Danish Experiences in Innovation for Ukrainian Inspiration

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Author

Anders Kragh Bingen and Iryna Bezverkha

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List of Abbreviations

BERD	Business enterprise research and development expenditure
CLM	Centre for Legal Metrology
DANAK	The Danish Accreditation
DCFTA	Deep and Comprehensive Free Trade Agreement
DFIR	Danmarks Forsknings- og Innovationspolitiske Råd
DS	Dansk Standard
ERDF	European Regional Development Fund
EUDP	Det Energiteknologiske Udviklings- og Demonstrationsprogram
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GERD	Gross domestic research and development expenditure
MES	Ministry of Education and Science
MMF	Market Maturation Fund
R&D	Research and development
R&I	Research and innovation
SIK	Danish Safety Technology Authority
SME	Small and Medium Enterprises
UVCA	Ukrainian Venture Capital Association

1. Introduction

The Ukraine Reform Conference, will be held in Copenhagen on 27th of June 2018. In order to provide input to the conference as a source of inspiration for the Ukrainian policy reform agenda with a particular focus on innovation policies, Tana Copenhagen was contracted to draft a policy paper for the Danish Ministry of Foreign Affairs.

The paper highlights Danish experiences and Danish policy instruments in areas where the public sector has managed to promote business innovation while reflecting the priorities of the Ukrainian government as stated in interviews and discussions conducted as part of this exercise.

The study is based on desk reviews of relevant aspects of Danish and Ukrainian innovation policies as well as interviews with key Danish and Ukrainian stakeholders.

In chapter 2 the paper establishes the framework for Ukrainian innovation policy and examines some of the challenges and barriers the country is facing in order to achieve the country's priorities.

Chapter 3 describes Danish innovation policy by highlighting some of the key strategic initiatives and the legislation guiding the area. Furthermore, it presents the key institutional players in the field and explains some of the key features, which contributes to the Danish success in this domain.

Chapter 4 highlights some of the most prominent examples of Danish innovation achievements, which are intended to provide inspiration for their Ukrainian counterparts.

Finally, chapter 5 reflects upon the differences between Denmark and Ukraine and provides recommendations for Ukraine to take on board in its pursuit for more innovative policies and businesses.

2 Ukrainian Innovation Policy and Priorities

The importance of enabling Ukraine to take part in an innovation-driven development has grown over time. In today's world, countries that create increased new knowledge have faster growing economies. Over the last decade, Ukraine has been through two deep recessions. In 2009, GDP fell by almost 15 per cent as a result of global financial crisis. The illegal annexation of Crimea and the military conflict in eastern Ukraine since 2014 brought another severe recession to Ukraine's economy, which had already been slowing down since 2012 as a result of low world commodity prices, high energy prices, low FDI inflow, unaddressed structural imbalances, and corruption. Real GDP fell cumulatively by about 16 per cent in 2014-2015. The country recovered from recession in 2016 with a modest growth rate. In 2017, GDP expanded by 2.5 percent, yet the rate is too low to cover the development gap.

On the other hand, Ukraine has great potential for innovative development with good scientific and technical capacities, a well-educated workforce, a mature IT sector, and significant natural resources. In 2017, Ukraine ranked 24th among 130 countries on the Global Human Capital Index, significantly ahead of its neighbouring EU countries.

Previous governments were committed towards an innovation policy reform agenda, but their efforts failed because of systemic and structural problems, which have been accumulating over

years. Some of these were caused by inconsistencies in policy implementation, lack of proper coordination and funding, as well as overreliance on supply-side innovation policy.

Currently, Ukraine does not have a well-established ecosystem for innovation development. The share of innovative enterprises ranges between 14-16%. Moreover, the industrial structure, which has not changed significantly, impedes innovation. The loss of Russian market shares which was a major consumer of high-technology machine building goods from Ukraine and the growing share of exports to EU, which is mostly commodity based promote further concentration on low research and development (R&D) intensive industries.

The country improved its position in the Global Competitiveness Index 2017-2018 reaching 81th place[1]. The ranking in the "Innovation" pillar remained relatively high (61th position). However, the performance in this pillar has deteriorated, especially in "government procurement of new technologies and products" and "interlinks of universities with industry in R&D".

2.1 Innovation policies and strategies

The EU Association Agreement/Deep and Comprehensive Free Trade Agreement (DCFTA) opens new opportunities for Ukrainian companies. As of 2018 Ukraine now has full access to support in the framework of the Danube Macro-Regional Strategies in innovation and the smart specialization component.

