MINISTRY OF ECONOMIC DEVELOPMENT AND TRADE OF UKRAINE

DRAFT

CROSS–SECTOR EXPORT STRATEGY 2019–2023

INNOVATIONS FOR EXPORTS

RESEARCH

Trade with Ukraine

Ukraine NOW

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ACKNOWLEDGEMENTS

The Cross-Sector Export Strategy "Innovations for Exports" (hereinafter – the "Strategy") was initiated by the Ministry of Economic Development and Trade of Ukraine in the framework of "Export Strategy of Ukraine: Strategic Trade Development Roadmap for 2017-2021 and Action Plan" implementation, elaborated with the support of the International Trade Centre and Non-Governmental Union "Foundation for Support of Reforms in Ukraine" and with financial contribution from the German government through Deutsche Gesellschaft für internationale Zusammenarbeit (GIZ) GmbH.

The document benefited particularly from the inputs and guidance provided by the National Team Coordinator Mr. Sviatoslav Sviatnenko, representative of the Global Shapers Community (Kyiv Hub) of the World Economic Forum.

The views expressed herein may not reflect the views of the German federal company Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, Non-Governmental Union «Foundation for Support of Reforms in Ukraine» and the Ministry of Economic Development and Trade of Ukraine, or individual participants of the three rounds of National Consultations on the Development of Sector and Cross-sector Export Strategies.

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ACRONYMS

AR	Augmented Reality
COSME	Competitiveness of Small and Medium Enterprises
EaP	Eastern Partnership
EIS	European Innovation Scoreboard
EASME	Executive Agency for Small and Medium-Sized Enterprises
EU	European Union
GCI	Global Competitiveness Index
GDP	Gross Domestic Product
GII	Global Innovation Index
IoT	Internet of Things
IP	Intellectual Property
IPR	Intellectual Property Rights
ITC	International Trade Centre
ICT	Information and Communication Technologies
LMIC	Low-and Middle-Income Countries
MEDT	Ministry of Economic Development and Trade of Ukraine
MES	Ministry of Education and Science of Ukraine
NIPs	National Innovation Policies
NIS	National Innovation System
OECD	Organisation for Economic Co-operation and Development
PoA	Plan of Action
R&D	Research and Development
R&I	Research and Innovation
S&T	Science and Technology
SME	Small and Medium Enterprises
STI	Science, Technology and Innovation
STEM	Science, Technology, Engineering and Math
Strategy	This Strategy
UNECE	United Nations Economic Commission for Europe
US	United States of America
VC	Venture Capital
VR	Virtual Reality
UVCA	Ukrainian Venture Capital and Private Equity Association
WIPO	World Intellectual Property Organization

EXECUTIVE SUMMARY

Innovation supports a country's economic growth by improving productivity, generating employment, creating new business opportunities and enabling economies to react flexibly to emerging global trends. An enabling innovation environment involves a range of public and private institutions working together within a coherent National Innovation System (NIS), coordinated through government policies that facilitate the effective development and inter- action between the institutions and incentivise innovative activities in both the public and pri- vate sectors. Globalization and new technological advances have reinforced competition and the opening of new markets, offering opportunities for innovation in products and services. Major emerging market countries are moving up the value chain through the development and export of innovative products, processes and services, particularly in higher technology industries.

Although firms are the main innovators in an economy, National Innovation Policies can play a critical role in removing the barriers they face and stimulating innovation activities. Tradi- tional approaches, economic mix and government policies can result in varying emphases being placed on the role the government plays in stimulating innovative activities. There is a general trend globally toward a more firm-centred innovation and university-centred R&D approach. Governments are increasingly seeking to strengthen the foundation of the know- ledge triangle through public research; business innovation; and entrepreneurship (includ- ing skills). Direct and indirect government financing of business R&D has been increasing significantly in both absolute and relative terms.

Ukraine's innovation performance has been strong in recent years. It is the highest ranked LMIC in the Global Innovation Index, having moved from a rank of 71 in 2013 to 43 in 2018. It ranks relatively high in innovation outputs relating to knowledge, technology and creative outputs, but low on inputs such as strength of institutions, human capital; research; infrastruc- ture; market and business sophistication. Between 2013 and 2018, Ukraine's innovation input scores and rankings have broadly remained the same, but its output scores and rankings have increased significantly; principally due to improvements in knowledge creation, impact and diffusion, as well as creative outputs such as trademarks and mobile apps. The European Innovation Scoreboard finds Ukraine's human resources and employment impacts to be the strongest innovation dimensions, while linkages and an innovation-friendly environment are the weakest. Since 2010, Ukraine's EIS innovation performance has declined by 4.2% compared with the EU average.

Ukraine has great potential for developing a more innovative export-oriented economy and this needs to be supported by more proactive, coordinated government policies and a robust National Innovation System. The country has strong foundations for an innovative economy, with a very high number of IT professionals; a vibrant start-up culture; significant record in patent registration; and a network of specialized universities. However, the country has been experiencing emigration of skilled professionals; increased political and economic risks; financial crisis and currency devaluation; and slow implementation of planned reforms. There are also important gaps in the NIS, including a coordinating structure; a dearth of tech- nology transfer entities; and weak demand for innovation from the government and private consumers.

Ukrainian enterprises and academia need to be more innovative. For example, just 17% of Ukrainian companies consider themselves to be innovative, compared with an EU average of 49%. R&D spending has been declining since the 1990s, with the majority of investment ear- marked for innovation actually going to procurement of machines, equipment and software licenses. Barriers to innovation highlighted include the concentration of exports in tradition- al low-innovation sectors; low consumer demand for domestic innovation; lack of access to finance; weak IP protection; and a dearth of innovation and innovative-export-related infor- mation. Schools and academia are not connected with industries; research scientists face constraints in undertaking innovation-related research; scientists lack incentives and ability to commercialise their outputs; and linkages with international R&D institutions are weak.

In recent years, the government and private sector have implemented a number of initiatives to stimulate research. However, these are often ad hoc rather than part of a coherent strategy that is effectively coordinated and communicated. A number of national and regional govern- ment agencies are charged with promoting innovation, but their activities are often not coor- dinated effectively. The private sector (in some cases in partnership with the government), has been leading in developing clusters, science parks, incubators, accelerators, co-work- ing spaces and innovation centres. These initiatives, including independent start-ups and

established high-tech companies, have contributed to a rapid increase in innovative high-tech exports from Ukraine, albeit from a low base.

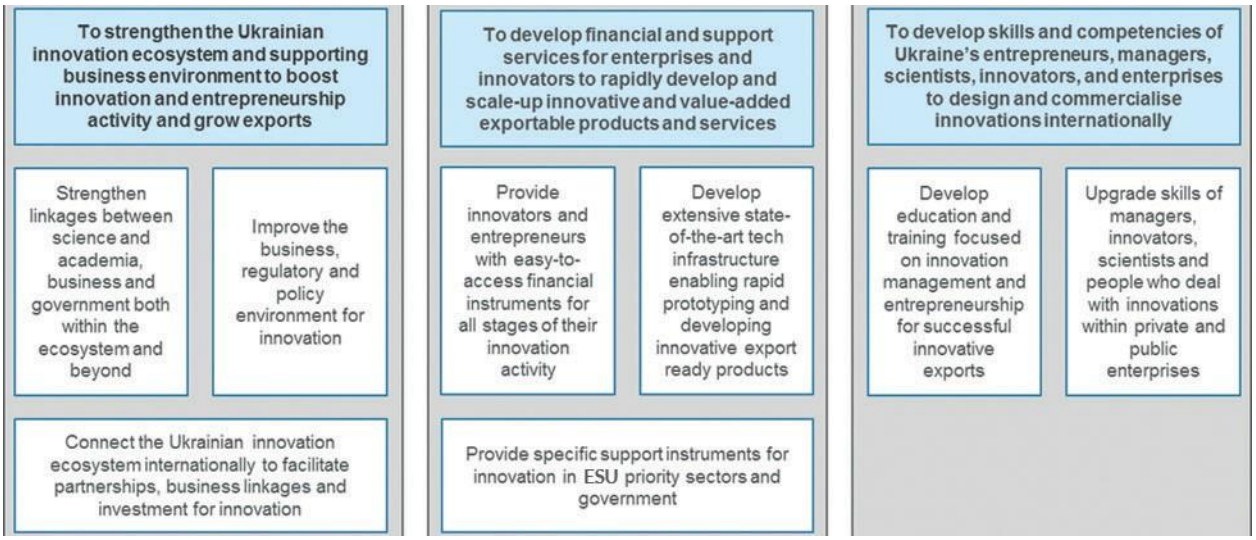
The following key interventions are priorities in order to strengthen Ukraine's ability to export innovative products and services:

- Strengthening the Ukrainian innovation ecosystem through, supporting the business environment to boost innovation and entrepreneurship activity, and grow exports;
- Developing financial and support services for enterprises and innovators so they can rapidly develop and scale-up innovative and value-added exportable products and services;
- Developing the skills and competencies of Ukraine's entrepreneurs, managers, scientists, innovators, and enterprises, to design and commercialise innovations internationally.

The following is the proposed vision and strategic objectives of this Strategy. The vision statement was agreed upon by all stakeholders of the Innovation for Exports cross-sector in Ukraine:

A creative economy for innovative, competitive and value-added exports

The Strategic Plan of Action responds to this vision by addressing key constraints and leveraging opportunities in a comprehensive manner. Particular efforts will be made in the following strategic and operational objectives are provided in the below.



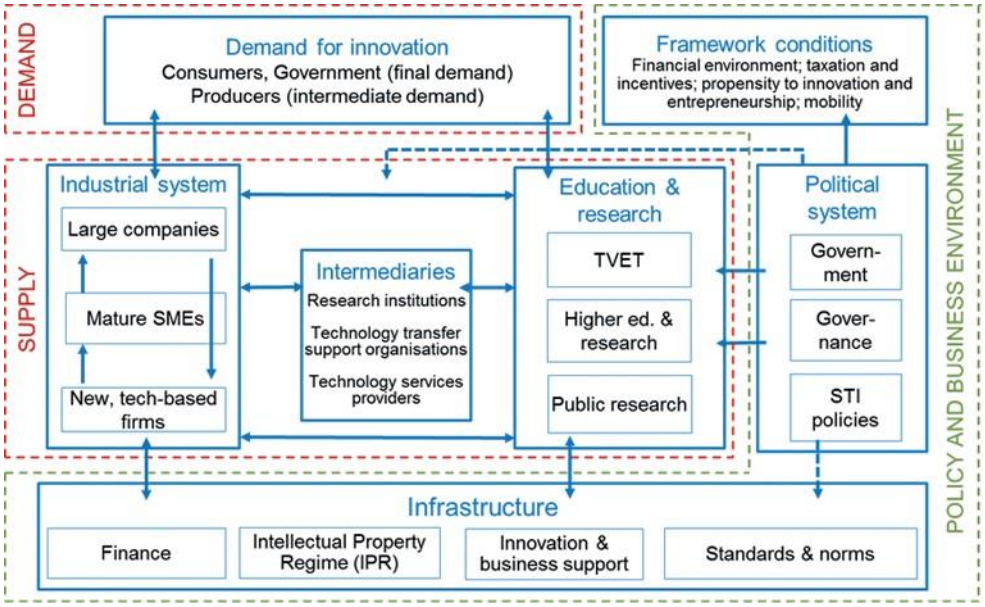
Coordinating activities, monitoring progress and mobilizing resources for implementation will be critical to successful achievement of these targets.

INNOVATION: CONTEXT AND INTERNATIONAL DEVELOPMENTS

Definitions and background

An innovation is the implementation of a new or significantly improved product (good or service), or process, or marketing method, or organisational method in business practices, workplace organisation or external relations[1]. Innovation contributes to economic growth by improving productivity, generating employment, creating new business opportunities and enabling economies to react flexibly to emerging global trends. A supporting innovation environment involves a range of institutions working together within a coherent National Innovation System (NIS) and coordinated government policies. These facilitate the effective development and interaction between the institutions in the NIS and incentivise innovative activities in both the public and private sectors.

Figure 1: Components of and interactions in a National Innovation System[2]



As Figure 1 highlights, a NIS typically includes:

- Entities that create demand for innovation, typically local and overseas consumers, governments and firms (for example, as part of value chains);
- Suppliers of innovation: primarily firms, business or start-ups, but increasingly governments or NGOs;
- An enabling business environment and government policies. This includes business-focused educational system that also engages in fundamental and applied research and development, and intermediaries that can, for example, assist in commercialization of R&D.

  The government's science, technology and innovation (STI) policies, wider economic policies, and the country's business environment (importantly, the ICT infrastructure technology readiness of firms) provide critical foundations and catalytic impetus to the innovation system. The Intellectual Property governance framework, and the institutions that implement the IP Regime are included here, alongside innovation support institutions and finance providers.

A key prerequisite for a successful NIS is an effective governance mechanism that facilitates the coordination and collaboration between its components.

[1] Oslo Manual: Guidelines for collecting and interpreting innovation data. Third edition. OECD. 2005.
[2] Source: Adapted from RCN in the Norwegian Research and Innovation System. Stefan Kuhlmann and Eric Arnold, November 2001.

GLOBAL AND REGIONAL INNOVATION TRENDS AND UKRAINE

In recent years, globalization and new technological advances, especially ICTs, have reinforced competition and the opening of new markets, offering opportunities for innovation in products and services. Major emerging market countries are moving up the value chain through the development and export of innovative products, processes and services, particularly in higher technology industries. China, in particular, has significantly increased investment in R&D and has been increasingly focusing on exports of goods and services higher up the value chain. Innovation in environmentally friendly technology is also an increasingly important trend[3].

Innovation and competitiveness

Innovation is a key component of countries' economic competitiveness. This is recognised in the WEF[4] Global Competitiveness Index (GCI), which ranks economies based on their innovation and business sophistication factors, basic requirements[5] and efficiency enhancers[6].

Table 1: Global competitiveness and innovation: Top 10 GII countries vs Ukraine and regional[7]

Top 10 countries			Ukraine and selected neighbours		
Country	GCI Overall Ranking	GCI Innovation Ranking	Country	GCI Overall Ranking	GCI Innovation Ranking
Switzerland	1	1	Russian Fed.	38	49
United States	2	2	Poland	39	59
Singapore	3	9	Turkey	53	69
Netherlands	4	6	Romania	68	96
Germany	5	5	Ukraine	81	61

Source: WEF Global Competitiveness Index 2018

Table 1 highlights that there is a strong correlation between the top five GCI ranked countries and the rankings for their innovation component (eight of the top 10 GCI countries were also ranked in the top 10 for innovation), highlighting innovation's importance for competitive strength. Ukraine and its neighbours rank significantly lower in GCI. With the exception of Ukraine, the innovation ranking of these neighbours lags significantly behind their overall GCI rankings, suggesting the need to strengthen this aspect of economic competitiveness.

