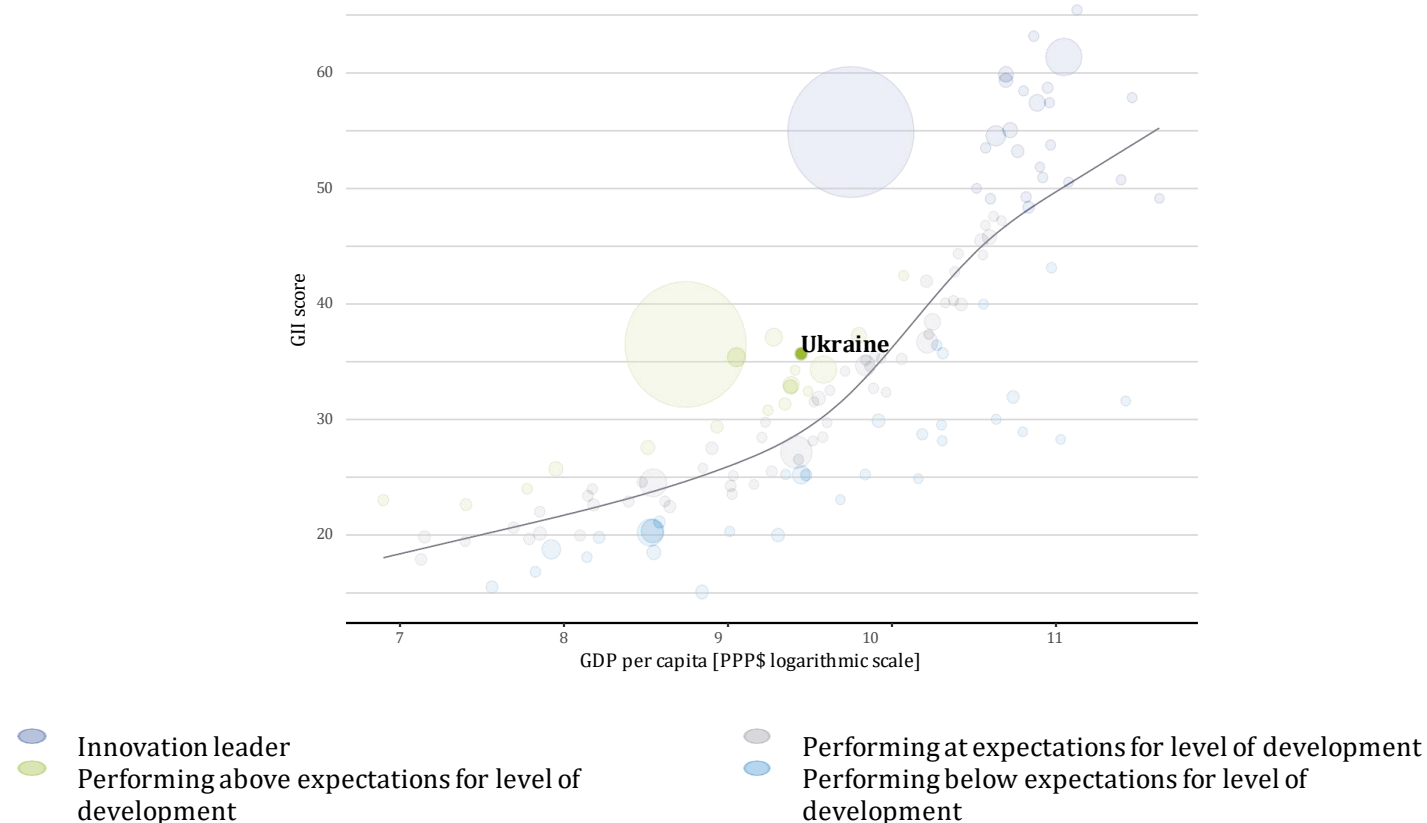
**32<sup>th</sup>** Ukraine ranks 32nd among the 39 economies in Europe.

# EXPECTED VS. OBSERVED INNOVATION PERFORMANCE

The bubble chart below shows the relationship between income levels (GDP per capita) and innovation performance (GII score). The trend line gives an indication of the expected innovation performance according to income level. Economies appearing above the trend line are performing better than expected and those below are performing below expectations.

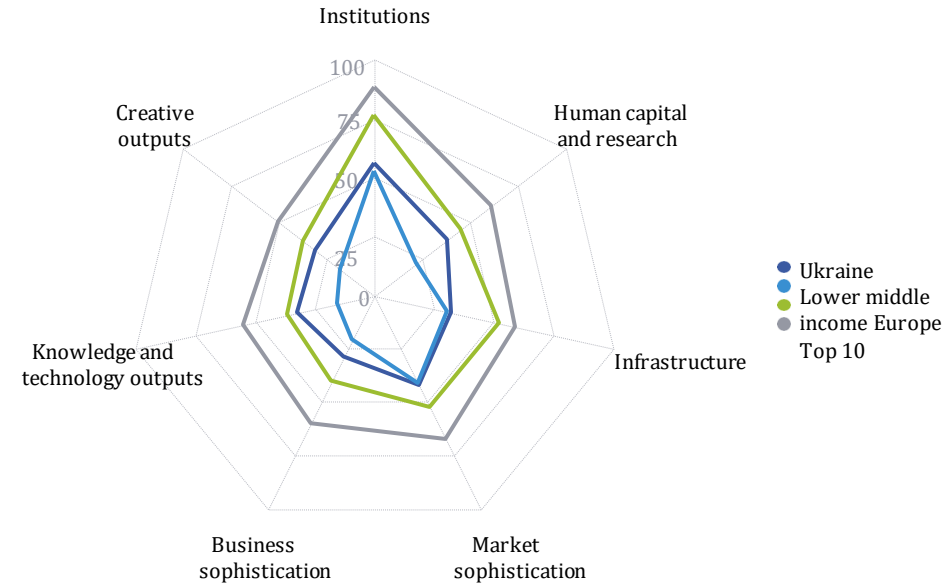
Relative to GDP, Ukraine's performance is above expectations for its level of development.