The Mid-Term Plan of Government Priority Reform Actions by 2020 aims at transforming Ukraine from a commodity-based to an innovative economy. In 2018 innovation development was set as one of the top priorities by the Government with an intended shift from supply-side innovation policies to a business-driven demand for innovation policies. The government started developing a business-oriented organizational set-up of the government's innovation initiatives, improving the intellectual property and technology transfer system, providing better conditions for access to finance for innovative SMEs and startups, creating an enabling environment for companies to invest in production innovation and an entrepreneurial ecosystem for startup development.

The new law on Innovation Development and the Strategy for Ukraine's Innovative Development are currently under formulation by the Ukrainian Government. These documents will serve to develop a national innovation system; defining the legal framework for implementing the latest technologies, developing innovations and providing state support to innovative enterprises.

2.2 Institutional reform

Lack of consistency and proper coordination has been one of the issues that hampered implementation of innovation policies in the last decades. To address this issue, the Council for Innovation Development was established last year. This consultative and advisory body headed by the Prime Minister gathers relevant government executive bodies, including representatives of the National Council for Science and Technology Development, the National Committee for Industrial Development and Business to cooperate on business-driven innovation reform. As a result of this work, the two leading bodies of central executive power responsible for innovation policy, the Ministry of Economic Development and Trade and Ministry of Education and Science, established clearly defined functions to avoid overlapping.

In support of demand-side innovation policy and the establishment of a business-oriented organisational architecture, the Government plans to set up the Innovation Development Office

[1] Global Competitiveness Index 2017-2018 http://www3.weforum.org/docs/GCR2017-2018/05FullReport/TheGlobalCompetitivenessReport2017%E2%80%932018.pdf

later this year based on the best practices of the innovation agencies from around the world and backed by international donors' financial support. The Office is expected to implement innovative business support programs fostering innovation in established companies, especially SMEs; encouraging innovative start-ups. The Office should also advocate, promote and coordinate innovation initiatives.

With regards to innovation and digital ecosystem development, the Government plans to focus on:

- improving the regulatory framework for innovation to bring definitions and classification of innovations up to date and align it with best practices indicated in the OECD Oslo Manual;
- providing a legal framework for new funding mechanisms for innovations (startup fund, business angel investment, venture capital funds);
- improving the regulatory framework for the operation of innovation infrastructure (technology parks, incubators, accelerators, clusters);
- removing legislative barriers to foster digital and fin-tech innovations;
- enhancing intellectual property protection.

In order to support innovation in the regions and utilising the potential of cluster development and a smart specialisation approach, the government has launched the Cluster Development Programme for Ukraine encouraging internationalisation and the development of existing and new cluster organisations in Ukraine. Eighteen clusters have been registered in the Cluster Collaboration Platform so far.

2.3 Key features in Ukrainian business innovation

Ukraine has a well-educated workforce with a high rate of enrolment in tertiary education and Ukrainian students are considered to perform well in math and science. But university programmes are not adapted to provide skills demanded of the private sector. It leads to migration of the qualified workforce, which is unable to find matching jobs in Ukraine.

The Government sees the development of university accelerators and incubators as one of the ways to bridge the skill gap, but the universities do not have the relevant knowledge and experience in building and operating such incubators. One of the successful startup initiatives in this area is YEP!, a network of academic business incubators, although their capacity is limited and do not cover all regions.

Low funding of state programmes and initiatives as well as lack of access to finance is another issue. In 2017, the main source of financing for innovation for existing firms was the firm's own funds (85 percent of total expenditures). Other funding came from domestic and foreign investors (4.2 percent), loans (6.6 percent), state and local budgets (3.6 percent).

The startup activity is growing in Ukraine. According to UVCA (Ukrainian Venture Capital Association), in 2017, investment in Ukrainian startups totalled USD 265 million, and there were about 3,000 high-tech startups with a Ukrainian origin. However, there is a financing gap with regards to the availability of seed capital for startups. This causes Ukrainian developers to seek financial resources abroad, often in neighbouring countries. As a result, firms eventually register in foreign countries with more favourable investment opportunities and with a more attractive business climate and they typically stay abroad rather than returning to Ukraine. According to one of our interviews, most of the successes of Ukrainian startups are the successes of foreign startups, in which Ukrainians acted as co-owners. In order to address this financing gap, the government has assigned UAH 50 million (about USD 1.9 million) to support startup projects. The

Ukrainian National Startup Fund will be established later this year to allocate the budget funds supported by international co-funding to increase access to the funding for startups.