Global innovation index and trends in regional innovation performance

The Global Innovation Index (GII) ranks countries by their innovation inputs, outputs and efficiency through the indicators highlighted in Figure 2.

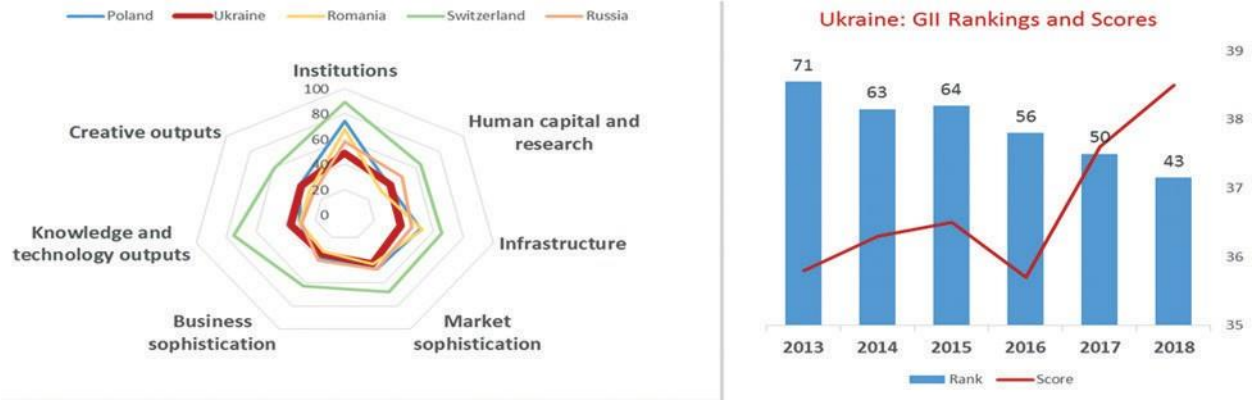
Traditionally, the higher income countries in Northern Europe and North America have led the GII, with Switzerland ranked number one for the last 10 years. In the 2018 index, the US dropped two positions (from fourth to sixth); in Asia, China broke into the top 20 for the first time (in 17th position) mainly due to increased focus on R&D. However, the innovation performance of Asian countries overall continues to be impeded by protectionism, particularly in technology-intensive sectors, IP and cross-country knowledge sharing.

A number of African economies, such as South Africa, Kenya and Malawi, have been high innovation achievers from low bases, focused on improving economic competitiveness through investment in science and technology (S&T) and labour skills. In Latin America, with the exception of Chile, Costa Rica, Mexico and Brazil, innovation is hampered by weak fiscal incentives, limited skilled workforces, and limited public investment in S&T. Eastern European

[3] Innovation and Growth: Rationale for an Innovation Strategy. OECD 2007.
[4] World Economic Forum.
[5] Including strength of institutions, infrastructure, macroeconomic environment and health and primary education.
[6] Including higher education and training, goods and labour market efficiency, financial market development, technology readiness and market size.
[7] Source: Global Competitiveness Index 2017-2018 Rankings (out of 137 countries). World Economic Forum.

countries, Bulgaria, Ukraine (see below), Moldova, Montenegro and Serbia, were the region's best achievers and the region generally saw strengthening in innovation across the board. In the Middle East, Israel (11th) continues to be a strong performer and the United Arab Emirates tops the list of Arab countries[8].

Figure 2: Innovation performance of Ukraine and its neighbours[9]



Source: Global Innovation Index 2018

As Figure 2 shows, with the exception of 2016, Ukraine has been performing well in the GII, increasing its ranking from 71 to 43[10] between 2013 and 2018. It is the highest ranked LMIC (the closest other regional LMICs are Moldova (48) and Georgia (59)). Ukraine's other neighbours highlighted in the Figure are Poland (2018 ranking: 39), Romania (49) and Russia (46). Ukraine's overall 2018 GII score was 38.5 (out of 100). In comparison, Switzerland, the leader, scored 68.4. At 35, Ukraine ranked relatively high in innovation outputs (covering knowledge and technology outputs (ranked 27 globally) and creative outputs (45)), but low (75) on inputs (strength of institutions (107), human capital and research (43), infrastructure (89), market (89) and business sophistication (46)). Between 2013 and 2018, Ukraine's innovation input scores and rankings have largely remained the same, but its output scores and rankings have increased significantly (score, from 22.7 to 36.6 and ranking from 118 to 35), principally due to improvements in knowledge creation, impact and diffusion as well as creative outputs such as trademarks and mobile apps[11].

Innovation performance in the European Union

The EU publishes the European Innovation Scoreboard (EIS)[12], covering its members and selected neighbouring countries (including Ukraine), to assist members assess their performance, track progress and develop innovation policy.

The 2018 EIS showed that the EU is accelerating, with average performance increasing by 6% since 2010, with expectations to improve by an additional 10% over the next two years. The EU continues to improve its position relative to the US, Japan and Canada, but China is catching up with three times the EU's innovation performance growth rate. Sweden leads the EIS. Lithuania, the Netherlands, Malta, the UK, Latvia and France are the best innovation improvers[13]. The report finds the largest difference between innovation leaders and laggards are found in areas such as human resources; attractiveness of research systems; innovation-friendliness of environment; finance and support for innovation; firm investment in innovation; availability of innovators; and linkages[14]. The EIS assessment of Ukraine finds

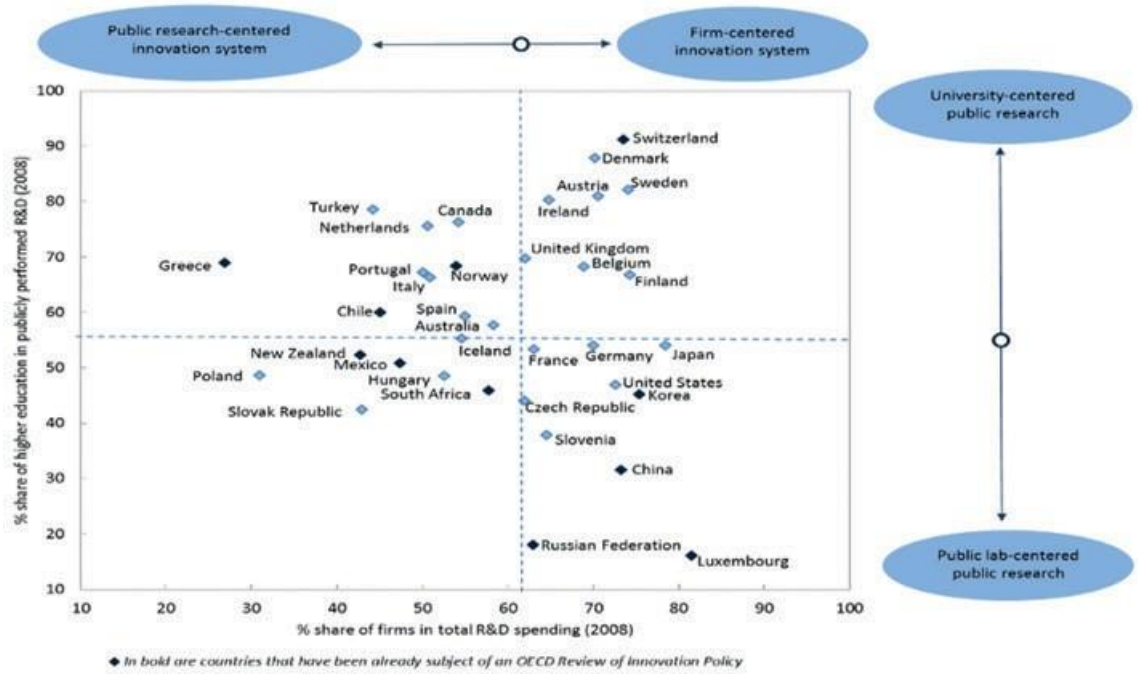
[8] Global Innovation Index 2018: Who's Up, Who's Down, and Why? Global Finance. 17 July 2018. Retrieved from: https://www.gfmag.com/global-data/non-economic-data/global-innovation-index
[9] Source: https://www.globalinnovationindex.org/analysis-indicator
[10] Out of 126 countries.
[11] https://www.globalinnovationindex.org/analysis-economy
[12] Based on performance on 27 indicators: Framework conditions capture the main drivers of innovation performance external to the firm and cover three innovation dimensions: Human resources, Attractive research systems, as well as Innovation-friendly environment. Investments capture public and private investment in research and innovation and cover two dimensions: Finance and support and Firm investments. Innovation activities capture the innovation efforts at the level of the firm, grouped in three innovation dimensions: Innovators, Linkages, and Intellectual assets. Impacts cover the effects of firms' innovation activities in two innovation dimensions: Employment impacts and Sales effects. (European Innovation Scoreboard 2017. European Union. 2017).
[13] https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en
[14] European Innovation Scoreboard 2018. European Union 2018.

human resources and employment impacts to be the strongest innovation dimensions, while linkages and innovation-friendly environment are the weakest. Since 2010, Ukraine's EIS innovation performance has declined by 4.2% compared with the EU average.

GLOBAL TRENDS IN INNOVATION POLICY

National innovation policies (NIPs) typically seek to: a) create a skilled workforce to provide the foundation for innovative activities; b) establish a supportive business environment; c) develop a strong and efficient system for knowledge creation and diffusion; d) implement policies to directly encourage forums to engage in innovation and entrepreneurial activities; and e) institute an effective governance and monitoring system to implement and assess the efficacy of STI initiatives.

Figure 3: Focus of innovation activities in public and private sectors[15]



Source: OECD Science, Technology and Innovation Outlook 2016. OECD. 2016

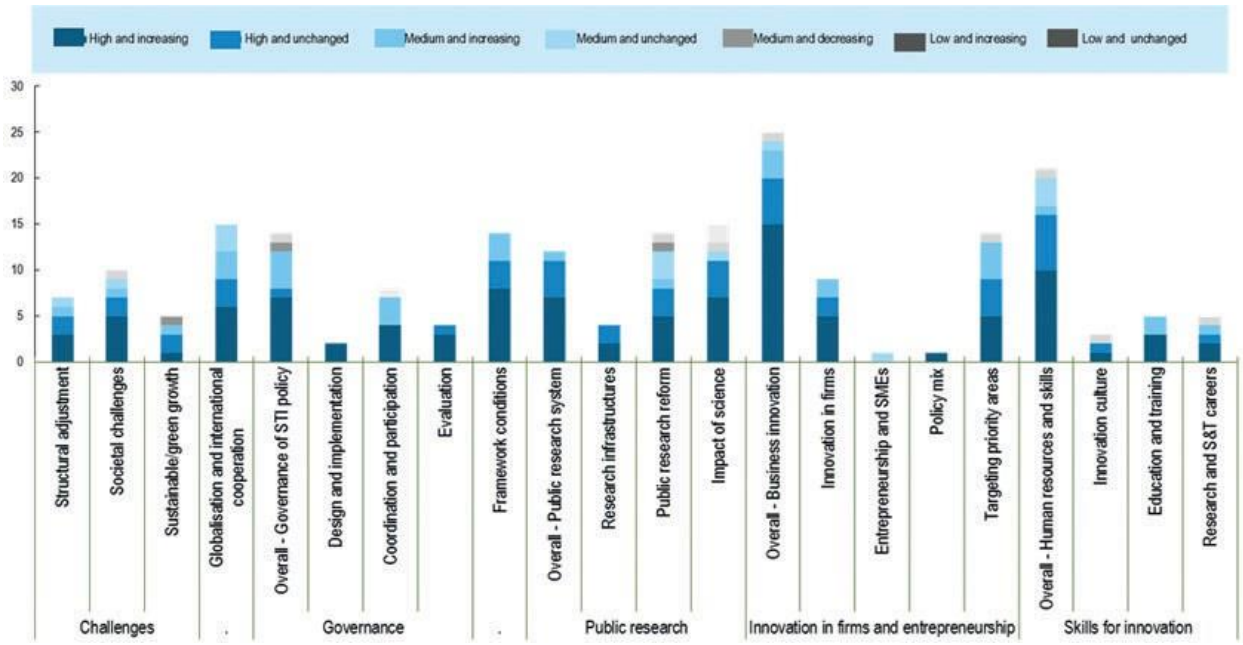
Firms are the main innovators in an economy. However, NIPs can play a critical role in removing the barriers they face and stimulating innovation activities. Traditional approaches, economic mix, and government policies, can result in varying emphases being placed on the role the government plays in stimulating innovative activities. As Figure 3 shows, innovative economies can be firm-centred, or public-research centred; and public research can be conducted in government labs or in universities. Switzerland, the most consistent innovation leader, has one of the most firm-centred innovation and university-centred research economies compared to other countries, but many other innovators, including Germany, Japan and the US, have a more mixed approach. There is a general trend toward a more firm-centred innovation and university-centred R&D approach[16], which requires universities to develop sophisticated IP policies and capabilities, even if they commercialise via licensing.

◇ Policy trends

Figure 4 highlights the implementation of different policy tools by governments in OECD countries and a number of large emerging economies based on an OECD Survey[17]. Governments are increasingly seeking to strengthen the foundation of the knowledge triangle: public research, business innovation and entrepreneurship (and skills).

[15] OECD Science, Technology and Innovation Outlook 2010. OECD. 2010.
[16] Ibid.
[17] OECD Survey. See countries covered (52) in OECD Science, Technology and Innovation Outlook, Chapter 4. Changes compared between 2014 and 2016. OECD, 2016.

Figure 4: Recent trends in adoption of innovation policy measures[18]



Source: OECD Science, Technology and Innovation Outlook 2016. OECD. 2016.

The survey finds trends with a clear emphasis on promoting business innovation through improving firms' ability to invest in R&D and innovation; an increasing share of public R&D funds are being allocated to the business sector instead of public research; direct and indirect support for business innovation, especially through competitive grants and R&D tax incentives the latter is supposed to more actively engage SMEs, start-ups, as well as support technologies transfer; governments increase public support to SMEs and support their access to international markets, including internationalization of clusters; streamlining business innovation policy programmes to ease access and encourage broad diffusion; and increasing the use of public procurement to catalyse business innovation.

Human resources and skills development to support innovation is another priority area, and governments have been seeking to widen the range of skills required to innovate through, increased budgets for STEM[19] education; updating curricula to develop generic skills, problem-solving capacity and entrepreneurial behaviour; and promoting programmes to popularise science and build science and innovation cultures.