## The positive relationship between innovation and development



# BENCHMARKING AGAINST OTHER LOWER MIDDLE-INCOME GROUP ECONOMIES AND EUROPE

## The seven GII pillar scores for Ukraine



### Lower middle-income group economies

Ukraine performs above the lower middle-income group average in all GII pillars.

### Europe

Ukraine performs below the regional average in all GII pillars.



# INNOVATION STRENGTHS AND WEAKNESSES

The table below gives an overview of the strengths and weaknesses of Ukraine in the GII 2021.

## Strengths and weaknesses for Ukraine

Strengths			Weaknesses		
Code	Indicator name	Rank	Code	Indicator name	Rank
2.1.2	Government funding/pupil, secondary, % GDP/cap	7	1.1.1	Political and operational stability	123
2.1.5	Pupil-teacher ratio, secondary	7	1.3.2	Ease of resolving insolvency	117
2.2.1	Tertiary enrolment, % gross	18	2.3.3	Global corporate R&D investors, top 3, mn US\$	41
5.1.5	Females employed w/advanced degrees, %	2	3.2	General infrastructure	124
6.1.3	Utility models by origin/bn PPP\$ GDP	1	3.2.3	Gross capital formation, % GDP	125
6.2.3	Software spending, % GDP	17	3.3.1	GDP/unit of energy use	120
6.3.4	ICT services exports, % total trade	9	4.1.3	Microfinance gross loans, % GDP	79
7.1.1	Trademarks by origin/bn PPP\$ GDP	10	4.2	Investment	120
7.1.3	Industrial designs by origin/bn PPP\$ GDP	15	4.2.2	Market capitalization, % GDP	73
7.3.4	Mobile app creation/bn PPP\$ GDP	17	4.2.4	Venture capital recipients, deals/bn PPP\$ GDP	93
			5.2.4	Joint venture/strategic alliance deals/bn PPP\$ GDP	116
			7.2.2	National feature films/mn pop. 15–69	97

# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

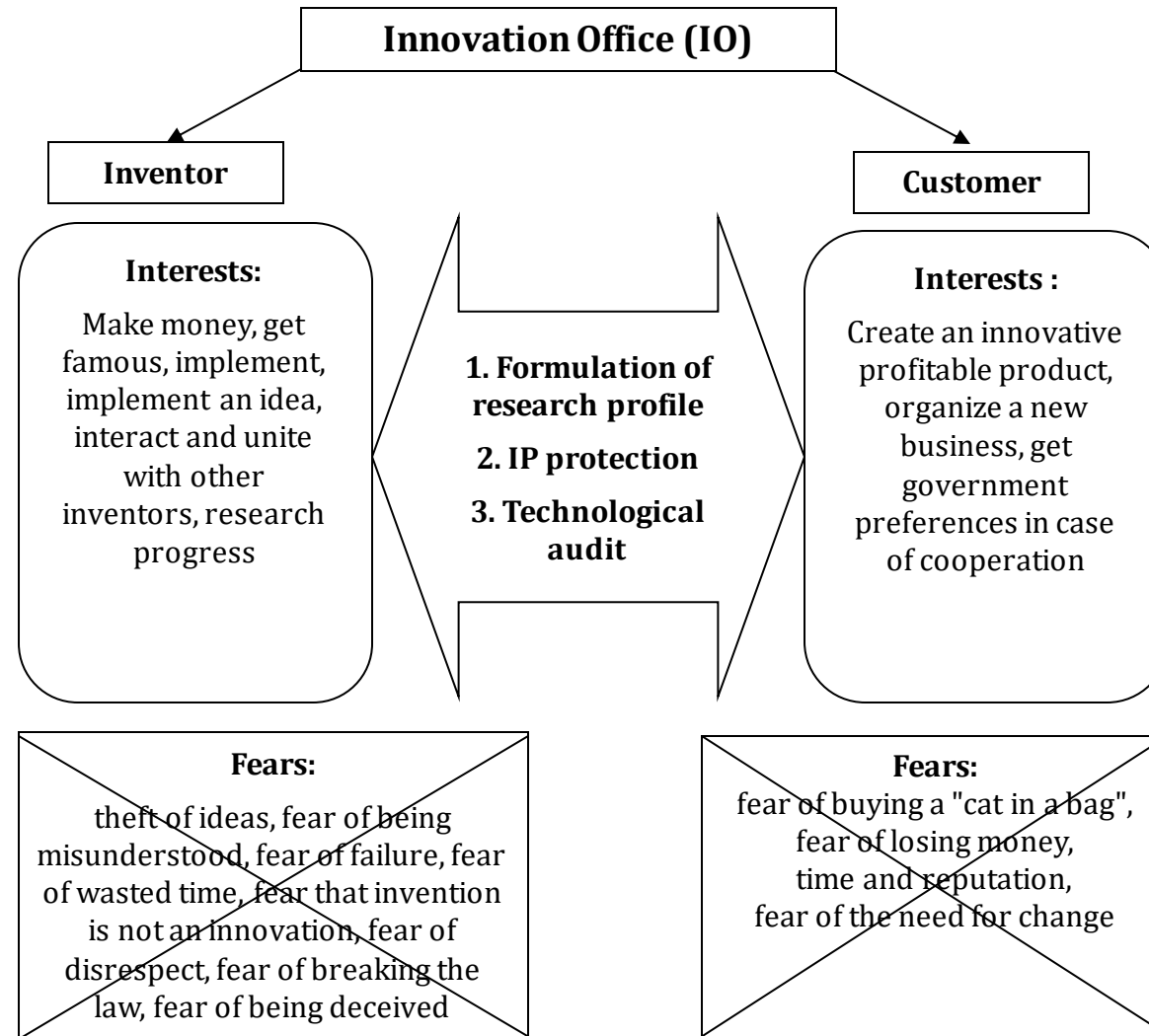


Fig. 1 An effective machine for the transfer of ideas to society

# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

**Participation in competitions for research funding is not possible without:**

- qualitative research;
- firm commitments of the university management;
- financial resources allocated to achieve goals;
- definition of research competencies and skills;
- valorization of research potential at the international level;
- international cooperation;
- timely information system;
- bilateral and effective dialogue with the industrial sector;
- effective management system and administrative system;
- simplified administrative procedures (time and responsibilities);
- qualified staff and quality IO services.

# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

Tasks of an effective machine:

- 1. Formulate the research profile of the university.**
- 2. Conduct technological audit of industrial enterprises.**
- 3. To protect the idea of the inventor.**

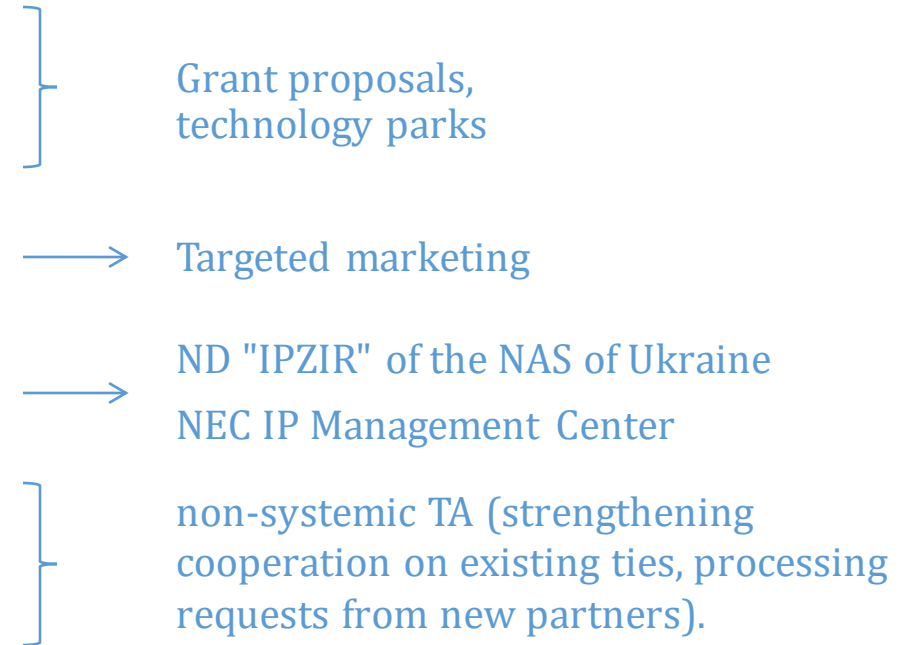
Preparation for determining the research potential of the institution included:

- inquiries about scientific interests;
- inquiries about previous experience and links with industry;
- identification of scientific competencies in certain areas.

# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

## **Pilot operations of the ONU Center "Innovation Office": barriers and overcoming.**

1. There is interest from "business angels".
2. Distrust of the new structure;
3. Existing marketing activities required targeted positioning;
4. A legally agreed system of material incentives and protection of IP rights has not been developed.
5. Technological audit (the need for additional unplanned costs).To involve 2 independent experts)



# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

## **Result:**

- formed a new team of scientists aimed at participating in project competitions to fund research;
- undocumented developments and potential have not yet been documented.

## **Features that separate the innovative activities of universities:**

- directed and timely communication;
- coordination with international partners;
- constant dialogue with customers.

## **Principles of organization of innovation infrastructure of the university:**

- the principle of division of labor;
- the principle of professionalization of intangible assets management;
- the principle of allocation of technological transfer in an autonomous organized process, which is organized and pursues clear goals, characterized by specific measurable indicators.

Efficiency is achieved through the feasibility of all elements of the organizational structure of the university as a leader of innovation.

# UNIVERSITIES AS ENGINES OF INNOVATION: FROM THEORY TO PRACTICE

The developed proposals and experience gained in the EU project "Universities for Innovation" regarding the practical implementation of the tasks of Innovation Centers of Universities can create an **effective machine for the transfer of ideas to society** in the case of:

- taking into account the recommendations on the legislative regulation of the income received by the university,
- centralized technological audit services,
- endowment of Innovation Centers of Universities with the rights of an independent legal entity,
- benefits in the case of the introduction of university innovations and preferential regimes for the operation of university technology parks.

# TASKS OF UNITS FOR TECHNOLOGICAL TRANSFER OF HIGHER EDUCATION INSTITUTIONS

## **1. Analysis and training:**

- In-depth needs analysis and comparative study of existing practices in Ukrainian and European higher education institutions.
- Working visits of representatives of Ukrainian higher education institutions and government officials to EU universities.
- Building an innovative culture among universities.

## **2. Innovation offices:**

- Awareness and support of innovation and research activities among university staff and students.
- Support of scientists in the implementation of innovation and research projects.
- Identification, valorization and transfer of research results.
- Involvement of universities in international projects.
- Establishing a strategic partnership with industry.



# TASKS OF UNITS FOR TECHNOLOGICAL TRANSFER OF HIGHER EDUCATION INSTITUTIONS

## **3. Capacity development:**

Developing the potential of university staff to encourage and promote research is a key factor in activating the knowledge triangle.