Properly working quality infrastructure is an important part of enabling an innovation environment in innovative countries. The term refers to a system of institutions and regulatory framework ensuring that produced intermediaries, goods and services conform to a specified quality and standards[2]. Overall, Ukraine's national quality infrastructure is consistent with accepted international practices. However, The World Bank found a number of limitations and gaps of quality infrastructure mostly related to institutional structures and operational frameworks and suggested a set of short-term and long-term recommendations on reform actions. One of them is to change the role of the national quality infrastructure if Ukraine's government is determined to increase competitiveness of national producers in export markets and ensure sustainable development. The present role is passive: resources are mostly utilized to make sure that products are tested properly and comply with the relevant requirements. To obtain maximum benefits for the economy and society, the quality infrastructure should play a proactive role, be engaged in scientific and industrial research contributing to the development of new products and materials and the improvement of existing ones.

3 Danish Innovation Policy

Denmark is considered to be one of the most innovative countries when it comes to introducing new products and solutions in both the public and the private sector. This is documented in a number of international studies and demonstrated through a number of strong business cases, which we will look further into in this chapter.

Denmark was listed as second in Europe in both 2015 and 2016, and third in the 2017 European Innovation Scoreboard. According to Statistics Denmark (2015), 44% of all companies in Denmark had innovation (see definition in section 3.1) activities in 2015: 30% were engaged in product or process innovation, 27.5% in organisational innovation, and 28% in marketing innovation. This indicates that the Danish business environment facilitates a strong foundation for business innovation and that inspiration can be found in many shapes and forms.

The Danish **research and innovation (R&I) system** is highly centralised. Framework conditions for innovation in Denmark are primarily influenced by innovation strategies: "**Denmark – A Nation of Solutions"** from 2012, and the 2017 R&I strategy **"Denmark – Ready for the Future"**.

A major policy initiative was the **INNO+ Catalogue** (2013), which aimed to prioritise resources for targeted innovation efforts. Being the result of an extensive process involving a wide range of stakeholders from industry and interest organisations, knowledge institutions, ministries and research councils, etc., the INNO+ catalogue identified 21 essential and promising focus areas of strategic investments for research and innovation (The Ministry of Science, Innovation and Higher Education, 2013b).

The Danish Government is active in promoting research and innovation, which is reflected in a well-established and centrally organised funding infrastructure. According to Eurostat (2018), Denmark's gross domestic expenditure on R&D (GERD) reached 2.87% of GDP in 2016, which is well above the EU average (2.03%). According to our interviews, various Danish

[2] A reliable Quality Infrastructure System (QIS) typically includes standardisation, metrology (scientific, industrial and legal), accreditation and conformity assessment services (inspection, testing and product- and system certification) necessary to provide acceptable evidence that products and services meet defined requirements (UNIDO, 2017).

Governments have prioritised the innovation agenda for a long period and see it as a way to enhance growth and international competitiveness.

The Danish R&D system is dominated by private R&I, evidenced by its business enterprise R&D expenditure (BERD) – 1.89% of GDP –, which contribute to about two thirds of overall Gross domestic expenditure on R&D GERD (Eurostat, 2018). Public R&I is mostly carried out by the universities, but the external share of funding of university research is the highest in the OECD (Regeringen, 2017). This indicates a high level of **public-private cooperation**, which occurs mainly between firms and the eight Danish universities as well as the nine GTS ('Godkendte Teknologiske Serviceinstitutter', i.e. Advanced Technology Groups) institutes. The research suggests that strong and trustworthy public-private partnerships have helped bring about innovative solutions for Denmark benefitting both the public and the private sector and that it is important to see the two sectors as complementary and not in direct competition or opposition to one another.

It appears that the dialogue and cooperation between the public and private sector in relation to promoting innovation is a lot stronger in Denmark compared to Ukraine. Some of Ukraine's latest policy initiatives try to address this, but more could be done in this area.

3.1 Innovation policies and legal framework

In Denmark, the definition of innovation, research and development follows the internationally recognised definition of research and innovation applied by OECD and the EU (The Danish Ministry of Science, Technology and Innovation, 2012). In "Denmark – A Nation of Solutions", innovation is defined as "knowledge and ideas translated into products and processes, which create commercial and societal value." (The Danish Ministry of Science, Innovation and Higher Education, 2012). The strategy document also cites the OECD and the EU definition of innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method or a new organisational method in business practices, workplace organisation or external relations."

The Danish government has been making significant efforts to enable better regulation primarily through administrative simplification (OECD, 2009). Innovation regulation consists primarily of the innovation strategies and other soft law translated into strategic priorities for research and innovation funding (Grimpe & Mitchell, 2016). Moreover, most regulations have been implemented in the form of R&D subsidy programs to stimulate preventive process solutions and cooperation among technology suppliers, research institutes, consultancy firms, and users (Grimpe & Mitchell, 2016). To that effect the Danish regulation is simple and focuses on facilitating business opportunities rather than (over-)regulating and hindering private initiatives.