Poland's Strategy for Responsible Development identifies at the national level 17 areas of Smart Specializations (each of the country's 16 regions have their own Smart specialization strategies), which are intended to focus R&I support. A third area of focus has been the strengthening of governance of STI[20] policies, with improved policy evaluation through more extensive use of online 'big data'; smaller and quicker evaluations and increased complexity of concepts and practices; more systemic evaluations; and building a more evidence-based knowledge base through the systematization of evaluation and other practices.

In public research, spending has generally been rationalized; more effective linkage between public and private research encouraged; interdisciplinary research and open science promoted; more non-government funding of public research (through public private partnerships and philanthropic and private science foundations) engaged; and governance of public research has been reformed and public research agencies and entities restructured to lower cross-disciplinary barriers.

In light of continuing post-crisis budgetary constraints, many governments have implemented 'no spending' policy approaches, halting additional short-term spending. There has also been a shift to demand-side instruments, with particular focus on targeted public procurement to encourage innovation.

[18] OECD Science, Technology and Innovation Outlook 2016. OECD. 2016.
[19] Science, technology, engineering and mathematics.
[20] Science, technology and innovation.

Table 2: Innovation policy in Poland

Most Central and Eastern European countries that have recently joined the European Union have aligned their innovation strategies with the Europe 2020 Strategy, which sets the Union's agenda for economic development for the current decade.

They have all invested in innovation, supported by EU funds, and have seen improvements in their innovation capabilities. Nevertheless, improvements in GII scores and rankings have generally been quite low over the last five years, highlighting the long-term nature of investments required and scale of institutional and policy coordination and implementation challenges that need to be addressed.

Poland, for example, has improved its GII score from 40.1 to 41.7 between 2013 and 2018 (GII ranking improved from 49 to 39). A recent EU report[21] on the country's Research and Innovation (R&I) landscape highlights the following challenges and policy responses:

- Increasing the intensity of private sector R&I through: increased attractiveness of R&D tax incentives; large portfolio of support and awareness campaign from public funding agencies for R&D intensive companies; and launching of new venture capital (VC) funds with corporate partners.
- Strengthening science and industry collaboration by: focusing on reforms of higher education and research institutes; promoting industry-oriented career tracks for scientists; launching an industrial doctorate scheme; and making available a variety of grants supporting collaboration and commercialisation as well as creation of Technology Transfer Offices.
- Increasing the quality of public research base through various legislative and structural initiatives aimed at differentiating research-oriented universities from others; increasing focus on science; and enabling easier mobility of researchers.
- Strengthening priority setting in the R&I governance system through increased inter-ministerial coordination in some areas as well as streamlining and prioritising list of smart specialisations.
- Other initiatives include the introduction of "Seal of Excellence" instruments by the country's National Centre for Research and Development (NCBR) and Polish Agency for Enterprise Development (PARP).

Trends in government funding of business R&D and innovation

Although most business R&D is financed by industry (average 86.5% for OECD countries in 2013) government financing for business R&D has increased significantly in absolute and relative terms. Direct funding through grants, debt financing (loans, guarantees and risk-sharing mechanisms) and public procurement remains the main mechanism for government support for business R&D. These, in addition to tax incentives and technology consulting, are increasingly important in many countries. Nevertheless, there is a large variation between countries in the mix of business R&D financing through direct and indirect mechanisms. Countries favouring indirect funding such as R&D tax incentives include France, Canada, Belgium and the Netherlands. On the other hand, countries such as Germany, Switzerland and Mexico only provide direct funding (which increasingly rely on more market-friendly approaches encouraging competition-based selection and streamlining public support schemes).

In the aftermath of the 2008 financial crisis, countries have increasingly used direct debt and equity financing for innovation and entrepreneurship to meet the shortfall in private (mainly bank) funding. Where feasible, countries have extensively used loan guarantees and risk sharing instruments to improve SME access to finance. Governments have also consolidated domestic equity markets (particularly for seed capital) through new or refunded venture capital funds, implemented support schemes for business angels and new co-investment schemes.

[21] RIO Country Report 2017: Poland. Research and Innovation Observatory country report series. K. Klincewicz, et al. 2018. Joint Research Centre. European Union.

Key takeaways

- Innovation is increasingly a critical prerequisite for developing a high-productivity, competitive and growing economy that seeks to move to higher value-added exports and integrate into global value chains.
- An innovative economy relies on a robust and coherent National Innovation System where all necessary components are in place and functioning smoothly. An effective National Innovation Policy plays an important role in providing the strategic framework for the NIS and ensuring the performance of each of the components, and the system as a whole, is optimised.
- International trends are toward more firm-centred innovation and university-centred R&D approaches, away from more direct government-led research interventions. Direct and indirect government financing of business R&D has been increasing significantly in both absolute and relative terms.
- Ukraine's international innovation performance has been strong in recent years. In global rankings it scores relatively high in knowledge, technology and creative outputs, and employment impacts, but low in areas such as: strength of institutions, human capital and research, infrastructure, innovation-friendly market and business sophistication and linkages.

National Innovation System

Ukraine's innovation and industrial strategy aims to be export-focused. Given the number of Free Trade Agreements (FTAs) signed (Canada, EU, Israel), more products are expected to be imported, thus increasing competition for domestic enterprises. Innovation is one of the key instruments for increasing the competitiveness of local firms.

In Ukraine, the NIS comprises both public and private institutions. The central executive bodies such as Cabinet of Ministers of Ukraine (CMU), Ministry of Economic Development and Trade of Ukraine (MEDT), Ministry of Education and Science of Ukraine, Ministry of Information Policy of Ukraine, National Investment Council and UkraineInvest are devoted to create a business environment that offers incentives for innovation, including promotion of the Ukrainian brand, protection of IP rights and attraction of foreign investments.

Table 3: Foundations for an Innovative Economy in Ukraine

- 99% literacy rate
- 500k+ construction, manufacturing, engineering students
- 2000+ start-ups
- 180,000+ professionals in IT[22]
- 146,000+ patents and utilities by Ukrainians since 2007
- US$ 250 M+ invested into Ukrainians companies in 2017
- Significant amount of specialized universities

Trends in innovation activities

The key trends affecting innovation in Ukraine since the Maidan/Revolution of Dignity are:

- Emigration and brain drain.
- Post-Industrialization, Technologization and Globalization (4G introduction, fast Internet and significantly increased mobile coverage).

[22] https://www.epravda.com.ua/news/2019/01/31/644857/

- Increased country risk for international corporations and capital, making Ukraine a less attractive investment destination.
- Continuous reforms and institution-building process (introduction of new institutions like advisory bodies on business, innovations and investment, both at Cabinet of Ministers of Ukraine and President level).
- European integration and strengthening of international affairs with the National Assembly[23] (signing and ratifying Horizon 2020, signing and ratifying DCFTA with EU, CUFTA with Canada, signing and ratifying COSME[24]).
- Rise of civil society & activism (new regional and industrial clusters, hubs, NGOs and business associations were founded).
- Financial Crisis and currency devaluation.

R&D spending has trended downward from nearly 3% of GDP in 1990, to 1.2% in 2004 and around 0.5% in 2017[25]. According to Ukraine Statistics Agency, in 2017 16.2% of enterprises were involved in innovations, spending UAH 9.1 billion. However, 65% of spending went to procure machines, equipment and software licenses. Moreover, UAH 7.7 billion was spent by enterprises from its revenues, while only UAH 600 million were credit costs. UAH 322 and UAH 380 million were received from government agencies and investors respectively[26].

Businesses, start-ups and entrepreneurs

The private sector is the most important driver of innovation in Ukraine, particularly in the ICT sector (IT in particular). Initiatives like co-working, learning and creative hubs and clusters are either supported by foreign grants and funds (e.g. EaP Culture and Creativity Programme for the Creative Towns and Regions Initiative), or by private investments. Central and local authorities usually provide assistance that does not involve additional efforts or funding, like giving away abandoned buildings.

Nevertheless, just 16.2% of Ukrainian companies are innovative[27] compared to the EU average of 49%. Most of Ukraine's industry is concentrated in traditional sectors that are usually characterized as low R&D (metals and heavy engineering), although IT exports are booming. The main implementers of R&D are academic institutions, while businesses are lagging behind on developing and introducing innovations.

Other limiting factors for export innovation are the lack of appreciation of the value of innovation and the inability to find appropriate financing. The lack of demand for innovation from large firms limits the market for new innovative technology based firms and limits the demand for local innovation. As a result, innovation is not seen as a priority and only a few "open innovation" programmes (as Reactor) and corporate incubators (as Radar Tech) currently operate in Ukraine. Investors in new Ukrainian tech firms and start-ups also frequently require investees to register their companies outside Ukraine, in a more conducive business environment.

The world's leading corporations with R&D offices in Ukraine include Samsung, Microsoft, Amazon (Ring), Siemens and Huawei. The country's IT sector is dynamic and fast-growing, due to emerging support organizations such as IT clusters, IT Ukraine Association[28] and Start-up Ukraine[29], which provide a range of support services and connect entrepreneurs with resources and business angels, organize numerous events as well as provide co-working spaces. Eighteen IT service providers with offices in Ukraine are on the list of IAOP (International Association of Outsourcing Professionals) 100 world's best outsourcing companies. Altogether, close to 180,000 IT specialists are currently working in Ukraine in more than 1,000 IT firms, while IT service exports reached US$4.5 billion in 2018 and is second only to agricultural exports as a proportion of GDP[30]. Ukraine has a significant IT talent pool with more than 200 Higher Education Institutions (HEIs), over 50 IT education providers and more than 15,000 qualified IT specialists that enter the IT industry per annum, which serves as a strong foundation for the country becoming a leading international technology and innovation hub.

[23] National Assembly of Ukraine: https://nau.inet.ua/
[24] http://cosme.me.gov.ua/
[25] Compiled on the basis of data of State Statistics Service of Ukraine [Online resource]: http://ukrstat.org/en
[26] https://www.ukrinform.ru/rubric-economy/2444528-v-proslom-godu-predpriatia-potratili-na-innovacii-svyse-9-milliardov-gosstat.html
[27] Defined as introducing a new product or process, either in the market or just in their enterprise.
[28] https://itukraine.org.ua/
[29] http://startupukraine.com/
[30] https://www.epravda.com.ua/news/2019/01/31/644857/

Academia, R&D and HEIs

Research centres are potentially an important component of the Ukrainian NIS. These include the National Academy of Science of Ukraine, which is an independent institution established on the basis of state property, as well as educational institutions both private and public. Nevertheless, creativity, initiative-taking, entrepreneurship and innovation are not valued nor sufficiently promoted in most state educational institutions. Schools and academia are often not connected with their surrounding economic and business environments and lack international linkages[31].

Between 1991 and 2015, the number of Ukrainian scientists dropped by almost five times, from 313,079 to 63,864[32]. The country is experiencing a loss of innovation potential due to the low prestige and poor employment conditions for researchers, combined with growing foreign demand for Ukrainian talent resulting in scientists emigrating to other countries. In addition, scientifically educated personnel at universities are mostly engaged in teaching, rather than research. Only half of the 350 Ukrainian universities perform R&D and many of these undertake very limited R&D. Ukrainian universities feature low in international rankings in this area.

Most international rankings highlight that in Ukraine inter-industry collaboration is weak, preventing firms from acquiring the latest industrial advances. Innovation management programmes are non-existent. Industry-academia co-authorship is rare. There is also little technology transfer as well as limited commercialization potential of innovations (via licensing, spin-offs).

In 2017, YEP!, the first University Incubator in the country[33] was founded. It creates courses and business incubators for students to empower them with key skills and knowledge required to develop and commercialize inventions and innovations. Moreover, the INSCIENCE[34] project was founded to build links between academia, business and government and popularize science and innovation. It organizes the largest science pop conference in Ukraine, as well as media projects and public lectures from local and international speakers.

Cases	
International:	**UA:**
Wageningen University (NL): Top Life Sciences University in the world Unilever to open R&D centre 65 people working on AgroRobotics Whole City/Campus unites biz, MNCs, funds, students and academia University Incubator with 100+ agro-tech start-ups	Kyiv Polytechnic Institute (KPI) KPI has industrial partnerships and creates spin-offs and operates a science park that has mechanisms for facilitating interaction with industry Start-up competition, conferences

NGOs, clusters, co-workings, business and innovation parks

Another important component of the Ukrainian NIS comprises unions and associations, such as the High-Tech Office Ukraine[35] and the Ukrainian Association for Innovation Development (UAID)[36]. High-Tech Office Ukraine is a union of high-tech enterprises whose goal is to create favourable conditions for the development of innovative business and digital economy in Ukraine. The High-Tech Office Ukraine's Supervisory Board includes representatives of MEDT, the Verkhovna Rada of Ukraine and the Presidential Administration, which enables effective interaction between the business and the government. UAID unites leading international and national companies in the spheres of IT, hi-tech, machine building, microelectronics, etc. and has similar mission to the High-Tech Office Ukraine.

[31] Farinha, op.cit.
[32] DOI: http://dx.doi.org/10.23856/2405
[33] http://www.yepworld.org/en/
[34] http://inscience.io/
[35] http://www.ht-office.org
[36] https://www.facebook.com/innovations.for.ua/

Kyiv, Kharkiv, Lviv, Dnipro and Odessa have been taking the lead among Ukrainian cities on a number of co-working spaces, hubs that have been created in the last five to six years. Such places create a collaborative atmosphere and provide necessary equipment to stimulate creativity and innovation, as well as develop skills by organizing workshops and trainings.

For example, iHub, is a project financed by the Seed Forum[37] with the support of the Government of Norway, as well as sponsorships from Finland, Sweden and UK. Kyiv City Administration is additionally providing administrative support in the form of an old building. This serves as a viable model of donor-private-public partnership that may be rolled out to other regions of Ukraine. iHub is a network of centres that aims to support and nourish innovation and entrepreneurship. It equips start-ups with necessary education and skills, mentorship support, and help in accessing investments and high-quality infrastructure[38]. Another example is the Pawillion[39] hub that creates an enabling environment for entrepreneurship, creativity and innovation, and aims to become a focal point for entrepreneurship and innovation in Lviv.

In 2016, a new project "Hub-laboratory Internet of Things" was launched as a platform for business, production and education[40] collaboration, with the support of the Agency for European Innovations. The aim of the HUB is to support adoption of Internet of Things (IoT) and digital manufacturing to provide competitive advantage for SME manufacturers.