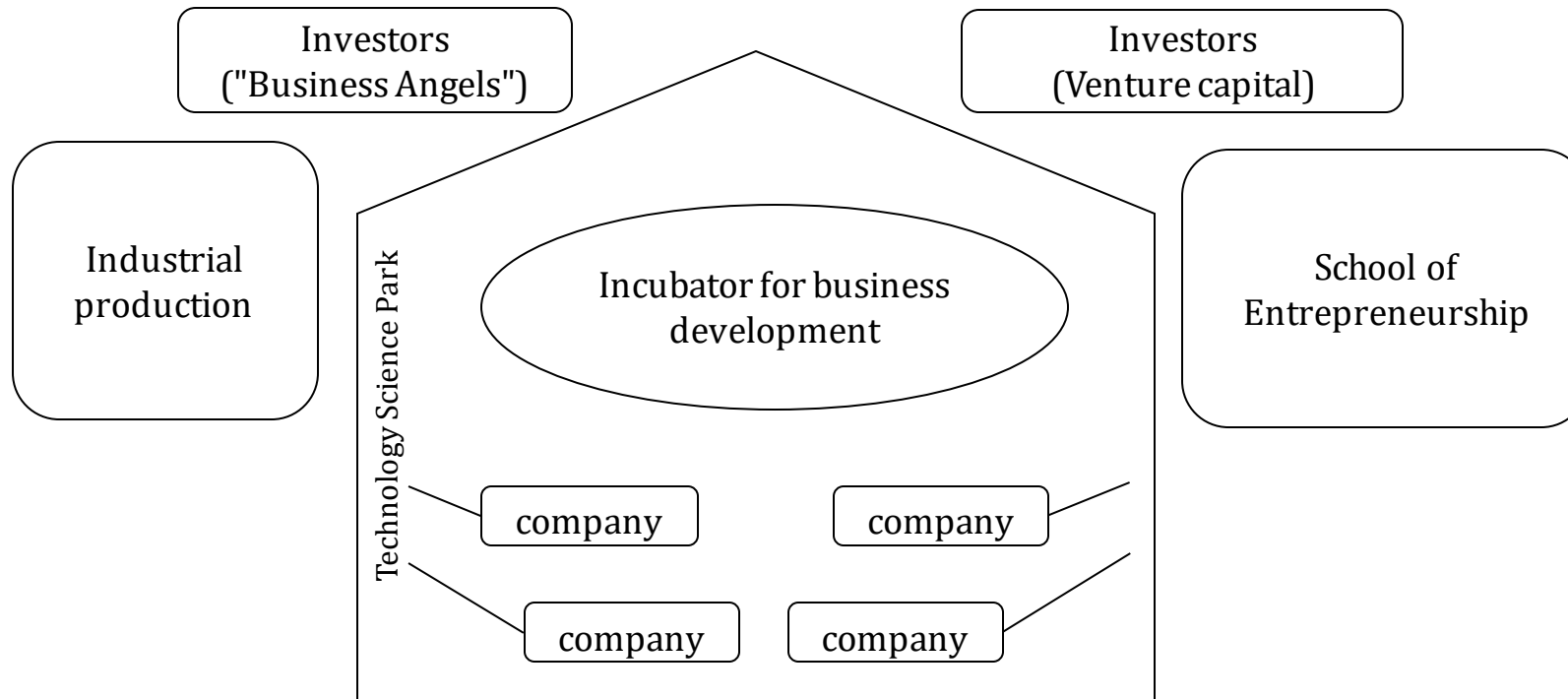
Opportunity for internships for employees of Ukrainian universities by:

- conducting activities to support the transfer of innovation and knowledge among universities;
- intensification of research cooperation with enterprises and participation in international projects;
- management of intangible assets and intellectual property rights.

## **3. Establishing business contacts:**

Development of innovation networks as platforms for regular dialogue and exchange among universities, enterprises and other participants in the innovation system.

# INTERACTION OF STUDENTS WITH REGIONAL INNOVATION SYSTEM

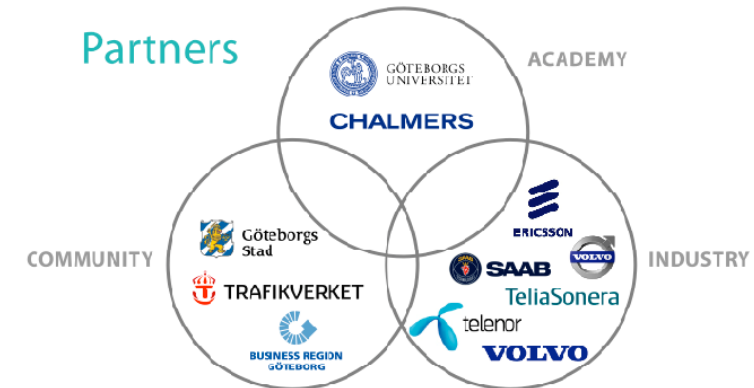


*Fig. Gothenburg Regional Innovation System*

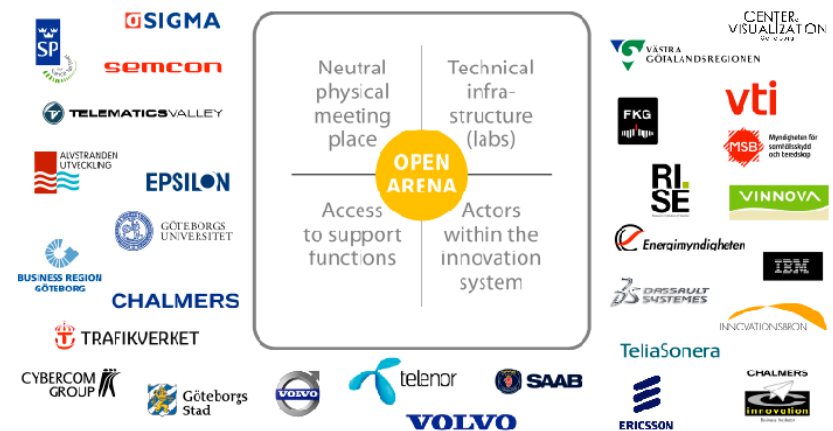
# LINDHOLMEN INTERNATIONAL SCIENCE PARK



## Lindholmen Science Park



## Infrastructure/Partners



# INTELLECTUAL PROPERTY RESEARCH CENTER (IP-RC)

**Consulting company on research and development of production to help high-tech companies in building and managing a business based on intellectual assets.**

## **Purposes:**

- conducting interdisciplinary research in the field of intellectual asset management;
- assistance to clients in creating a knowledge-based business;
- assisting clients in building platforms and interfaces that facilitate the creation of a knowledge-based business;
- intellectual asset management;
- management of operations of purchase and sale of knowledge and technologies;
- patent management;
- building organizational schemes and internal incentives in knowledge-based business;
- increasing the value of new knowledge and technology through software, standardization, control of production and use;
- assistance in knowledge and technology management at various stages of technology transfer (patenting, licensing, branding and trademarks, commercialization, partnership development, joint ventures, technology licensing and integration).

# WESTERN INNOVATION OFFICE

## Innovation Office West



**Objective:** "Providing qualified support in the implementation of research results through commercialization, including patenting and licensing, knowledge transfer."

### Specifics:

- works closely with other structures to support the university's innovation, which allows to coordinate the stages of transfer for the researcher;
- provides services for 7 other free economic zones, is engaged in the search for companies interested in the development of Chambers.