The Technology and Innovation Act, approved in 2002, added various existing initiatives into one. It aims to develop cooperation between private companies and public research institutions and support innovative firms by providing different types of funding. Consolidating acts were issued on Innovation incubators (2008 and 2014), Innovation networks (2008 and 2014), as well as Research Misconduct (2017). Furthermore, the Act on Inventions at Public Research Institutions (1999) regulates the commercial utilisation of research outcomes generated by use of public funding. The aim of the act was to strengthen and incentivise commercialisation of research results.

A **cluster organisation** is defined as a "flexible organisational entity that serves as a facilitator for value-creating interaction between players in the cluster." (The Danish Ministry of Science Innovation and Higher Education, 2013a). Cluster organisations have often been highlighted as

a positive setting for stimulating creative growth and innovative solutions and it has thus been a priority area for Denmark to enable these environments across the country.

Over the last 20 years, a whole string of cluster organisations has been created in Denmark based on public offers of funding for cluster and network secretariats (The Danish Ministry of Science Innovation and Higher Education, 2013), which is another example of the public sector trying to stimulate private sector growth. This trend of focusing on clusters as a growth stimulator was also seen in recent Ukrainian initiatives.

The main measures to support R&D collaboration are administered by the **Innovation Fund Denmark** established in April 2014. These measures are:

- **Industrial PhD and PostDoc**: In addition to the 'traditional' model of PhD education, Denmark also offers a path referred to as the Industrial PhD Programme. Established in 1970, the Industrial PhD Programme is internationally recognised for its combination of industrial experience and academic research. It has found to be able to contribute to knowledge and technology transfer from academia to industry, thereby fostering innovation. The Industrial PostDoc programme creates career paths in the private sector for those who have already completed their doctoral degree in public research activities.
- **InnoBooster** is a grant for SMEs with limited experiences to hire highly educated employees for development or innovation projects. It also includes a measure known as the innovation voucher: 40% co-funding of development projects for SMEs to be used for knowledge acquisition from a public research organisation or a GTS institute.
- I**nnoFounder** offers a monthly grant for 12 months and a lump sum grant to recent or soon-to be graduates with a great business idea; a permanent and experienced mentor, and a desk at a co-working space. InnoFounder targets early-stage startups in all fields of business with a scalable idea and a clear market potential.
- **Public-private partnerships on innovation and strategic R&D projects**: The Innovation Fund offers support for problem-oriented strategic research projects, high-technology projects involving firms and public research institutions, and innovation partnerships within certain thematic areas (blue jobs and green solutions; intelligent, sustainable and effective plant production; water-efficient industrial production, etc.).

Though some of the above-mentioned policies and initiatives are found in a Ukrainian context, many of the Danish policy measures appear to be more mature and well-tested. Some of the initiatives such as an industrial PhD programmes will take time to implement, while others such as specific grants for SMEs or startups can be tested in a shorter-term perspective. This will be addressed in chapter 5.

3.2 Institutional framework

The main responsibility for research and innovation is placed within the authority of a 'super-ministry' – the Ministry of Higher Education and Science. The Ministry of Business and Growth has certain tasks related to business development, and several sectoral ministries – the Ministry of Energy, Utilities and Climate, the Ministry of Environment and Food and the Ministry of Foreign Affairs – have larger R&I programmes.

In general, the Danish system is characterised by close cooperation between the above-mentioned and other line ministries. An example of this cooperation can be seen in the Innovation Centre Denmark, which is a partnership between the Ministry of Higher Education and Science and the Ministry of Foreign Affairs. The cooperation encompasses seven innovation centres, which help businesses and researchers connect and form strategic partnerships and access capital.

The Danish cooperation and coordination appear to be more coherent compared to Ukraine. As previously mentioned attempts have been made to streamline the institutional organisation to avoid overlapping responsibilities, but there is still some way to go before Ukraine will have a well-functioning system catering for innovation.

As the Danish innovation system is highly centralised, the regions play a lesser role in the R&D governance process (Grimpe & Mitchell, 2016). The **ministries** have specific **agencies**, which implement the respective policies. Our interviews highlighted the fact that Denmark's many specialised agencies and corresponding advisory boards with private sector representatives positively enable business development and innovation.

The **funding system** is composed of three main actors: the Danish National Research Foundation, the Danish Council for Independent Research, and the abovementioned Innovation Fund Denmark. Basic research is funded by the Danish National Research Foundation through a non-thematic approach only oriented towards scientific excellence. The Danish Council for Independent Research finances both basic and more applied, curiosity-driven research that would not find funding elsewhere in the system. The Council is also engaged in R&I policy advising to ministries, the government and the parliament. The Innovation Fund Denmark was established in April 2014 by joining research, technology development and innovation grants from the Danish Council of Strategic Research ('Det Strategiske Forskningsråd'), the Danish Council for Technology and Innovation ('Rådet for Teknologi og Innovation') and the Danish National Advanced Technology Foundation ('Højteknologifonden'). The Fund facilitates the development of knowledge and technology in order to foster growth and employment and is seen as a leading capacity in supporting relevant research in demand.