In 2017, UNIT.City, inspired by the world's leading innovation centres, was opened in Kyiv. It is the first innovation park in Ukraine and is expected to become the focus of the country's creative economy[41]. Alongside the UNIT.City operates the Innovation Development Platform that was created with the support of the State Concern "Ukroboronprom" to attract innovation and commercialize start-ups in the defence industry. In 2017 UNIT.City held 400 events related to tech and innovations. The park has a number of deep tech laboratories with required infrastructure (fab lab, block chain, VR/AR, Agri). Concepter[42], Sector X[43], Radar Tech[44], and Reactor[45] are among key accelerators, incubators, open innovation platforms and venture studios present in Ukraine.

Cases	
International:	**UA:**
EPFL Innovation Park[46]	UNIT.City Innovation Park
Public & private & University partnership	Private project, revitalization of old moto factory
Part of Nation-wide Swiss programmes	25ha with residential and commercial property
Focus on life/agro/materials/energy deep tech science	Mix of corporates, start-ups, education
Access to equipment, R&D, science, 329 laboratories	Focus on innovation and ecosystem
160+ companies as residents	Perks for residents
	400+ events per year
	8 incubators/accelerators

Investors and investment funds

The current innovation policy, programmes, and relevant public funding, is limited and inadequate to promote innovation effectively in a sustained manner. The capacity to innovate is further impaired due to limited knowledge of entrepreneurs and innovators of opportunities to participate in international innovation programmes (like Horizon 2020[47]). Access to finance is rated by SMEs as a major barrier to growth. Debt financing is limited and interest rates are high. For early stage start-ups, there is low probability of ever getting a bank loan. Most investments

[37] www.seedforum.org
[38] http://ihub.world/en/about-us/
[39] http://pawillion.com/
[40] https://inno.lviv.ua/en/item/1016
[41] http://unit.city
[42] https://concepter.co/
[43] https://sectorx.city/
[44] http://radartech.com.ua/
[45] https://reactor.report/about
[46] https://epfl-innovationpark.ch/
[47] http://h2020.com.ua/uk/

in innovation are internally financed by companies. Equity financing through the stock market is mostly unavailable due to weak institutions and rule of law[48].

FDI in Ukraine is low compared to peer countries (and declined in 2014–2015 due to the Eastern Crisis). Most FDI is concentrated in relatively low-innovation sectors, such as machine building, metals, food processing, and finance and banking. Ukraine's talent, low costs, and large market size could and should drive additional FDI. But at the moment foreign multinationals limit their investments in Ukraine due to high business risk, including war, political instability and uncertainty, corruption, and weak rule of law.

Two organizations/business associations have been founded in order to increase investment flow and innovation financing: UVCA and UAngel.

- UVCA aims to shape the future direction of the venture capital and private equity industry in Ukraine by promoting its investment opportunities, advocating the interests of private equity investors to policymakers, and improving the local investment and business climate[49].

- UAngel is a Ukrainian business angels' network, providing a platform for entrepreneurs to meet investors and for investors to locally and internationally syndicate investments. It's a closed group of high net worth individuals or entities interested in financing early stage start-ups[50].

Currently UVCA has over 50 members, according to its annual report, and more than 20 funds operating in Ukraine. Some notable cases include Grammarly[51] (online grammar tool) that raised US$110 million from global reputable investment funds as General Catalyst[52], Spark Capital[53] and IVP[54].

Government institutions and policy

During the ESU consultations with innovation stakeholders, the lack of national and regional programmes to kick-start and support innovations export was highlighted as one of the key issues limiting innovative exports. In addition, there are fragmented efforts and currently no unified innovation strategy at national or regional level. Nevertheless, to support these efforts and focus on innovations a number of new institutions have been introduced in the last 3-4 years:

- SME Development Office funded by the EU whose goal is to increase the competitiveness of SMEs in Ukraine.

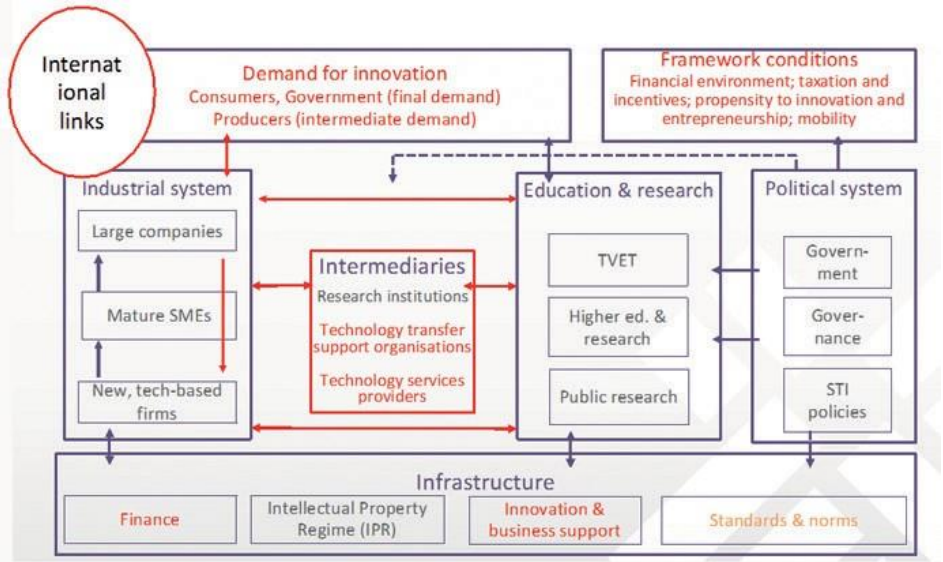
- UkraineInvest[55] – created to attract and support investment in Ukraine. It provides investors with objective, real-world information and advice, about doing business in the country.

- STII – State Finance Institution for Innovations (SFII) with a number of financial instruments including for innovation-focused enterprises.

- National Start-up Fund – UAH 350 million fund to invest in Ukrainian tech start-ups.

[48] Stakeholder consultations.
[49] http://uvca.eu/en
[50] http://uangel.com.ua/
[51] https://www.grammarly.com/
[52] https://www.generalcatalyst.com/
[53] http://www.sparkcapital.com/
[54] https://www.ivp.com/
[55] https://ukraineinvest.com/about-us/

Figure 5: Ukrainian national innovation system[56]



In addition to (1) supply, (2) demand, and (3) policy levels of the NIS, specific attention is given to the importance of international links and integration of Ukraine's NIS into global context. During the national consultations key stakeholders highlighted the critical need for the Ukraine's NIS to work efficiently and smoothly, connecting all the relevant actors, and enabling both demand and supply for innovations facilitated by targeted policies and government-led activities. On the other hand, some of the key shortcomings and drawbacks of Ukraine's NIS are:

- Limited demand for innovations from end-customers, large corporations and government.
- Weak international links and slow integration of Ukraine's NIS into global system.
- Weak links within the innovation ecosystem, in particular at the industry level between large business and new tech firms as well as between education, business and government regarding norms and standards policymaking.
- Infrastructure is particularly weak due to limited availability of finance and fragmented/ fractured innovation and business support measures.
- Some actors required for effective NIS are either too few or virtually non-existent, in particular technology transfer offices and commercialization offices.

During the national consultations, the following key problems limiting innovations for exports were highlighted:

- Weak NIS (both limited local collaboration between actors and little international collaboration).
- Limited access to financing.
- Poor access to markets (and no local market).
- Lack of business expertise (and serial tech entrepreneurs, mentors).
- Fragmented tech infrastructure and environment, from limited modern equipment to lack of unified innovations policy.

Key takeaways

- Most of these initiatives throughout Ukraine remain atomized lacking a joint strategy, notably at the level of communication and advocacy. There are attempts to link and realize joint projects, for example the "Coworking Friendly" initiative that allowed for free mobility of co-workers among a group of co-working spaces in Ukraine[57].

[56] A full list of institutions and stakeholders composing the Ukrainian National Innovation System is appended in the Annex.
[57] Farinha, op.cit.

- Overall, all necessary institutions for creation of positive incentives to innovate are in place. The problem mostly lies in the performance of these institutions, lack of communication and interaction between them, limited cooperation with foreign partners and diverse sector stakeholders, lack of intermediary organizations that would bring together all stakeholders interested in the field of innovations, and limited access to finance and poor IPR protection[58].

- National funding programmes that would create networks and clusters could help to improve the current situation. Additionally, as suggested in the Developing Culture and Creative Industries in Ukraine report, it may be useful to create specific and independent cross-ministerial task forces to coordinate and develop creative industries and innovations. Such task forces should include representatives from private sector, ensure interaction among all stakeholders, and represent the sector within the policy-making process.

- Given the number of advantages and achievements highlighted above Ukraine's NIS has untapped opportunity to boost innovations development and exports utilizing vast human capital, cost-effective resources. Nevertheless, currently high-tech products and services count for less than 5.5% of total Ukraine's export[59].

IPR GOVERNANCE AND POLICY FRAMEWORK

Domestic dimension of the legal framework

A comprehensive normative IP framework is in place in Ukraine. It consists of the Civil Code of Ukraine, the Law on Protection of Rights to Inventions and Utility Models, Law on Protection of Rights to Industrial Designs, Law on Copyright and Related Rights, Technology Transfer Law, Innovation Law, Law on Scientific and Scientific-Technical Activity and Law on Higher Education[60]. The normative framework is in line with the international developments of IPRs governance, in terms of the main types of rights, their duration, and limitation[61].

Since 2015, Ukraine has been active in developing legislation relating to patents, copyright and related rights, including trademarks and collective management organizations[62]. In 2015, the Strategy for Judicial Reform – with a focus on enhancing judicial independence and overhaul of the judicial system, was adopted by Presidential decree[63]. In June 2016, Ukraine adopted a number of legislative measures as part of the Strategy, including the establishment of the High Court for Intellectual Property (HCIP) as "a court of first instance for copyright, trademark and patent disputes[64]." In September 2017, Decree No. 299/2017 "On the Establishment of the HCIP" was signed by the President of Ukraine. One month later, the Parliament adopted the Law "On Amendments to the Commercial Code of Procedure of Ukraine, Civil Code of Procedure of Ukraine, Administrative Code of Procedure of Ukraine and Other Laws", which specifies a significant revision of the procedural law, including those related to IP[65].

The two ministries in charge of innovation in Ukraine are the Ministry of Education and Science of Ukraine (MES) – which oversees basic research, and the Ministry of Economic Development and Trade of Ukraine (MEDT) – which focuses on applied research and innovation. In 2016, the Cabinet of Ministers of Ukraine decided to transfer the functions of the State Intellectual Property Office, which was responsible for processing applications for granting IPRs, to MEDT. Since 2017, MEDT has been granted powers to issue patents and certificates for IPRs[66].

[58] See subsequent sections for an analysis of IP framework and issues in Ukraine.
[59] http://www.me.gov.ua/Documents/Detail?lang=uk-UA&id=200fad70-119d-4769-b8b2-287e6a94f8d2&title=TendentsiiRozvitkuZovnishnoiTorgivliUkraini
[60] World Bank (2018), p. 20.
[61] A complete and updated list of IP-related laws and regulations is found on: https://www.wipo.int/members/en/details.jsp?country_id=177
[62] Office of the United States Trade Representative (2018). Special 301 Report.
[63] Democracy Reporting International. (2018). Ukraine's new high Intellectual Property Court: Implications for the Justice System. Briefing Paper 91.
[64] The World Bank. (2018). Ukraine- Intellectual Property and Technology Transfer Regulatory Review. p. 15.
[65] Democracy Reporting International. (2018).
[66] World Bank (2018), p.15. MEDT Order date 22 March 2018 No 387 lists state enterprises that comprise the state system of IP protection.

In 2018, after in-depth review of Ukraine's IPR regulations, the European Commission concluded that the level of IP protection and enforcement remains weak[67]. The pending trademark applications database has become searchable and accessible free of charge for right holders which make it easier and faster for users to register trademarks and avoid trademark infringements in Ukraine. However, in most cases IPR limitations referred to fight against counterfeit products or piracy, which is less relevant for Ukrainian innovative companies exporting activities. Nevertheless, IPR reform is required to foster innovations and develop creative industries in Ukraine. Moreover, the EU-Ukraine Association Agreement shall lead to significant policy and regulations approximation, especially about copyrights, trademarks, e-commerce and patents.

International dimension of the legal framework

Ukraine is a party to a number of multinational and bilateral treaties. For example, it accedes to the Patent Cooperation Treaty (PCT) and Paris Convention for the Protection of Industry Property administered by the WIPO, and the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) administered by WTO[68]. Ukraine also signed an Association Agreement with the EU in 2014, under which Ukraine is obliged to ensure a sufficient level of effective protection and enforcement of IP rights. It is worth noting that a significant part of start-ups or innovation-focused companies are registered outside Ukraine and do not sell their products and services at Ukrainian market, so local IP regulations is less relevant for them.

INNOVATION RELATED PROGRAMMES, PLANS, AND POLICIES

Effective framework documents

Export Strategy of Ukraine: Strategic Trade Development Roadmap for 2017-2021 and Action Plan (hereinafter - the "ESU"), under the Ministry of Economic Development and Trade of Ukraine, 2017. This holistic strategy defines the overall Export Strategy of Ukraine. The ESU emphasises innovation as one of the key drivers of competitiveness of exporting Ukrainian SME. The first strategic objective of the ESU seeks to create an enabling environment that stimulates trade and innovation for diversified exports through a series of measures aimed at strengthening the institutional framework for innovation, and at boosting the innovation capacities of Ukrainian enterprises. The second strategic objective refers to enhancement of business and trade support services that would contribute to competitiveness of primarily small and medium business. Third objective is aimed at skills advancing (for small and medium enterprises in the first place). The ESU includes a specific cross-sector functional support strategy on innovation for exports. The ESU is built around five sectors with high potential for exports of value added and innovation-intensive products and services: (1) food & beverages; (2) machinery; (3) aircraft repair and maintenance; (4) information and communications technologies, and (5) creative industries.

Concept for Reforming the State System of Intellectual Property Protection in Ukraine adopted in June 2016 by the Cabinet of Ministers of Ukraine (for 2016–2017) proposes a two-tier structure for the state IPR protection system through the establishment of a national IP body accountable to MEDT based on the current Ukrainian IP Institute. The national IP body will perform a few public policy functions while the major IP policy competencies would belong to MEDT, as the main central executive body that formulates and implements national IP policy. The Concept also envisages harmonization of the national IP legislation with the EU law via implementation of the EU-Ukraine Association Agreement and ensuring proper functioning of DCFTA. Implementation is planned to be financed from the state budget allocations as well as by international technical assistance and bilateral donors. In August 2016, an Action Plan for implementation of the Concept was approved.