INNOVATIONSKONTOR  
Väst

# KEY PROCESSES OF INNOVATION SUPPORT

- 1. Education and communication**
- 2. Work with research structures**
- 3. Identifying the value of research results** (decentralized process with clear procedures)
- 4. Evaluation of the possibilities of using research results** (creative unstructured process)
- 5. Commercialization**
- 6. Management** (Within the selected strategies to promote innovation with a regional or thematic focus)

# ORGANIZATIONAL SUPPORT OF THE FUNCTIONING OF THE INNOVATIVE UNIVERSITY

- the principle of division of labor;
- professionalization of intangible assets management;
- allocation of technological transfer in an autonomous organized process, which is organized and pursues clear goals, characterized by specific measurable indicators.

**Efficiency** is achieved due to the feasibility of all elements of the organizational structure of the university as a leader of innovation to optimize the management function.

Elements of the organizational structure were born as a result of the need to perform constantly emerging tasks to stimulate innovation and a clearer implementation of a certain stage of innovation.



# LEGAL SUPPORT OF STAGES OF COMMERCIALIZATION OF SCIENTIFIC DEVELOPMENTS IN UKRAINE

The mechanism of commercialization of developments of higher educational institutions and scientific institutions of state ownership consists of 6 stages:

1. Technological audit (TA). At least 2 independent experts in the relevant field are involved in conducting the TA.
2. Marketing research (MD).
3. Economic audit (EA).
4. Obtaining security documents. After the assessment of the scientific and technical level of development, economic efficiency of development and evaluation in accordance with paragraph 1.4.2, if necessary, additional actions are taken to obtain security documents (patents, certificates).
5. Promotion.
6. Concluding a contract. Agreements are concluded in accordance with the norms and requirements of the Law of Ukraine "On state regulation of activities in the field of technology transfer".



# **BARRIERS TO THE INTRODUCTION OF INNOVATION STRUCTURES (IP) IN HEI, WHOSE ACTIVITIES ARE AIMED AT THE COMMERCIALIZATION OF THEIR RESEARCH AND DEVELOPMENT**

- increased responsibility and insufficient motivation of participants in the process of knowledge and technology transfer;
- lack of interdisciplinary competence (management, economics, intellectual property, legal protection of developers) of IP employees;
- uncertainty of coordination and subordination of IP ("Education"? "Science") due to the need to respond quickly to requests from entrepreneurs;
- the complexity of developing and legally agreeing on a clear and transparent, mutually beneficial system of material incentives for all participants in the process of implementing innovations with the participation of free economic zones;
- internal competition and distrust of researchers;
- lack of incentives for entrepreneurs to participate in the acquisition of free economic development (in particular, tax);
- lack (lack) of the budget of the Free Economic Zone for the development (salary, material support) of IP.

# ORGANIZATIONAL SUPPORT FOR THE COMMERCIALIZATION OF EUROPEAN RESEARCH: KEY INDICATORS OF THE PROCESS

## Indicators of progress in the transfer of knowledge, technology and innovation with the participation of HEI:

- increase in the number of funded research contracts;
- increase in the number of registered patents, licenses, establishment of enterprises initiated by the development of free economic zones;
- increase in the number of contracts for the commercialization of the results of scientific, technical, research activities of the Free Economic Zone;
- growth in the number of created "spin-out" enterprises and the amount of external financing;
- increase in the number of knowledge and technology transfer agreements with external customers;
- growing number of partnerships with businesses and government organizations.
- growth of income from commercialization of intellectual property rights of the Free Economic Zone.

# VALUE ADDED AS A SOURCE OF NATIONAL INCOME

The central macroeconomic indicator within the concept of expanded economic production is gross domestic product

$$GDP = GVA + VAT + NIT ,$$

where *GVA* – the amount of gross value added at producer prices;

*VAT* – Value Added Tax;

*NIT* – net import taxes (amount of import taxes less import subsidies).

# VALUE ADDED AS A SOURCE OF NATIONAL INCOME

Traditionally, the determination of the economic value added of trade in the gross domestic product of the country is the official statistical indicator of exports. Similarly, bilateral trade balances are considered to illustrate the balance of economic interests between two trading partners. Gross value added (GVA) is calculated as the difference between output of goods and services and intermediate consumption. There are other schemes for calculating GVA: as the sum of consumption and accumulation (in the economy as a whole), by adding depreciation, wages and profits (distribution method). The sum of sectoral GVA is gross domestic product (GDP). Its derivative - net value added (NDA) is calculated by summing the wage and profit fund or reducing GVA on depreciation, taxes and other payments. This is a national income, the level and dynamics of which are also of great importance. NPV - newly created value in the form of income of employees and owners. Airborne forces are an effective sectoral and macroeconomic performance indicator.

# VALUE ADDED AS A SOURCE OF NATIONAL INCOME

**The Trade in Value Added (TiVA)** database is a joint initiative of the Organization for Economic Co-operation and Development (OECD) and the World Trade Organization (WTO). It is derived from the OECD I / O tables linked together by a bilateral database on industrial goods and end-use, and assesses bilateral trade flows in services (STAN Bilateral Trade Database by Industry and End-use category). [<https://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm>].

At TiVa, the information is aimed at better tracking global production networks and supply chains. OECD Global Value Chain Indicators are presented for 59 countries (34 OECD countries and 23 non-OECD countries) for 18 industries in 1995, 2000, 2005, 2008 and 2009. These indicators are calculated on the basis of 5 global I / O matrices. TiVa data.

# VALUE ADDED AS A SOURCE OF NATIONAL INCOME

## *TiVA indicators include:*

- breakdown of gross exports by industry by domestic and foreign origin;
- the content of gross export services by exporting industry (broken down by internal and external origin);
- bilateral trade balances based on value added flows embodied in domestic final demand goods;
- intermediate imports embodied in exports.

# QUANTITATIVE AND QUALITATIVE MOVEMENT OF INDUSTRIAL POWER. CAPITALIST LABOR. MEASURING ECONOMIC BACKWARDNESS. THE REASON FOR THE DEBT DEPENDENCE OF COUNTRIES WITH A RAW MATERIAL ORIENTATION. CONSEQUENCES OF RAW MATERIALS ORIENTATION OF THE ECONOMY.