Also established in April 2014, the **Danish Council for Research and Innovation Policy** (DFIR, 'Danmarks Forsknings- og Innovationspolitiske Råd') is tasked with the development of research, technology development and innovation for the benefit of society as a whole. Comprising primarily recognised researchers or research experts as its members, the Council provides the Minister for Higher Education and Science with high level, independent advising on research and innovation, including future needs, based on relevant national and international experience and developments. The Council is another example of Denmark's approach towards establishing highly specialised and competent entities that can promote an important policy area.

Danish business support policies have applied the **smart specialisation** principles for a long time, emphasising experimentation, as well as recognising and utilising locally embedded strengths, resources and regional stakeholders in an entrepreneurial discovery process (Foray et al., 2009). Both the national innovation strategy and the national cluster strategy contain elements promoting smart specialisation, with INNO+ catalogue being an important policy initiative complementary to the smart specialisation priorities. Furthermore, the Danish Growth Council coordinates and promotes cooperation and development between the national growth strategy and the regional growth and development strategies (Grimpe & Mitchell, 2016). Smart specialisation is at a much earlier stage in Ukraine where this concept has been introduced quite recently, e.g. through the Danube Macro-Regional Strategies.

Public sector innovation – A well-functioning and innovative public sector is important for the business environment. An innovation survey by Statistics Denmark in 2014 on Public Sector Innovation identified a high frequency of innovation across all types of public organisations, with process innovations being the most frequent type of innovation (Statistics Denmark, 2015).

The policy initiatives include the establishment and support of the national Centre for Public Innovation and the appointment of a Minister for Public Sector Innovation within the Ministry of Finance with the objective to improve public sector innovation, digitalisation, modernisation and governance. The Centre has produced the world's first statistic on public innovation, which shows a high level of innovation in the Danish public sector. It also shows that 79% of public innovation takes place in cooperation with partners from entities external to the organisation itself, including 22% in cooperation with the private sector (Innovationsbarometret, 2016). This indicates that innovative activities can be promoted if varying competences engage in partnerships, which could be relevant to investigate further in a Ukrainian context.

Also, according to our interview with the Danish tax authorities ("SKAT"), the Danish public sector provides important services to the private sector that promote innovation:

"In relation to the ecosystem we have a 2+ year digitalisation strategy and a vision (examples include NEM-ID, e-income and NEM-account). We prioritise the essentials for essential groups. We are assisting smaller companies in paying VAT for example. We are a service institution and not an institution of punishment. We are in dialogue with companies concerning processes and we offer solutions that make things easier for them."

These are important achievements that many Danish citizens and companies today take for granted, but which have in fact been ground breaking and facilitate easy digital access for all, which considerably reduces the administrative burden that hurt smaller companies in particular.

As mentioned previously **Quality Infrastructure** is an important feature for providing confidence to a nation's citizens and to international trading partners that the products and services provided will meet their needs and expectations (UNIDO, 2017). The main components of a typical QIS are *standardization*, *metrology*, and *accreditation.*

The Danish national legal metrology authorities are: Center for Legal Metrology (CLM) and Danish Safety Technology Authority (SIK). The Danish Accreditation (DANAK) is the national accreditation body, while Dansk Standard (DS) is responsible for national standards (BIPM, 2018). The Danish quality infrastructure is considered to be strong on an international scale and acts as a mediator for high quality products.

In that sense the Danish authorities seem to play a much more proactive role as opposed to Ukraine where the structure may exist, but where the public sector plays a more passive role.

3.3 Key features of Danish business innovation

According to our interview with the Danish Business Authority (Erhvervsstyrelsen), bureaucracy is the biggest barrier when establishing a new company. There needs to be predictable market conditions where contracts are awarded based on merit and on equal terms. Digitalisation processes could be used to enable a faster system with less bureaucracy and corruption. However, these processes should be introduced gradually, and the legal framework needs to be in place before introduction, which is confirmed by the interview with the Tax Authorities:

"In Denmark we have a strong trust in the public authorities, a low level of corruption, strong norms for complying with rules, high acceptance of public regulation, strong level of fundamental registration, business friendly legislation, a common public infrastructure, visions for further development, limited controls, forthcoming demands for companies' documentation.

The interview with the Danish Business Authority also emphasised the importance of access to finance and competence, pointing out that Denmark is also fighting for the tech talents. However, access to finance seems to be a much bigger challenge in Ukraine.