Medium-Term Plan of Priority Actions until 2020[69], adopted in April 2017 by the Cabinet of Ministers of Ukraine (the "Plan"). The Plan establishes that innovation development and IP sector reform are governmental priorities. The Plan aims at ensuring fundamentals for the

[67] http://trade.ec.europa.eu/doclib/docs/2018/march/tradoc_156634.pdf
[68] WIPO-Administered Treaties. Retrieved from https://www.wipo.int/treaties/en/ShowResults.jsp?treaty_id=2
WIPO (2019). Ukraine Treaty Membership. Retrieved from https://wipolex.wipo.int/en/legislation/profile/UA
[69] Cabinet of Minister of Ukraine. Discussion of the Draft Medium Term Plan of Priority Actions of the Government until 2020. Retrieved from: http://www.kmu.gov.ua/control/uk/publish/article?art_id=249634799&cat_id=244828445

development and introduction of innovations across economy sectors, as well as further switching to the digital economy (including revising of legislative and regulatory framework applicable to innovations, IP and digital economy; development of public policy in the sphere and enhancement of innovation development programs).

The Plan stipulates the establishment of the Innovation Development Office aimed to support and encourage the development of innovative companies and start-ups by providing funding, necessary expertise, and technical assistance at all stages of innovation in the real economy, from the idea to the final product. As a result, newly created hi-tech companies and start-ups will create new jobs, reduce "brain drain" from Ukraine and raise its investment attractiveness.

The Plan also provides for introduction of the program, which will represent Ukraine abroad as a leading producer of innovative high-tech products and services.

National Strategy for Education Development was adopted in 2013 along with the Plan of Actions, which covers the period until 2021. It aims at increasing accessibility and competitiveness of education based on the requirements of innovative social and economic development. Its key strategic development directions are increasing quality of education; introducing state standards for technical education; and optimization of technical schools' network in view of labour market needs locally and regionally. The main implementation directions of the strategy are update and modernization of educational legislation and system; formation of educational institutions' budgets based on the number of students; and multi-channel financing of educational system via introduction of subsidies, grants, credits and mix thereof depending on the funds recipients, etc. The strategy also contains national monitoring and evaluation components as well as a chapter on the expected results.

Information Society Development Strategy until 2020, was adopted by the Cabinet of Ministers of Ukraine in May 2013 and contains a section on e-economy. The strategy focuses on introducing a number of digital services and digitalizing key sections of the economy. As such, concepts such as e-commerce, e-services, e-health and other are defined, while a roadmap and a list of activities is outlined to boost e-economy in Ukraine. One of the main goals in e-economy is the development of e-business, implying the elaboration and usage of e-commerce tools; use of e-signature and ensuring e-safety; promotion of national payment system integration with international payment systems; and introduction of e-reporting to decrease time spent preparing and submitting reports using "single window." Specific focus is given to information infrastructure building, improved access to knowledge, e-government, e-education, science and innovation.

Concept for Digital Economy and Society of Ukraine for 2018-2020, was adopted by the Cabinet of Ministers of Ukraine in 2018. The key idea of the paper is to abolish a number of barriers and challenges for Ukraine to move towards digitalization. Activities are focused on attracting investment, development of digital and IT services, ensuring wide Internet coverage including in villages, and the development of creative and innovative industries.

Strategy for the Development of Small and Medium Enterprises in Ukraine, until 2020 – adopted by the Cabinet of Ministers of Ukraine, 2017. Defines entrepreneurship as a priority for government policy. In particular, the strategy focuses on easy of doing busi- ness, opening and operations of SMEs and a number of specific areas, access to financing; streamlining of tax administration; promotion of fair entrepreneurship; improving competitiveness and fostering the innovation potential of SMEs; developing innovation and entrepreneurial skills.

◇ Initiatives currently developed

In 2015, the Cabinet of Ministers of Ukraine approved the project entitled **"Concept of the State Target Economic Programme Development of Innovation Infrastructure 2017-2020."** This aims to create conditions for the development of innovation infrastructure that will facilitate the formation of an innovative model of the national economy growth. The project also aims to ensure efficient use of national scientific and technological, innovative and educational potential; commercialization of scientific and technological developments; and wide innovation and growth of competitiveness of Ukraine's economy. The programme will be financed by the state and local budgets, through investment, international assistance, public-private partnerships and venture investment. However, support of the private sector still has an important role to play in encouraging and sustaining innovation in Ukraine.

Strategy of High-Tech Industries Development until 2025, is being developed as a key government strategy aiming at the innovative, technological, and competitive model of economic development. The hi-tech strategy prioritizes ten promising sectors, namely: agriculture; military-industrial complex; creation of new substances, materials and nanotechnology; ICT; energy; tech building; development of the human sciences, biomedical engineering, cell medicine, pharmacy; development of transit infrastructure; tourism and leisure; other economy sectors. The strategy identifies five programmes: (1) Establishment of a hi–tech office, as an instrument to support innovative projects; (2) Development of export-oriented innovative ecosystem; (3) «Digital agenda for Ukraine»; (4) Attracting innovative multinational companies; and (5) «Hi–tech nation», promoting high technologies and science for Ukrainian citizens and the youth in particular.

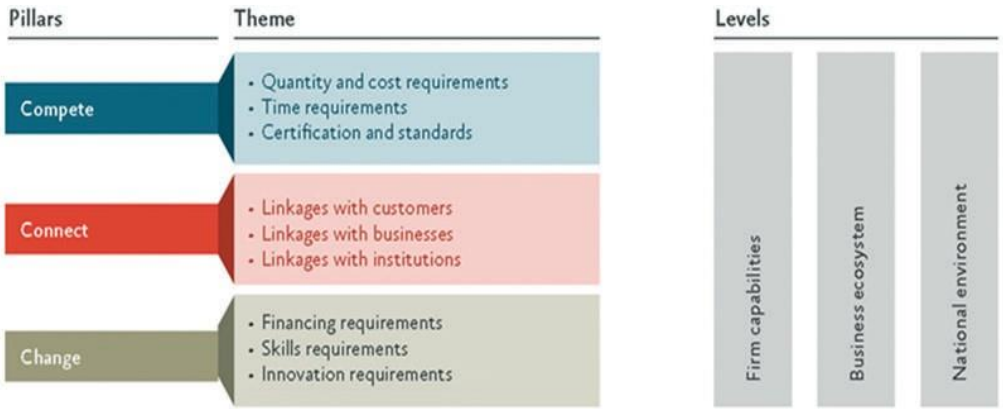
Strategy of Innovative Development of Ukraine recently adopted by the Cabinet of Ministers of Ukraine[70]. The main objective of this strategy is to build the innovative ecosystem of Ukraine, which should provide rapid and qualitative transformation of creative ideas into innovative products and services, as well as increase the level of innovation of the national economy. The strategy is expected to increase revenues from sales and use of facilities intellectual property, science-intensive products (results of research and development, software, know-how, other intelligent services); increase in volumes extrabudgetary financing of research work at the expense of domestic funds and foreign investors; increase in the share of investments in intangible assets from the total volume of capital investments; increase of knowledge intensity of GDP; the growth of the number of annual patents (primarily foreign ones) for inventions and utility models.

Intellectual Property Strategy of Ukraine to be prepared by the Ministry of Economic Development and Trade of Ukraine[71].

Innovation Diagnostics

The ESU development process has revealed constraints in the innovations for export cross-sector function and policies that impair Ukraine's innovation performance. To ensure that the cross-sector strategy is efficient and precise, the most critical bottlenecks are addressed in this Strategy and are detailed below. Constraints are identified following an established ITC methodology (Figure 6).

Figure 6: ITC framework for SME competitiveness



Constraints to Connect: Issues restraining connectivity to suppliers, markets and clients. This dimension includes challenges related to market information, marketing, trade promotion, branding and trade agreements, among others.

Linkages with buyers

Important mismatches exist between innovations produced by firms and actual market demand

[70] https://www.kmu.gov.ua/ua/news/mon-dlya-gromadskogo-obgovorennya-rozmishcheno-proekt-strategiyi-innovacijnogo-rozvitku-ukrayini-zaklikayemo-nadavati-zauvazhennya-i-propoziciyi
https://mon.gov.ua/storage/app/media/gromadske-obgovorennya/2018/10/22/innovatsiynogo-rozvitku-ukraini.pdf
[71] https://www.kmu.gov.ua/ua/news/rada-z-pitan-intelektualnoyi-vlasnosti-prezentuvala-koncepciyu-nacionalnoyi-strategiyi-rozvitku-galuzi

Entrepreneurs believe that the domestic market does not adequately financially reward innovation and significant barriers exist in exporting innovative products and services. In the agricultural and agro-processing sectors, the vast majority of Ukrainian companies are not ready to adopt innovations and technological improvements, and to move away from production of commodities to higher value-added products. Conversely, lack of adequate transport and logistics for processed and perishable food products, compounded with a lack of access to finance, hamper innovation and product diversification in those market segments where demand exists. These mismatches also result largely from a lack of awareness and information about, and understanding of, evolving market trends and innovation opportunities by Ukrainian firms.

The following constraints are addressed in PoA: 1.1.4., 1.1.6., 1.3.

Linkages with institutions

Poor or non-functioning links among and within the National Innovation System, institutions and other innovation stakeholders

As in many other CIS countries, collaboration on innovation between enterprises, academia and public agencies is severely lacking, due to the absence of requisite infrastructure, limits in information gathering and sharing and a lack of trust. There are no platforms for communication for exchanging ideas, knowledge, best practice, and collaboration among stakeholders in the ecosystem, and no effective means of systematic gathering of information about industry problems by associations. Also importantly, intermediary organizations that can facilitate innovation and business linkages, are only nascent in Ukraine, and consequently links to the markets are weak or ineffective.

The following constraints are addressed in PoA: 1.1.5., 1.2.

Lack of overarching institutions and arrangements leads to weak coordination of STI policies and their implementation

Currently, there is no lead agency for promoting and supporting innovation at the national, regional and oblasts levels. There is no coordinated network of existing institutions across the country, such as innovation offices or technology transfer offices at universities. The Ukrainian Council on Innovation is only an advisory body to the President of Ukraine. Consequently, there is no coordination of STI policies and support activities, SME, or trade and investment policies, that would take into account interests of public agencies, research institutions, academia and the private sector.

The following constraints are addressed in PoA: 1.1., 2.3.

Limited understanding of business models by scientists, lack of interest and limited resources result in poor linkages between industry and scientific community

One of the main root causes of limited linkages between scientists and the industry is the lack of stimulating conditions for IT product development and IP creation at University R&D centres. There are no incentives for commercialisation of inventions at the university level, and no royalties for research centres and researchers for their inventions. In addition to reducing motivation of scientists, it inhibits partnerships between scientists and IT product development companies and start-ups. Other contributing factors include a general decline in interest for science and inventions and limited R&D facilities in general. There are no institutions specializing in popularizing and supporting domestic scientific research and providing technical assistance to scientists and start-ups. Therefore, no one is promoting the formation of a positive image of scientists and entrepreneurs associated with the scientific field and spreading news about science and innovations.

These constraints are addressed in PoA: 1.1.2-1.1.6., 1.3.1., 3.1.4.-3.1.6.

Ukrainian universities and research institutions are insufficiently linked to European and international innovation and research networks

The country's research institutions are insufficiently linked with European and other international counterparts, thus limiting their expertise and ability to collaborate on larger innovation projects as well as limiting access to research resources and the latest scientific research results. This also limits the opportunities for Ukrainian researchers to be exposed to ongoing research and innovation, and to participate in international, notably European, research programmes.

The following constraints are addressed in PoA: 1.1.6., 1.2.1., 1.2.4., 1.3.1., 2.1.7.

Poor access to information about existing resources and business opportunities for innovation and R&D, especially in global value chains

Currently, there are no knowledge platforms or easily accessible information sources in Ukraine, which would enable collating relevant information and highlighting opportunities. There is a need for SMEs to access such web-based intelligence and information portals, databases, or business platforms, to provide information about innovation and business opportunities. This would include innovation in export as a part of value chains, as well as market players such as start-ups, investors, funding sources and support schemes. Although some public and private funding is available, clearance and dissemination of information about such resources for innovation is weak.

The following constraints are addressed in PoA: 1.1.5., 1.3.1., 1.3.4.

Constraints to Change: Issues limiting the cross-sector's capacity to innovate and tap into emerging trends. This dimension relates to challenges in accessing trained/skilled labour, institutional support to innovate, investment promotion, corporate social responsibility, and youth and women's employment, among other issues.

Skills requirements

Limited entrepreneurial culture and competence to define, evaluate, manage and market innovation among Ukrainian SMEs

Ukrainian enterprises often have limited managerial and entrepreneurial capability to innovate and exploit innovations. There is a lack of digital literacy and practical knowledge on how to use finance and IP, especially patents, trademarks, copyright and related rights, etc, for market applications. Deficiencies in management capability are exacerbated by a lack of knowledge and awareness of modern management and operational processes and technologies, global industry trends, global value chains, and expertise in transforming innovations into profitable businesses. Managers do not have access to appropriately qualified coaches, mentors and experts to address such deficiencies. These shortcomings are reinforced by insufficient and non-systematic demand for innovation from the State, and no incentives or priorities for application of scientific research for business and market needs.

The following constraints are addressed in PoA: 3.1.

Shortage of qualified workforce to manage and develop new, innovative products, especially for exports, limit the capacity of Ukrainian SMEs to diversify and upgrade their products and enter new markets

SMEs face challenges in recruiting people with the right technical qualifications and adequate experience in modern marketing and sales skills and methods, let alone knowledge and skills to manage intangible assets. Gaps in foreign language capabilities and communication are an additional barrier. The shortage of qualified workforce and adequate skill for innovation and R&D activities, are compounded by a low culture and motivation of entrepreneurial spirit among school goers at secondary level. Technical and higher education curricula do not sufficiently focus on developing entrepreneurial, managerial and innovation capabilities in students.

The following constraints are addressed in PoA: 3.2.