*Industry 4.0*

*Big Data Analytics*

*Autonomous robots*

*Simulation*

*Horizontal and Vertical Integration*

*Industrial Internet of Things*

*Cybersecurity*

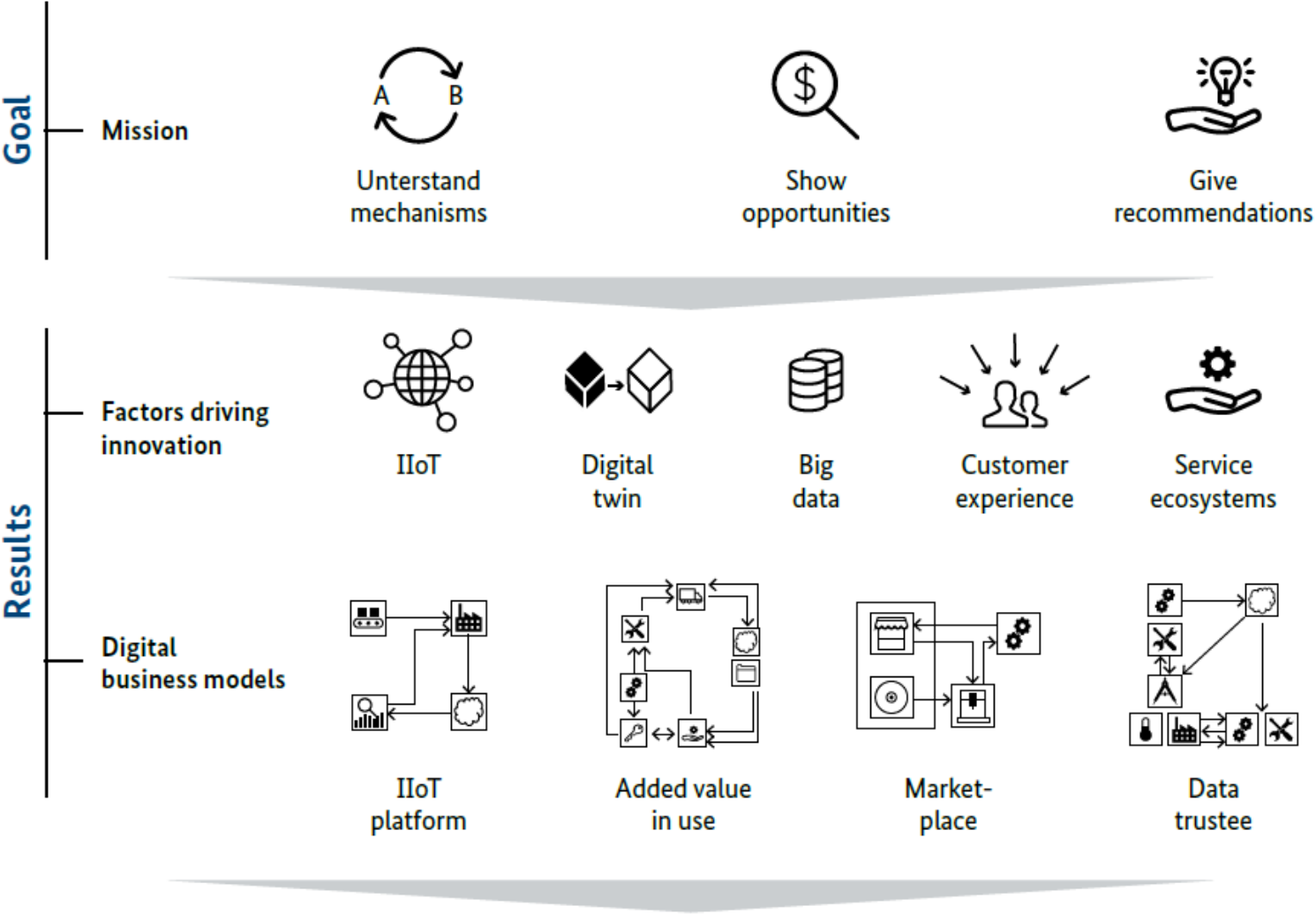
*Clouds*

*Additive Manufacturing*

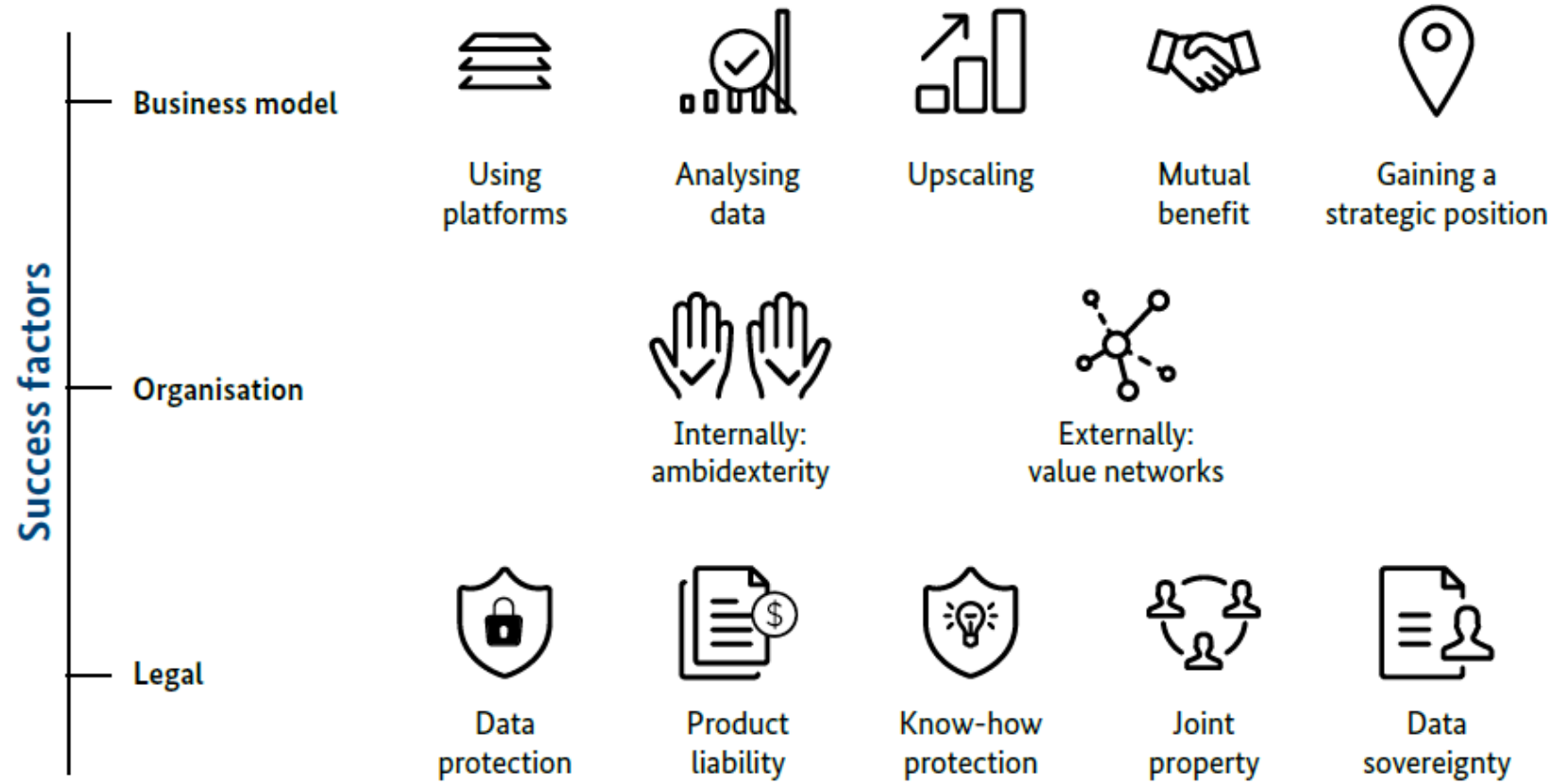
*Virtual Reality*

Source: Скіцько В.А.Індустрія 4.0 як промислове виробництво майбутнього [http://www.investplan.com.ua/pdf/5\\_2016/8.pdf](http://www.investplan.com.ua/pdf/5_2016/8.pdf)