According to our interview with Business Region Aarhus, strategic mobility is the key – rather than infrastructure. Investment in IT structure cannot be a quick fix – it cannot be made hastily but has to be part of a bigger plan.

Essentially the conducted interviews point towards different coherent elements in Danish business innovation that provide strong results because they are part of an overall long-term strategy and because Denmark generally has been able to avoid quick fixes and suffer under contradicting political priorities. To that effect, Ukraine should probably not try to copy the Danish features, e.g. by introducing advanced digital solutions from day one, but rather select the relevant elements, which fit their current position and build them over time to strengthen their strategic approach towards business innovation, thus, enabling the public sector to become a supporter of business innovation rather than a hindrance.

4 Examples and types of support

With respect to the segment of high-growth and innovative firms, the Danish government has been keen to improve access to finance and has addressed the lack of **equity funding** in recent policy documents (Regeringen, 2017a). Together with private investors, the **Growth Fund**, a state investment fund, has been co-financing venture capital to entrepreneurial growth companies since 1992. A 2013 evaluation of the Growth Fund's activities showed that the fund's investments had led to short-term direct effects of increase in GDP and job creation (DAMVAD, 2013).

The Danish **taxation regime** for venture capital funds is generally favourable. Two different fund structures are available for private equity and venture capital investments, and both are tax-transparent and without undue restrictions. At the fund level, the maximum capital gains tax and withholding tax are 25% (EVCA, 2012). Our Business Authority interview highlighted that focus should be put on incentives, and according to the tax authorities, the public sector's ability to collect tax revenue is highly relevant. In that sense the "tax gap" – that is, how much tax should be paid compared to how much is actually paid – is a major issue in many countries.

Business Angel investment is another important way for entrepreneurs to obtain financing from individuals often as early as in the seed phase. Essentially the term Business Angels refers to a private network of investors and companies that provide advisory services and funding for promising business initiatives. The Danish Business Angels has 252 startups in their portfolio and is backed by 90 active investors and several financial companies, with an average investment of DKK 1,7 million (USD 270,000) per company. Companies can submit applications that become available to any angel in the network. Forty per cent of incoming proposals get a direct feedback from one or more investors (Danish Business Angels, 2018).

Science and Technology Parks – In order to improve their commercialisation capabilities, Danish universities have initiated a process of moving away from the traditional linear approach towards a more collaborative and interactive model. In line with this effort, physical 'Innovation Hubs' and 'Science and Innovation Parks' are being built to provide shared facilities for researchers, student entrepreneurs, and businesses. Currently, there are five scientific parks functioning in Denmark, including the Copenhagen Bio Science Park, located with the Copenhagen Biotech Research and Innovation Centre, and the NAVITAS park opened in

Aarhus in 2014 focusing on bringing public research and private firms in the area of energy research together. There are four **Innovation Incubators** offering pre-seed and seed capital accompanied by counselling for entrepreneurs. Most of the incubators are housed in science parks that also provide combined office and laboratories in close proximity to the universities. The Danish Business Authority contributes to the ecosystem by building shared office facilities.

Startups[3] – Entrepreneurship is seen as the most important source of creating new jobs in Denmark (and internationally) and is thus an important foundation for growth (Iværksætterpanelet, 2017). According to Global Entrepreneurship and Development Index (GEDI), Denmark has a strong entrepreneurship performance – it was ranked 4th in the world in 2016, 5th in 2017, and 6th in 2018 out of 137 countries, and has moved up from number 17 in 2009 (thegedi.org). In the World Bank's "Ease of Doing Business", Denmark was ranked 3rd in 2017 (doingbusiness.org), one of the reasons being the high rate of digital communication between the private and the public sector. Startup Heatmap Europe's 2017 survey listed the top factors for location choice as follows: access to talent, ease and cost of doing business, access to capital, quality of ecosystem, existing personal network, and proximity to target market (European Startup Initiative, 2017). According to Eurostat data, Denmark had a business birth rate of 11% in 2015, which is relatively high compared to other EU countries. However, exit rates were also at a relatively high level (OECD, 2015). According to our Business Authority interview, many had not been planned well enough. At the same time the exit rate is not alarming if we look further ahead than the first year. Many startups are founded on digital business models and have a global market from the outset ("born globals"), but often take an ad hoc approach to internationalization.

This has led the government to prioritise stimulating higher quality startups where internationalisation advisory support is offered.