Innovation and intellectual property requirements

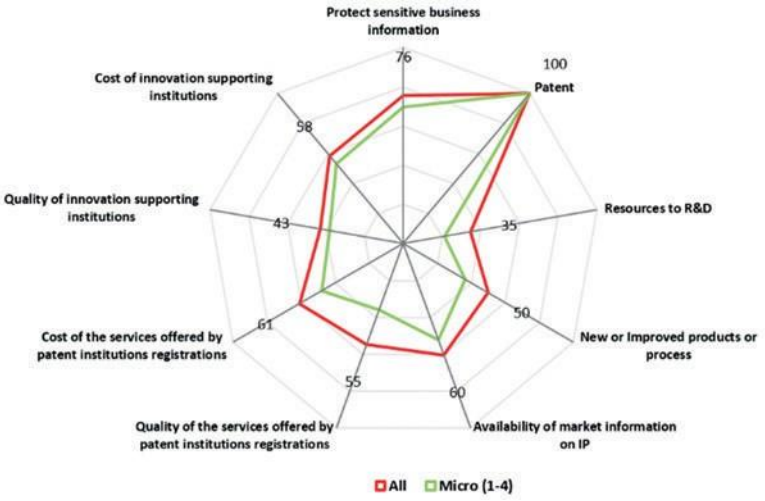
An inadequate innovation system in Ukraine impedes the development of new, high value added sectors

In Ukraine, the poor alignment of property rights and a lack of economic incentives for investments into R&D limit SMEs' innovation capacities. Only 17% of enterprises allocate significant funds to R&D, while half do not invest any significant amount into innovation, according to the SME Competitiveness Survey Ukraine 2018[72]. As a result, a third of enterprises rarely develop and implement new products or processes. SMEs invest significantly less into R&D compared to large companies. Therefore, SME innovation is in many cases not based on R&D[73], but

[72] ITC, SME Competitiveness Survey Ukraine 2018.
[73] Edler, J. et al. (2003). Changing Governance of Research and Technology Policy: The European Research Area. Cheltenham (UK): Edward Elgar.

rather on minor adaptation to existing products, innovation in designs, modes of delivery or management, and marketing practices[74].

Figure 7: SME competitiveness survey results on innovation



Source: *SME Competitiveness in Ukraine, 2018*

While innovation supporting institutions, such as universities and research institutes, could provide support especially to SMEs, the quality and cost of these institutions are rated badly by all firms, but especially by SMEs. Furthermore, many enterprises highlighted the insufficiency of intellectual property protection in Ukraine as a reason for their low levels of investment in innovation, since innovations are frequently copied or used by other companies despite existing trademarks.

The following constraints are addressed in PoA: 1.2., 1.3., 2.2.

Lack of strategic focus and clearly defined priorities for innovation, research and development and smart specialisation results in a fragmented ecosystem and weak support mechanisms

Ukraine has no overall vision, strategy, or clearly defined priorities to support market-driven innovation activities and to move towards a knowledge-based economy. There is a general lack of awareness and appreciation among policymakers about the importance of innovation in economic performance and exports in particular. Universities do not have commercial understanding of market aspects of research and lack IP policies and competences to handle technology transfer and market applications of research. Lack of strategic direction and priority leads to: a) persistent fragmentation of the national innovation ecosystem; b) inefficient coordination among institutions; c) weak incentives for firms to innovate; and d) lack of institutional and financial support for market-driven innovation by public institutions and the private sector.

The following constraints are addressed in PoA: 1.1., 1.2.4., 3.1.6.

Intellectual property legislation and regulation has been subject of recent reforms, but remains patchy and its enforcement is weak

The legislative and regulatory framework for the protection of IP in Ukraine has been improving, with numerous recent reforms in the wake of the implementation of the Association Agreement with the EU. However, this framework is still evolving and still contains many gaps and loopholes. Enforcement of IPR is also very weak and inconsistent, leaving space for piracy and patent trolling. Moreover, Ukraine does not systematically track data on patent applications and commercialization.

The following constraints are addressed in PoA: 1.2.3.

Financing requirements

Limited financing instruments to support innovation and R&D activity by SMEs

[74] Fernandez-Ribas, A. (2010). International patent strategies of small and large firms: an empirical study of nanotechnology. Review of Policy Research 27(4), pp 457-473.

In Ukraine, most enterprises use self-finance to investment and develop their business, limiting their opportunities to bring new products to markets and grow. Public financial instruments such as matching grants, vouchers schemes, low interest loans or guarantee mechanism, are not widely available and accessible. Private funding for the start-ups, such as venture capital and business angels, are only beginning in Ukraine. Foreign investment in innovation hinges on a risky opaque business environment and low expected returns.

The following constraints are addressed in PoA: 2.1.

◇ Innovation and IPR related constraints identified in select export sectors

Creative industries

Institutional framework related to IPR protection lacks consistency and cohesion. There is no single dedicated body mandated with overall IP protection that is capable of responding to the needs of enterprises. This results in a loss of income and royalties to enterprises and discoura- ges further investment. IP-relevant functions are dispersed over various government bodies and institutions that have limited niche IP expertise and capacity. The entire system is handicapped as there are grey areas in terms of roles and responsibilities, resulting in unnecessarily long and onerous procedures for enterprises. The absence of a clearly defined institutional system on IP protection also leads to weak monitoring and enforcement of existing laws and regulations. Overall, according to the Ukraine Alliance Against Counterfeiting and Piracy (WTO, 2016), the black market for counterfeit and pirated goods remains significant, with sales of fakes representing an estimated turnover of US$ 1.3 billion each year.

IP system is not fully compatible with international and European standards, particularly in the area of monitoring and enforcement. Ukraine has made important efforts to align its legal sys- tem with international IPR standards. However, Ukrainian legislation does not include adequate provisions ensuring effective enforcement of IPR rights; they are particularly unfit for enforcement in the digital environment[75].

Inadequate awareness about IPR protection among enterprises/IP owners constraints sector development. Royalties from the use of intellectual property are a fundamental source of income for enterprises in the creative industries sector. However, in Ukraine, IPR laws are often disregarded due to insufficient awareness among enterprises[76]. This does not incentivise new commercial ventures or the expansion of existing ones.

The absence of incubation or acceleration support system hinders the creation of start-ups and new enterprises. Currently, there is limited availability of business incubation programmes for the creative industries sector that can provide physical infrastructure and targeted support services for start-ups. No dedicated agency is assigned to assist with the development of business incubation, promotion and facilitation of knowledge creation, nor innovation and entrepreneurship activities.

Food and Beverages

Lack of R&D, innovation and use of technologies to all but largest companies. There is no R&D support at the national level resulting in low quality of national F&B production.

Information and communication technologies

Incentives, tax preferences for research and development and science, technology and innovation activities are provided for by the legislation but implementation is largely inexistent. As with IPR, STI and R&D activities benefit from tax incentives and preferences, but in practice, the system is ineffective and blocked at the implementation stage.

Lack of strategic focus and clearly defined priorities for innovation, research and development and smart specialisation results in a fragmented ecosystem and weak support mechanisms. Ukraine has no overall vision, strategy, or clearly defined priorities to support market-driven innovation activities, and to move towards a knowledge-based economy. There is a general lack of awareness and appreciation among policymakers about the importance of innovation in

[75] European Commission (2018). Report on the Protection and Enforcement of Intellectual Property Rights in Third Countries. Working document. European Commission, Brussels, 2018, pp 22-23.
[76] Farinha, op.cit.

economic performance and exports in particular. Lack of strategic direction and priority leads to: a) persistent fragmentation of the national innovation ecosystem; b) inefficient coordination among institutions; c) weak incentives for firms to innovate; and d) lack of institutional and financial support for market-driven innovation by public institutions and the private sector.

Universities and research institutions are not well equipped to engage in market-driven innovation activities and to commercialize results of scientific research. There is a dearth of information about the transfer or translation of scientific developments into business or commercial applications. Ukraine lacks a coherent technology transfer infrastructure for commercialising innovations from public research agencies. Universities do not have technology transfer policies in place, capacities to evaluate potential market value of innovation and the required infrastructure such as technology transfer offices, incubators, or accelerators for start-ups engaging in commercial applications of scientific research. Moreover, academia lacks basic financial autonomy and capability to access international STI platforms like Scopus and Web of Science, to hire foreign experts and to use foreign currency for their activities.

Sole entrepreneurs and researchers, not institutions, drive innovations in Ukraine. Ukraine exhibits low levels of fundamental and applied research, especially one that meets industry needs. Patent registration trends show higher numbers of individual patents than those of institutions, confirming that public research is not at sync with the needs of markets and industry.

Machinery

Firms are not sufficiently aware how research and analysis can add value to their businesses. At the institutional level, there is a general lack of cooperation and coordination between the business community and academia. Firms do not take advantage of the consulting opportunities offered by universities, think tanks or research institutes. This contributes to the perceived low pace at which changes are implemented and innovation takes place in the sector.

The absence of incubation or acceleration support system hinders the creation of start-ups and new enterprises. Currently there is no organized business incubation programme for the machinery sector that can provide physical infrastructure and support services for firms. There is also no specific agency with a mandate to assist with the development of business incubation, promotion and facilitation of knowledge creation, innovation and entrepreneurship activities.

The absence of a long-term pro-innovation culture exacerbates the concentration of the offering of the sector. There is no innovation strategy based on incentives and rewards for businesses adopting innovative approaches. Firms face multiple difficulties to innovate: lack of financial resources and human capacity are among them. However, more importantly, policymakers lack a conceptual framework for how innovation in the sector is to take place. In the absence of an adequate innovation policy, it is very difficult to generate the right conditions to ensure that firms find it profitable to invest in innovation.

Aircraft repair and maintenance (MRO)

The absence of a long-term pro-innovation culture exacerbates the concentration of the offering of the MRO sector. There is no innovation strategy based on incentives and rewards for MRO enterprises adopting innovative approaches. MRO firms face multiple difficulties to innovate: lack of financial resources, human capacity, and the limited size of the local MRO market just to name a few. However, more importantly, policymakers lack a conceptual frame- work for how innovation in the sector is to take place. In the absence of an adequate inno- vation policy, it is very difficult to generate the right conditions to ensure that firms find it profitable to invest in innovation.

The bulk of the MRO-related legislation and regulatory body does not exist in English. There is no plan to translate it. Aviation works in English. The process of updating legislation and translating it into English is lengthy and is limited by the availability of human resources with specialized legal skills in a handful of regulatory agencies.

The absence of incubation or acceleration/support system hinders the creation of start-ups and new enterprises. Currently there is no organized business incubation programme for the MRO sector that can provide physical infrastructure and support services for firms. No dedicated agency is assigned to assist with the development of business incubation, promotion and facilitation of knowledge creation, innovation and entrepreneurship activities.

THE WAY FORWARD

Vision

The following is a delineation of the proposed vision and strategic objectives of this Strategy. All stakeholders in Ukraine agreed upon the vision statement:

A creative economy for innovative, competitive and value-added exports

For this significant improvement in the different areas will be required.

Strategic framework

The strategic objectives define the main thrusts that will guide Strategy implementation to achieve the vision laid out by the industry. The Plan of Action (PoA) will respond to the vision by addressing the sector's constraints and leveraging opportunities in a comprehensive manner. To this end, the following three strategic objectives have been identified during the consultation with national stakeholders:

Strategic objective 1: **Strengthen the Ukrainian innovation ecosystem and support the business environment to boost innovation and entrepreneurship activity and grow exports**

Another key limitation for intensification of innovations exports lay in a weak National Innovation System, where some necessary actors are not existent while links between key actors and the IP governance framework are weak. Altogether, this prevents Ukraine's innovators, entrepreneurs, SMEs and other actors from collaboration that eventually boosts export potential. Moreover, the opportunities within the ecosystem are not being utilized properly, which in turn creates an unrealized gap.

The following three operational objectives have been formulated for practical implementation:

1. Strengthen linkages between science and academia, business and government both within the ecosystem and beyond.
2. Improve the business, regulatory and policy environment for innovation.
3. Connect the Ukrainian innovation ecosystem internationally to facilitate partnerships, business linkages and investment for innovation.

Strategic objective 2: **Develop financial and support services for enterprises and innovators to rapidly develop and scale-up innovative and value-added exportable products and services**

Currently, Ukraine's SMEs and innovation-focused organizations highlight the lack of financial instruments and technical infrastructure as main factors that limit the capacity to export innovative products and services. Indeed, a few funds, national financing programmes or innovation-focused banking programmes exist to support development, scaling and exporting such product and services. At the same time, very few organizations provide capabilities to rapidly prototype or produce innovative products ready for exports to international markets. As a result, there is a gap between the number of ideas that potentially may lead to creative value-added exports, and the actual number of innovative products and services being exported.

Thus, the following operational objectives are defined at the practical implementation level:

1. Provide Ukrainian innovators and entrepreneurs with easy-to-access financial instruments for each and every stage of their innovation activity.
2. Develop extensive state-of-the-art tech infrastructure allowing to rapidly prototype and produce innovative products ready for exports.
3. Provide specific support instruments for innovation in the ESU priority sectors and government.

Strategic objective 3: **Develop skills and competencies of Ukraine's entrepreneurs, managers, scientists, innovators, and enterprises to design and commercialise innovations internationally**

High quality competitive value-added innovative products and services may not reach the international market. This is due to the lack of business expertise, limited knowledge of best practices for exporting, as well as the lack of skills managers needed to successfully introduce and sell the product on international markets.

At the operational level, there are two objectives:

1. Develop education and training with a focus on innovation management and entrepreneurship for successful exports of innovative products and services.
2. Upgrade skills of managers, innovators, scientists and people who deal with innovations within private and public enterprises.

To achieve the vision and strategic objectives discussed a robust, actionable and realistic strategic PoA is required and its outline provided, making up the core of this Strategy (please see below for more details).

The PoA is structured along the three strategic objectives and their respective operational objectives. For each objective, the PoA outlines detailed activities and their implementation modalities, which include:

- **Priority level:** Priority one (1) is the highest and three (3) the lowest.
- **Duration:** The desired time frame of the activity.
- **Targets:** Quantifiable targets that allow monitoring of the activity during the implementation stage.
- **Leading implementing partners:** One single accountable lead institution per activity. (The institution can restrict itself to an oversight and coordination role but also can have a technical role).
- **Supporting implementing partners:** Any institution that should be involved at any stage of an activity's implementation.
- **Existing programmes or potential support:** Existing initiatives ongoing in the specified area of the activity.