Figure 1: Digital business models for Industrie 4.0



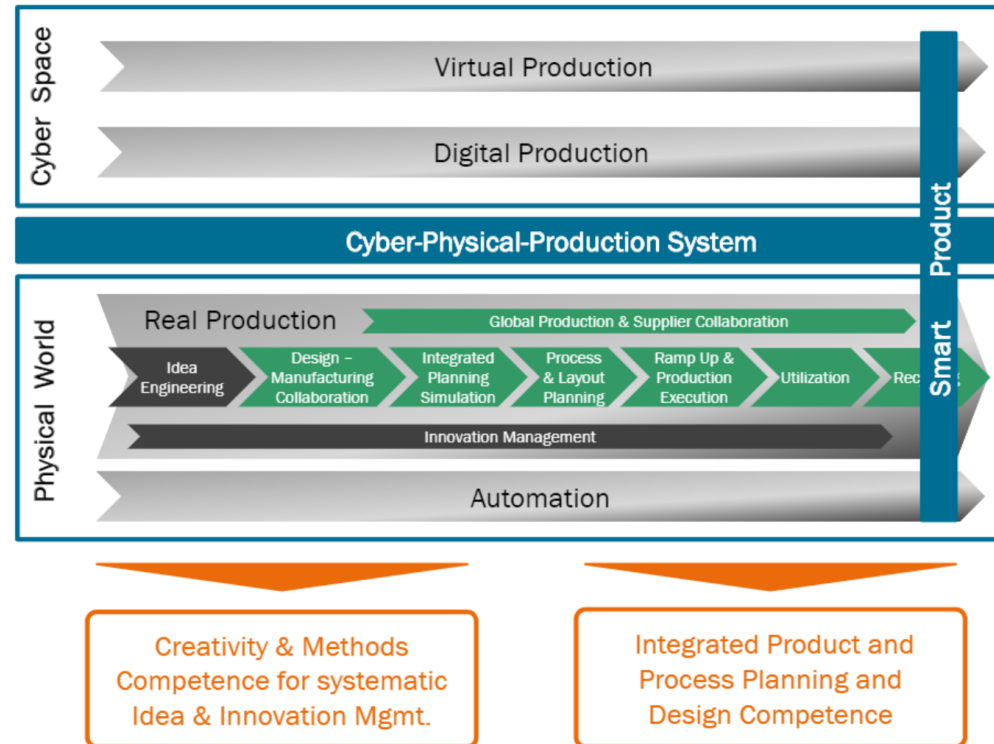




Source: Plattform Industrie 4.0

# Industry 4.0

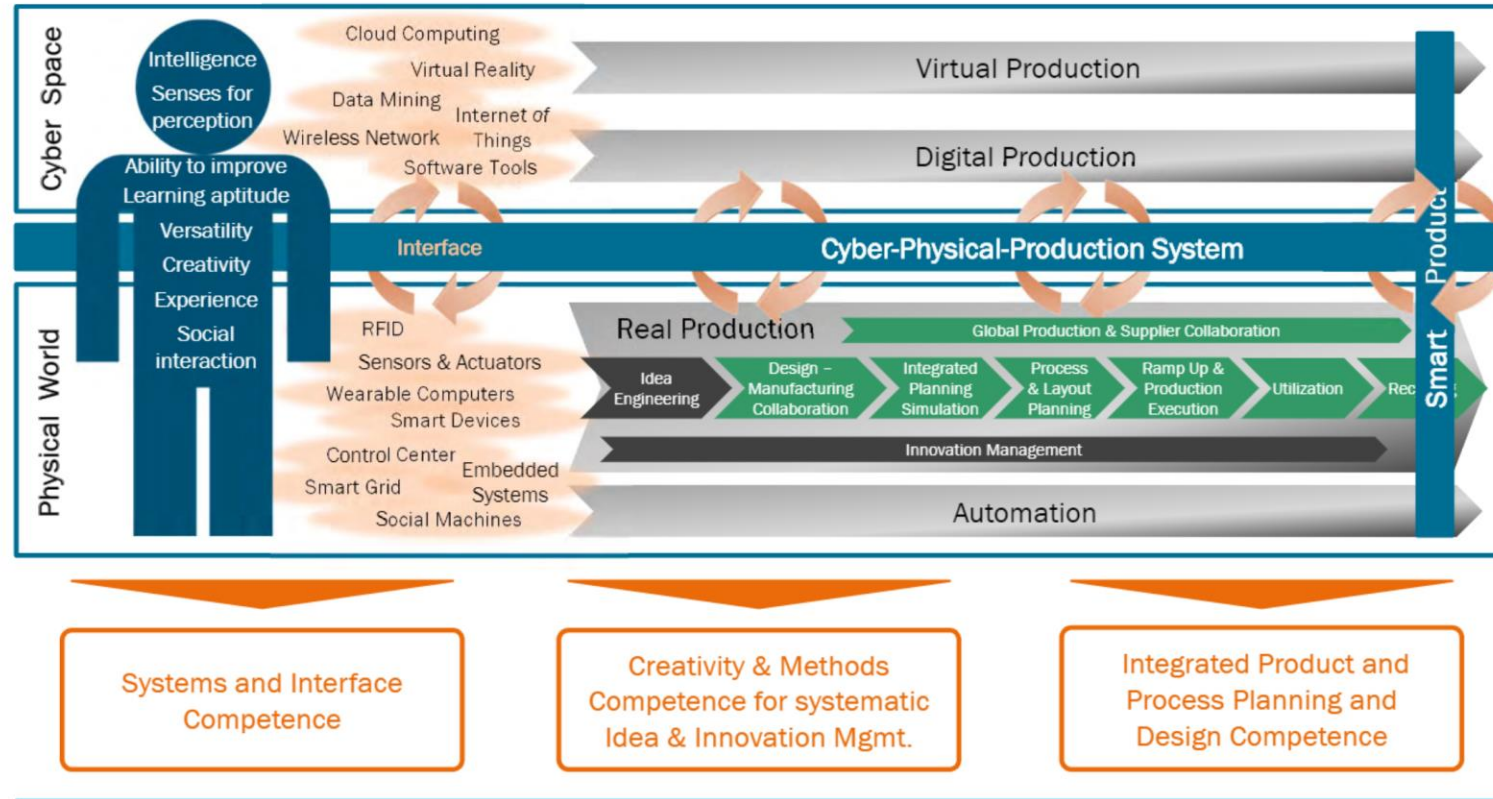
## Essential competence requirements



Source: Jäger, A., Ranz, F., Sihn, W., & Hummel, V. (2014). Implications for Learning Factories from Industry 4.0. In Proceedings of the 4th Conference on Learning Factories. Stockholm, 28.05 (pp. 1-35).

# Industry 4.0

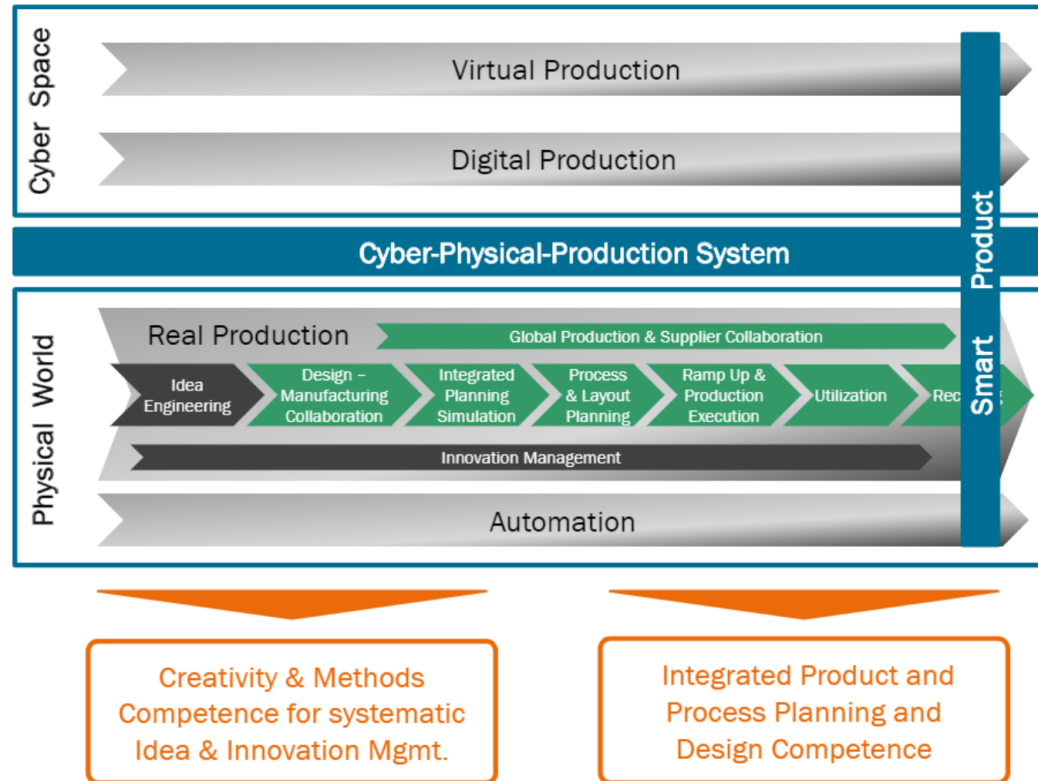
## Essential competence requirements



Source: Jäger, A., Ranz, F., Sihm, W., & Hummel, V. (2014). Implications for Learning Factories from Industry 4.0. In Proceedings of the 4th Conference on Learning Factories. Stockholm, 28.05 (pp. 1-35).

# Industry 4.0

## Essential competence requirements



Source: Jäger, A., Ranz, F., Sihm, W., & Hummel, V. (2014). Implications for Learning Factories from Industry 4.0. In Proceedings of the 4th Conference on Learning Factories. Stockholm, 28.05 (pp. 1-35).

STOP WAR

HELP UKRAINE