SMEs play an important role in Denmark with a slightly higher contribution to the economy than the EU average. However, the rates of innovation activities for SMEs are lower than the national average – 34.7% of SMEs have introduced a new product or process (European Commission, 2017). To stimulate innovation performance, the government has established both demonstration programs (e.g. the EUDP program) and the Market Maturation Fund (MMF). The latter supports projects with co-financing (up to 45%) and supports only prototype testing and adaptation of innovative solutions towards the market (The Market Maturation Fund, 2017).

As mentioned **cluster collaboration** and business support can be tools to facilitate entrepreneurship, cross-sectoral collaboration and growth, contributing to regional structural change and industrial modernisation (European Cluster Observatory, 2014). As many SMEs do not have the resources to operate business development units for strategic market analysis and development, cluster organisations can counterbalance this disadvantage by providing sophisticated market intelligence services. Denmark was one of the first countries to implement active cluster policies and there has been a continuous policy to enhance network-based innovation. The Danish cluster policy – The Danish cluster strategy 2.0 (2016-2018) and the first cluster strategy from 2013 – is well-established at national, regional, and municipal level, often developed with the involvement of regional stakeholders participating in the process. Regional investments in cluster development are covered by the ERDF programme, in which the industrial focus areas of the clusters belong to the overall regional smart specialisation priorities. A recent audit of the Danish network and cluster initiatives showed that especially small firms

[3] A **startup company** is an entrepreneurial venture which is typically a newly emerged business that aims to meet a marketplace need by developing a viable business model around a product, service, process or a platform (Wikipedia, 2018).

with less than 50 employees benefit from participation in the networks in terms of improving their innovative capabilities to increase their innovation output (Knudsen et al, 2018).

5 Policy recommendations

5.1 Comparing Ukraine and Denmark

This paper suggests that there are similarities but also a number of differences between Ukraine and Denmark in relation to innovation. To some extent the differences can be described as varying stages of maturity in the Danish and Ukrainian legal and policy framework. Whereas Denmark has been a frontrunner in working proactively with innovation policies, which has been supported by the institutional set-up, Ukraine has only recently pursued some of the same trends, e.g. in terms of shifting from a supply-side approach to a demand-side approach, establishing advisory boards and delineating responsibilities to avoid overlap between authorities.

The embedded approach to governance also appears to be somewhat different in the two countries. The Danish system is participatory and based on inclusiveness with the authorities acting more as advisors than controllers. Ukraine is gradually moving in this direction, but with a different democratic legacy, and where economic recessions have also had an impact on the government's ability to introduce ambitious and well-coordinated reforms. This discrepancy is also supported by the fact that the Danish level of digitalisation is very high, which facilitate for effective solutions reducing the administrative burden for companies and citizens, but which may not be implementable in most other countries.

The conditions for Danish startup companies are more favourable such as securing access to finance domestically, relying on a well-founded business community through both public and private organisations, quality infrastructure, and the level of transparency and accountability e.g. in public procurement.

5.2 Recommendations

Based on the above observations, and the analyses of the Ukrainian and Danish conditions for innovation, we are suggesting the following recommendations to be considered in a Ukrainian context.

5.2.1 Reduce administrative burdens and barriers for private companies

As mentioned one of the key features in the Danish interface between the public and the private sector is the relatively low level of administrative burdens on the private sector as well as the availability of electronic solutions. This is not something Ukraine can implement overnight, but it could be considered as part of a long-term strategy to integrate digital solutions and analysing the current barriers for innovation, which should then be addressed in the strategy.

In Denmark there is more focus on soft laws translating into policies, less on regulation and legal constraints. This would not necessarily work in Ukraine today as there does not appear to be same level of trust between the citizens and the authorities, so such new features in the system should be introduced gradually.

5.2.2 Increase policy coordination

Denmark´s experiences can help Ukraine achieve better policy coordination, for instance: avoidance of policy inconsistencies; minimisation of conflict, both bureaucratic and political; policy coherence and cohesion and an agreed ordering of priorities through promotion of a comprehensive or 'whole government' perspective against the advocacy of narrow, sectoral perspectives (Braun, 2008).

Ukraine has started reviewing and changing its institutional structure to accommodate these changes and to that effect the Reforms Delivery Office and other coordinating agencies play an important role. There is a need to follow up on these recent initiatives and perhaps also to take stock in the private sector whether they perceive that policies have been simplified and coordination streamlined.

5.2.3 Strengthen the triple helix approach

Using the 'triple helix' approach that acknowledges the interdependence between industry, universities, and the political sphere, the government can and should encourage developments in innovation by defining the 'rules of the game', financial assistance, and the creation of new actors (Etzkowitz & Leydesdorff, 2000).

Denmark has successfully established five Science & Technology Parks as well as seven Innovation Centres, which all play a part in strengthening the cooperation between private and public counterparts. Ukraine has already taken this path in some of their recent policy initiatives and this approach should be continued and strengthened, e.g. by studying the Danish and other international experiences.