PLAN OF ACTION 2019-2023

Strategic objective 1: Strengthen the Ukrainian innovation ecosystem and supporting business environment to boost innovation and entrepreneurship activity and grow exports						
Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
1.1. Strengthen linkages between science and academia, business and government both within the ecosystem and beyond	1.1.1. Within the scope of the Innovation Council, initiate public-private dialogue among top governmental representatives (*Innovation Deputy Ministers of Councils under each priority ministry*) and stakeholders from across the national innovation ecosystem. • Review and update remit, activities and membership of Innovation Council in light of this Cross-sector Export Strategy «Innovations for Exports»; • Establish formal linkages to the International Trade Council to ensure coordination and synergy; • Develop a work plan for the Council, incorporating key elements of this PoA and for each member ministry; • Publish minutes of meetings of the Council and updates of implementation of plan of action.	1	2019–2023	Innovation Council fully operational Work plan adopted	Innovation Council	MEDT, International Trade Council
	1.1.2. Establish Technology Transfer Offices (TTO) programmes at key technology institutes, universities and research institutions to develop and support technology transfer with a global focus. • Review TTO models in comparable countries (e.g., Switzerland, Germany, Poland and Estonia) and develop blueprints for appropriate models for Ukrainian institutions; • Design and implement pilot TTO program with clear identifiable, targeted sectors and activities, as well as their objectives and outcomes, with external donor technical and financial support, if necessary (with commensurate Ukrainian budget contribution); • Monitor and review progress of pilot and adjust as necessary; • Linked to establishing TTOs/programmes, implement and teach evaluation methods for innovations at universities and financing institutions and disseminate the wider public.	1	2019–2023	First pilot in H1 2020 Roll out programme in up to 5 regions, monitor and assess results, before further rollouts 5 pilot TTOs by 2021	HEIs & RIs, Ministry of Education and Science of Ukraine, TTOs	MEDT

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	1.1.3. Attract or launch business incubators and accelerators with international mentors and partners, with particular focus on export-oriented innovations and SMEs. • Review performance of existing business incubator(s), identify key lessons learned and constraints experienced (e.g., availability of finance), and develop model for business incubators; • Conduct review of other incubator programs in similar countries in the region (Poland, Estonia, Finland, Germany, Austria, Switzerland) to incorporate lessons learned; • Partner with incubator operators in selected EU countries (Poland, Estonia, Finland, Germany, Austria, Switzerland) for ongoing collaboration and with technical support from international agencies (IFC, UN); • Design and implement competition for Ukrainian SMEs/start-ups to participate in incubators/accelerators and to provide services such as technical support and finance.	2	2020–2023	Minimum 5 Business Accelerators/ Incubators by 2021 Minimum 15 Business Accelerators/ Incubators by 2023	Ministry of Education and Science of Ukraine	MEDT, Ministry of Finance of Ukraine, Business and international companies, HEIs
	1.1.4. Support projects, conferences, incubators, HUBs, clusters focused on promoting and popularizing science and research. • Within the scope of the activities of the Innovation Council, develop in partnership with the Ministry of Education and Science of Ukraine a portfolio of activities aimed at the practical or market application of science and research; • Over the next three years organize three international conferences with different themes (e.g., public-private partnerships in research, research cooperation in clusters, etc.) to exchange latest relevant practices, trends, and lessons; • Disseminate lessons learned from these activities through targeted channels and monitor effectiveness of dissemination; • Develop special and innovative mechanisms for fostering academia–research–industry partnerships and facilitating academia-industry linkages and mobility of experts.	2	2021–2023	Promotion plan established At least three conferences organized	Ministry of Education and Science of Ukraine	MEDT, HEIs, Business Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	1.1.5. Support and promote private sector organized periodic innovation conferences/hackathons or constantly working/operational houses of innovation to highlight and catalyse Ukrainian innovations. • Target a range of innovation-facilitation activities currently being undertaken in Ukraine and assess their effectiveness and lessons; • Design and promote competition among organizers of such events (e.g., universities, technology incubators and accelerators, technology financiers, etc.) for government subsidies to organise such events, with clear outcome targets, for a period of one year; • Monitor pilots, assess results and rollout incorporating lessons as appropriate.	2	2020–2023	A least one conference organised per year Increased awareness among innovation stakeholders	Business Associations	HEIs
	1.1.6. Develop a National Smart Specialisation programme in priority sectors under the Export Strategy of Ukraine (ESU). To achieve this, the following steps should be undertaken: • Develop a technology and innovation map of Ukraine to understand the state of innovation activity in the different regions of the country; • Use this mapping to plan and incentivise smart specialization for innovation in priority sectors; • Plan and allocate public resources to develop and support smart specialisation in these regions in line with the plan; • Incentivise private sector to scale up their investment and innovation activities, through: *Tax incentives;* *Voucher, grants or co-financing schemes, and* ***Opportunities and support from international cooperation (especially with the EU).***	1	2019–2021	National Smart Specialisation programme developed Smart specialisation incentives determined and deployed in 5 priority sectors	Ministry of Education and Science of Ukraine	MEDT, Ministry of Finance of Ukraine, Business Associations, HEIs

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
1.2. Enhance business, regulatory and policy environment for innovations	1.2.1. Secure or develop a more proactive membership of Ukraine in international organizations and programmes, such as: • OECD • UNECE • EU (Horizon 2020) • World Bank Innovation PolicyPlatform • EBRD • EIB • UNIDO • ITC To develop multilateral and bilateral cooperation and garner experience and knowledge sharing from other countries.	1	2019–2021	Increased cooperation activity Increased access to funding for STI activities	Ministry of Education and Science of Ukraine	MFA, MEDT, Business Associations, HEIs
	1.2.2. Develop tax, duty and visa incentives for research, innovation and R&D activities by foreign companies and investors in Ukraine. To that effect: • Implement a range of fiscal incentives (e.g. tax relief or zero duty for importing lab equipment) for R&D, internationalization of business and commercialization of science and research; • Introduce a friendly immigration policy with innovation policy to facilitate Ukraine's access to the global talent pool; • Introduce a zero-duty for selected imports of inputs and lab or research equipment for R&D on innovative products by enterprises, universities and research institutions.	3	2022–2023	Incentives put in place Increase in R&D activity	State Fiscal Service, Ministry of Finance of Ukraine	MFA, MEDT, Business Associations, HEIs
	1.2.3. Strengthen the regulatory framework for innovation and IP and its enforcement capacity with a view of improving marketability and exports of Ukrainian products and services, through the following measures: • Strengthen IP aspects: IP registers using block chain, strengthening the network of the local and regional level of IP offices (IP Help desks);	3	2022–2023	Statistics of technology-intensive or value-added products (GII Indicators)	MEDT	Ministry of Finance of Ukraine, Ministry of Education and Science of Ukraine

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	• Measures to improve enforcement capacity through training and capacity building; • Ensure international protection of Ukrainian IP assets, research results and inventions; • Improve regulatory framework for data access and sharing and for the creation and sharing of intellectual property; • Review, update and repeal as necessary anti-competitive and restrictive legislation and regulations.					
	1.2.4. Support review and/or adoption of technology transfer policies by leading technology institutes, universities and research institutions. • Develop team (or initially nominate an individual) at the Ministry of Education and Science of Ukraine with technology transfer remit (in conjunction with Activity 1.1.3.); • Develop and implement a training program for the Ministry of Education and Science of Ukraine and academia on technology transfer practices, regulations, commercialization and financial issues; • Undertake a regulatory and legal audit and remove barriers to technology transfers and their incentivisation; • Mandate targeted institutes, universities and research institutes to develop individual technology transfer strategies, policies and action plans, with appropriate staff incentives, integrated with their organization plan; • Allocate funding as required to implement plans; • Discuss with external development cooperation partners and secure technical and financial support for implementation.	2	2020–2023	TT policy piloted at one HEI by 2021 At least 5 HEIs by 2023	HEIs	Ministry of Education and Science of Ukraine

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
1.3. Connect and promote the Ukrainian innovation ecosystem internationally to facilitate partnerships, business linkages and investment for innovation	1.3.1. Systematically develop collaboration and networks for Ukrainian HEIs with European institutions (e.g. EASME) to promote knowledge sharing, technology transfer and cooperation for innovation development with European partner countries.	1	2019–2023	At least, 5 new cooperation arrangements with HES established each year Increased international cooperation activity	Ministry of Education and Science of Ukraine	Business Associations, HEIs
	1.3.2. Develop programmes to kick-start and support exports of innovative, high value-added or technologically intensive products and services. In particular, at the level of government, science and academia, business, and entrepreneurship. This should be done in line with priorities defined in 5 priority sectors under the Export Strategy of Ukraine. • Innovative, high value-added or technologically intensive products included in export promotion and investment promotion programmes established; • Involve HEIs, research institutions, incubators, accelerators in export and investment promotion activities; • Monitor and regularly report on export performance and investments related to these products.	2	2021–2023	A list of innovative, high value-added or technologically intensive products included in export promotion and investment promotion programmes established Increase of technologically intensive products as a % of total exports	EPO (MEDT)	Ministry of Education and Science of Ukraine, Business Associations, HEIs
	1.3.3. Implement a branding and communication strategy at the global level to promote Ukraine as a country with rich human capital and innovations, including the following elements: • Positioning, branding and promotion for innovation activity and exports for international and national audience; • Design a national brand module specifically designed to promote innovation, R&D and research opportunities in Ukraine, on the basis of the «Ukraine Now» national brand (alongside «Trade With Ukraine»); • Improving mobility and the attractiveness of Ukraine as a research, business and investment location; • Promote Ukraine's innovation internationally through road-shows and discovery tours to international conferences and targeted countries.	1	2019–2023	National innovation brand created Increase in FDI flows to innovation and technology sectors	Ministry of Education and Science of Ukraine	MEDT, EPO, UkraineInvest, MFA

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	1.3.4. Launch and develop national innovation web portal (similar to the Polish Innovation Portal[77]) and link it to the proposed portal for exporters. • Innovation help desk; • Funding sources; • Crowdfunding platform; • IP helpdesk; • Support programmes and services; • Map of innovation and smart specialisation; • Entrepreneurship toolkit. This portal should be linked to the Ukraine Export Promotion Portal. To be operated	2	2020–2021	National innovation web portal online Increased number of users (visits frequency) Increased awareness about innovation opportunities	MEDT, Ministry of Education and Science of Ukraine	HEIs, Business Associations upon consent
	1.3.5. Develop promotion and incentives packages to attract global technology companies and R&D institutions to Ukraine, through 3 types of measures: • Foreign companies to open R&D centres in Ukraine for export products and joint ventures or business partnership/ collaboration (facilitate residence and work permits); • Universities to partner and cooperate with Ukrainian universities; • Upgrading R&D and other equipment at universities and research institutions to improve their capacity to carry out R&D.	2	2020–2021	Per annum: 10+ global companies open offices in Ukraine Increase in FDI flows to innovation and technology sectors	Ministry of Finance of Ukraine	Ministry of Education and Science of Ukraine, MEDT, HEIs

[77] www.pi.gov.pl

Strategic objective 2: Develop financial and support services for enterprises and innovators to rapidly develop and scale-up innovative and value-added exportable products and services						
Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
2.1. Provide Ukrainian innovators and entrepreneurs with easy-to-access financial instruments for each and every stage of their innovation activity	2.1.1. Facilitate and mainstream access to international crowdfunding platforms to finance innovation with government guarantees/securities. • Showcase and disseminate best practice; • Provide kick-starter vouchers; • Pilot a national crowdfunding platform for innovative companies; • Amend legislative framework as necessary. Partnerships with government to select companies based on competition.	2	2021–2023	Increased access to crowdfunding for innovation 50% increase in funding raised per year	Ministry of Finance of Ukraine	Ministry of Education and Science of Ukraine, MEDT, HEIs, Business Associations
	2.1.2. Monitor effectiveness of the newly implemented grant programmes for research and development by academia and research institutions, which function on competitive grounds and establish clear and transparent selection criteria. Revising of such programs, if necessary: • Extend the system to be jointly financed or co-financed by the state and the private sector; • Consider extending the grant system to private business to carry out R&D activities; • Scale up grant programmes funded and co-financed by the private sector on request (research services for a fee) (e.g. DIFCO grant programmes, National Start-up Fund).	1	2019–2023	Monitoring in place Increase in grant funding	Ministry of Education and Science of Ukraine	Ministry of Finance of Ukraine, MEDT, HEIs, Business Associations
	2.1.3. Develop financial instruments for export-oriented innovative enterprises. In particular, work with UkrEximBank to develop special terms for SMEs to support exports of innovative products.	2	2021–2023	Increased share of funding to SMEs as % of GDP Increase of technologically intensive products as a % of total exports	UkrEximBank	Ministry of Finance of Ukraine, MEDT, Business Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	2.1.4. Implement Ukrainian Horizon 2020 with different financial instruments such as grants, vouchers, investment at both national and regional level. In particular, introduce instruments to support the development of internationalisation or go-to-market financing.	2	2020–2021	Ukrainian Horizon 2020 created Increase in amount of innovation funding awarded	Ministry of Education and Science of Ukraine	Ministry of Finance of Ukraine, MEDT, HEIs
	2.1.5. Launch a Fund for strategic investment to develop high technology and innovative enterprises through either investment in other dedicated funds or directly in enterprises through a separate window. • Set up the fund with public funding or guarantee from IFIs (IFC, EBRD, EIB) and/or from the government; • Develop an investment programme including criteria and rules; • Identify promising science, technology and innovation investments funds operating in Ukraine.	2	2020–2021	A Fund of Funds for innovation created Increased investment in innovation and technology	Ministry of Finance of Ukraine, IFIs (IFC, MIGA EBRD, EIB)	Investors and Investor Associations
	2.1.6. Introduce innovation vouchers for priority industries, targeted at MSMEs. • Secure technical assistance from international institutions for designing the scheme to develop vouchers issued to eligible MSMEs to exchange for services from qualified institutions; • Establish parameters for the scheme, including: size of fund and value of vouchers; SMEs selection criteria; eligible services (during inception phase services can be limited to R&D or mentor support); minimum qualifications/capability or competition; etc; • Identify organizer, provide training on operating such schemes; • Develop framework agreements; • Disseminate information about the voucher scheme; • Establish a monitoring and evaluation framework to assess results compared with objectives; • Implement a pilot with a targeted sector, possibly among priority sectors under the Export Strategy of Ukraine; • Rollout to other sectors, SME categories and types of services based on pilot results.	2	2020–2021	Voucher scheme operational in the pilot sector Increased access to finance for innovative MSMEs	Ministry of Finance of Ukraine, Ministry of Education and Science of Ukraine	MEDT, Investors and Investor Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	2.1.7. Improve Ukraine's access to international funding programmes such as Horizon 2020, notably through: • Disseminating information about research and innovation programmes and related funding through dedicated channels at HEIs; • Systematically discuss and advocate STI activities and support at the level of joint bodies of trade and investment agreements (e.g. AA with the EU) and at intergovernmental fora (e.g. OECD); • Strategically positioning STI cooperation in new FTAs, economic cooperation and investment agreements with third countries. Activity to be conducted in conjunction with activity 1.2.2.	2	2021–2023	Increased access to funding for STI activities Increased number of Ukrainian researchers and companies participating in international events.	Ministry of Education and Science of Ukraine	MFA, MEDT, Business Associations, HEIs
	2.1.8. Establish a pilot seed-capital equity investment fund for start-ups and early stage innovative companies, linked with the incubator/accelerator development activity (National Start-up Fund).	2	2021–2023	Increased access to funding for STI activities by start-ups Increased number of start-ups created and/or scaled up	Investors and Investor Associations	MFA, MEDT, Business Associations, HEIs
	2.1.9. Develop new or tailor existing partial credit guarantee programme aimed at innovative SMEs. Potentially, with state-owned banks as PryvatBank or UkrExportImportBank *e.g. EIB/EIF/Oschadbank/Raiffeisen Bank Aval scheme, or the* ***German-Ukrainian Fund Restart lending Project***	1	2019–2023	Increased share of funding to SMEs as % of GDP Increased volume of credit guarantees awarded	Investors and Investor Associations	MFA, MEDT, Business Associations, HEIs
	2.1.10. Engage banking institutions through banking associations in Ukraine in creating new bank products and services to support innovation for existing and new clients. • Evaluation techniques • Training • Toolkits on competition for innovation.	3	2022–2023	Increased share of funding to SMEs as % of GDP Increased access to funding for STI activities by innovative SMEs	Banking industry, National Bank of Ukraine, Ministry of Finance of Ukraine	Investors and Investor Associations, Business Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
2.2. Develop extensive state-of-the-art tech infrastructure allowing to rapidly prototype and produce innovative products ready for exports	2.2.1. Launch and support a network of regional research laboratories and shared R&D and scientific service centres with modern equipment (fab labs) and access to international research infrastructure and information networks. The research network should cover at least the priority sectors under the Export Strategy of Ukraine.	2	2021–2023	Network of shared scientific facilities launched Increased R&D activity by SMEs	Ministry of Education and Science of Ukraine	Oblasts, Business Associations, HEIs
	2.2.2. Attract global technological and innovative companies in Ukraine to invest and open R&D centres to tap into high skills and qualifications of university and technical schools' graduates, as well as competitive salaries: • Develop investment promotion packages targeted at developing R&D, product design and development activities; • Identify and develop suitable industrial or business zones or facilities to locate R&D and industrial parks and to house target companies; • Develop support services and amenities for companies moving to these locations.	3	2022–2023	Promotion scheme and incentives developed Increased FDI flows in R&D activities	UkraineInvest, MEDT	HEIs, Ministry of Education and Science of Ukraine, Oblasts, Business Associations
	2.2.3. Develop technical Hubs within academia and HEIs to work with business. To support the functioning of these Hubs: • Develop communication between the HUBs and Governmental fund of fundamental research, other government organizations and assign responsibilities; • Disseminate information about the HUBs and their services through Internet platforms (such as web portal in activity 1.2.2.).	3	2022–2023	One pilot Hubs operational Increase use of Hub services by SMEs	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
2.3. Provide specific support instruments for innovation in the ESU priority sectors and government	2.3.1. Promote usage of innovation, development and integration of practices that reduce the environmental impact of production or the development and marketing of environmental or sustainable products. • Mainstream sustainability in HEIs teaching and research programmes and curricula;	2	2021–2023	Increased R&D activity in environmental and sustainable products Increased exports of environmental and sustainable products as % of total exports	Ministry of Education and Science of Ukraine	EPO, UkraineInvest, MEDT, Ministry of Ecology and Natural Resources of Ukraine

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	• Garner opportunities and specific know-how available in Ukraine to specialise and develop competitive advantage in selected sectors (forestry, agriculture and agribusiness, engineering, etc.); • Promote sustainable production and products internally and externally through national branding (Ukraine Now).					
	2.3.2. Adapt teaching and research programmes at universities and technical and research institutes in line with market needs and technological change in the engineering, machinery and aviation industries to help them move to Industry 4.0 in Ukraine.	2	2021–2023	HEIs curricula and research programmes adapted Increased commercialisation of research and inventions	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business associations
	2.3.3. Develop innovation management specialization and curricula at HEIs for teaching and research. Ensure publicly funded research, education and training for innovation has an international focus and outreach or is market-oriented or geared at practical applications.	2	2021–2023		Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	2.3.4. Develop R&D activities jointly with the private sector to foster market applications, especially in industrial, technological and services sectors: • Joint research programmes agreed upon and funded by the public and the private sector; • Establishing decentralised R&D facilities or hubs for priority sectors under the ESU in the different regions of the country where production is located and to support cluster creation.	3	2022–2023	HEIs curricula and research programmes adapted Increased commercialisation of researches and inventions	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations, MEDT
	2.3.5. Increase awareness of innovation and introduce more innovative practices and culture within the public sector and encourage structured public-private dialogue (in conjunction with activity 1.1.1. above). • Provide training to public servants on creativity and innovation, focused on innovation in governments. Selection of a ministry/public bodies representatives linked to Innovations Council; • Roll out training and awareness generation within regional governments;	3	2022–2023	Increased innovation awareness in the public sector Increased digitalisation of government services	Cabinet of Ministers of Ukraine	Innovation Council, MEDT, HEIs

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	• Identify selected areas within the ministries (starting with MEDT) that are suitable for innovation, explore practices in similar countries in the region, and implement; • Support usage of local innovative products and services by Ukrainian companies in government public procurement (tenders) on the national and internationally (EU and GPA).					

Strategic objective 3: Develop skills and competencies of Ukraine's entrepreneurs, managers, scientists, innovators, and enterprises to design and commercialise innovations internationally						
Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
3.1. Develop education and training with a focus on innovation management and entrepreneurship for successful exports of innovative products and services	3.1.1. Develop or modernize modules on innovation particularly in business, ICT and engineering courses at higher education academic and vocational training institutions. Promote part-time education in tertiary education, enabling students to undertake work experience in parallel with their studies. To that effect, undertake the following elements: • Establish platforms for exchanging good practices between HEIs and networks of entrepreneurship professors and business people; • Work with the Innovation Council to define an entrepreneurship and innovation vision and agenda for HEIs; • Implement an international exchange programme for academic staff involved in research and teaching innovation; • Strengthen business representation in HEIs governance; • Develop traineeships, student and staff exchange, study visits and educational tours between key personnel of academia and business; • Develop twinning programmes between Ukrainian and foreign HEIs to share good practice and experience and promote student exchange in various areas of STI.	1	2019–2022	Entrepreneurship and innovation mainstreamed at HEIs Improved and increased entrepreneurship and innovation skills among students and graduates	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	3.1.2. Promote business internships for PhD students and fresh graduates, notably through the following measures at HEIs: • Introduce elective internships, study or expert visits in enterprises as part of graduate or PhD programmes and curricula; • Introduce entrepreneurship modules in allowing commercialising or spinning off research results, inventions or IP assets as part of graduate, PhD or post-doc programmes.	1	2019–2022	Elective internships Introduced in HEIs curricula Improved practical innovation skills among students	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	3.1.3. Implementing an innovation promotion scheme to support entrepreneurship and innovation at HEIs (such as HEInnovate in Poland), incorporating: • Business and entrepreneurship clubs; • Support for start-ups; • Business start-up financial instruments and incentives for students and staff who are motivated and able to start a business; • Develop information systems on higher education and on labour market supply and demand.	2	2021–2023	Innovation promotion scheme is operational Increased innovation activities at HEIs	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	3.1.4. Develop or encourage development of Entrepreneurship and Innovation Network to support teachers and trainers in Ukraine offering among others: • Continuous professional development programmes; • Mobility programmes & visiting international experts; • Scholarships, financial aid and advancing qualification for teachers, trainers and kindergarten teachers; • Training of Trainers. Such network could link HEIs and private sector organisations as well as support schemes for innovation, and establish linkages to similar networks at the international level.	2	2021–2023	Increased number of entrepreneurship and innovation trainers Increased innovation activities at HEIs	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	3.1.5. Develop and provide incentives mentorship programmes at Universities and Polytechnics, techno parks, incubators, accelerators as part of their support activities, to be carried out by business people pro bono or for a return or a benefit.	2	2021–2023	15-20% of HEIs introduce Mentorship programmes each year Increased innovation activities at HEIs	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	3.1.6. Support HEIs in developing formal strategies to build and strengthen entrepreneurship and innovation (including financing – such strategies shall become a fundamental element at the HEIs level): • Develop, adopt and clearly communicate the strategy; • Set-up a distinct function to coordinate and integrate entrepreneurship and innovation activities across the HEIs; • Develop, implement, monitor and regularly adjust the strategy; • Support faculties in integrating and rolling out their entrepreneurship and innovation activities and related synergies; • Support outreach and external collaboration and engagement of the HEI within the national ecosystem at the local and regional level to maintain and develop links to the private sector and to the markets; • Develop and maintain a funding strategy to align HEIs' funding requirement for entrepreneurship and innovation activities with their budget planning (with the possibility of self-funding).	2	2021–2023	At least one entrepreneurship and innovation strategy piloted at a HEI Increased number of formal entrepreneurship and innovation strategies adopted at HEIs	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	3.1.7. Support independence of post-doc researchers in their research, development, entrepreneurship and innovation activities, notably through the following measures: • Stimulate international and inter-sectoral mobility; • Improve career prospects for researchers by training business and internationalization skills; • Incentives for academic careers with transfer paths in and out of the private sector; • Evaluating the impact of research on the country, on social policy and on business ventures.	3	2021–2023	At least 10% of post-doc researchers get entrepreneurship and innovation training each year At least 50% of post-doc researchers find opportunities in entrepreneurship and innovation	Ministry of Education and Science of Ukraine	HEIs

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
3.2. Upgrade skills of managers, innovators, scientists and people who deal with innovations within private and public enterprises	3.2.1. Develop and support implementation of training programmes on export and market-oriented innovations focused on SMEs. In particular: • Explore feasibility of a MOOC platform as an appropriate delivery channel for such training programme; • Develop and support scientific skills and long-term research programs in line with the national and sectoral priorities set out in the Export Strategy of Ukraine; • Develop training programmes to develop private sector business expertise on innovation management.	2	2021–2023	10% of exporting SMEs have access to export and market-oriented innovation training programmes each year Increased spending on R&D activities by SMEs in priority sectors under the Export Strategy of Ukraine	Business Associations	HEIs, Ministry of Education and Science of Ukraine
	3.2.2. Undertake regular sensitisation campaigns to develop public awareness of and popularise support STI activities in Ukraine, including notably the following elements: • Youth campaigns to pursue a career in science, technology and innovation; • Support science promotion projects and programmes (e.g. InSCIENCE, Naukovi Pikniky, Maker Fairs); • Campaigns targeting students, teachers and researchers to promote science popularization and high-level research to benefit social and economic development and diversification of Ukrainian economy; • Science engagement programmes to strengthen engagement between RS&T employers and young people. Ukrainian Government and public companies to lead by example; embracing innovation and agility in the way we do business and serve as a validation stage prior to entering international markets.	1	2019–2023	Increased awareness about STI activities among the general public Increased % of graduates finding jobs in STI and entrepreneurship and innovation activities	Ministry of Education and Science of Ukraine	HEIs, Oblasts, Business Associations
	3.2.3. Develop international trainee-ship programme for innovation-intensive export-oriented enterprises.	3	2020–2023	Increased % of graduates finding jobs in STI and entrepreneurship and innovation activities Increased spending on R&D activities by SMEs in priority sectors under the Export Strategy of Ukraine	Business Associations	MEDT, HEIs, Ministry of Education and Science of Ukraine

Operational objectives	Activity	Priority	Duration	Target measures indicators	Leading implementing partners	Supporting implementing partners
	3.2.4. Support development of business schools, courses on innovations and experts for innovating enterprises.	3	2020–2023	Increased number of start-ups created Increased % of graduates finding jobs in STI and entrepreneurship and innovation activities	Business Associations	HEIs, Ministry of Education and Science of Ukraine
	3.2.5. Develop and support international business internships in and from Ukraine.	3	2020–2023	Increased % of graduates finding jobs in STI and entrepreneurship and innovation activities Increased mobility of researchers and labour in innovation-intensive sectors	Business Associations	HEIs, Ministry of Education and Science of Ukraine
	3.2.6. Promote women entrepreneurship with an international focus and provide special training programme for women on innovation for exports.	3	2020–2023	Increased % of women entrepreneurs Increased innovation activity SMEs with high proportion of women in management positions	Ministry of Education and Science of Ukraine	HEIs

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ANNEX

Table 4: TISIs composing the national innovation system and supporting innovation activity

Key stakeholders and support institutions in the Ukrainian national innovation system	
Policy support	• Ministry of Economic Development and Trade of Ukraine. • Ministry of Finance of Ukraine. • Ministry of Education and Science of Ukraine. • Ministry of Information Policy of Ukraine.
Promotion organisations	• Export Promotion Office (EPO). • UkraineInvest (Investment Promotion Office). UkraineInvest was created to attract and support investment in Ukraine and provide investors with objective, real-world information and advice about doing business in the country. • SME Development Office (SMEDO). • State Finance Institution for Innovations (SFII). Government agency created and designed to facilitate foreign direct investment and strategic partnerships for benefit of Ukraine and its partners around the world. • Hi-Tech Office. Initiative to develop high technology ecosystem in Ukraine. • National Intellectual Property Office (Ukrainian IP Institute). • Ukraine Chamber of Commerce (and regional offices).
Business, trade and innovation support	• State Finance Institution for Innovations (SFII). • National President Fund. 1 billion UAH fund to finance science-related projects. • Ukrainian National Start-up Fund (UNSF). Multimillion fund investing in early stage start-ups. • Western NIS Enterprise Fund (WNISEF). In 2015 WNISEF has launched a $35M legacy program focused on export promotion, local economic development, impact investing and economic leadership. • UVCA. Ukraine Venture Capital and Private Equity Association. • UAngel. Network of business angels. • Unit.city. Innovation park • 1991.CV. A non-commercial incubator that supports big data start-ups. Clients and partners are government agencies, businesses, and civil society organizations. • Concepter PIA. A start-up studio, that creates award-winning products. Product idea accelerator with $100,000 fund focused on hardware start-ups ready to launch via crowdfunding. • IoT Hub Accelerator. A hub and an accelerator for IoT start-ups focusing on robotics, smart home technology, smart clothing, drones, etc. • YEP! A network of academic business-incubators. They provide business-related education for youth, contributing to the development of the entrepreneurial ecosystem of Ukraine. • INSCIENCE. Science promotion and popularization; incubator for science-related projects. • ARTKB. A full-cycle hardware product development bureau (idea inception, mass production, design, certification and worldwide logistics). • Fabricator/FabLab. One of the largest prototyping laboratories in Ukraine and a part of the FabLab global network. • IT Ukraine Association. • IT Clusters.
Academia and civil society	• National Academy of Science of Ukraine. • Horizon 2020 – European financing project to support innovations. • Beetroot Academy – courses on IT and entrepreneurship all over Ukraine. • Prometheus – online learning platform.

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