5.2.4 Utilise the academic capacity

Denmark is also fighting to attract talents in the global competition, but overall Denmark has managed to attract and sustain academic talents. Ukraine is considered to have strong academic capacity but is struggling in terms of attracting and maintaining its own talents. The main reasons seem to be the weak link between academia and the private sector as well as the difficulty to secure local investments.

Denmark has tried to bridge the gap through e.g. the Industrial PhD and PostDoc programmes where academia interacts specifically with the private sector. The InnoFounder grant is also an example of where recent or soon-to-be graduates can jump from an academic career or merge it into business innovation. While the first example will need to be integrated into the Ukrainian educational system, the latter could be tested in a shorter-term perspective, but the professional capacity needs to be (made) available as the grants themselves are only part of the formula.

5.2.5 Develop relevant advisory services and functions

The Danish experience in business innovation has been to establish a number of competent boards e.g. the Danish Council for Research and Innovation Policy, which act as advisors to the relevant authorities. In that way, the private's sectors perspectives are reflected strongly in the policies and practices and the basis for qualified decision-making is strengthened.

This trend is also being introduced in Ukraine with the latest institutional reforms, but the private sector could have a stronger representation, and a clearer role, and the functions need to mature.

5.2.6 Improve access to finance

One of the main challenges in Ukraine seems to be the difficulty for startup companies to access capital with the consequence that there is a relatively low number of newly registered companies, and a tendency to seek abroad.

In Denmark there is a high number of new companies registered every year and though there is a high rate of companies closing down during the first year, the rates look good, if we look beyond the first year. This shows that there is a need for advice and financial support for longer than the first year, which is certainly also the case for Ukraine where the startup conditions are generally weaker than in Denmark.

The Ukrainian government has an ambition to provide the framework for a new funding mechanism for innovation, e.g. startups, business angels, venture capital funds. In line with the recommendation above, it is important that the funding is allocated effectively and in a transparent way. Also, the lessons from Denmark show that the funding should be extended a bit longer than the first difficult year, so it should be considered how to design different funding steps or different mechanisms of support.

5.2.7 Enhance the entrepreneurial capacity

As already indicated business innovation support goes beyond grants and funding. Denmark has a number of organisations and mentor programmes that the companies can turn to for help while the structure in Ukraine is more fragmented.

It is therefore suggested that Ukraine introduces programmes or initiatives that can help entrepreneurs develop the necessary skills for business development, fundraising, attracting talent and internationalization, e.g. through advisory services and a stronger focus on business entrepreneurship. In the early stages these services could be supported with international experience relevant to the local context.

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List of interviewees (Ukraine)

Name	Position	Organisation	Contact info
Olga Bolibok	Project Manager on Industry and Innovation Development	Reforms Delivery Office at the Cabinet of Ministers of Ukraine	olgabolibok@gmail.com +38 093 963 7453
Daria Chaika	Director-General of the Directorate of Innovation and Technology Transfer	Ministry of Education and Science of Ukraine	chayka@mon.gov.ua d.chayka@gmail.com +38 044 287 8255 +38 096 386 2297
Artem Akhromkin	Head of Division of Science and Innovation of the Department of Investment Attraction	Ministry of Economic Development and Trade of Ukraine	ahromkin@me.gov.ua +38 044 596 6815 +38 097 768 9209
Dmytro Yeromin	Managing Partner Member of the Council on Innovation Development headed by Prime Minister	UNIT.city, Innovation Park, Kyiv, Ukraine	ed@unit.cyty deryomin@gmail.com +38 068 079 7979
Maria Makhnovets	Consultant	Organic Trade from Ukraine, Kherson, Ukraine	mariia.makhnovets@gmail.com +38 095 837 4455
Denis Gursky	CEO/Founder Co Founder Member of the Council on Innovation Development headed by Prime Minister	SocialBoost, tech NGO focused on impact projects in the field of open data, civic participation and e-governance 1991 Open Data Incubator	denis.gursky@gmail.com +30 067 644-8613
Ruslan Korzh	CEO	Upromex, a company, Kyiv Ukaine	Ruslan.korzh@upromex.com + 38 044 290 2090 + 38 050 386 2836

	Member of Supervisory Board Member of the Council on Innovation Development headed by Prime Minister Former Deputy Minister of the Ministry of Economic Development and Trade (2015-2016)	Dnipro Space Cluster, Dnipro, Ukraine	
Dmitro Titarenko	Co-founder Ogranizer	Agroportex.bio, a start-up (developed mobile app AgroportEx connecting producer and buyer of organic agriproducts without intermediaries), Kherson, Ukraine AGROPORT Ukraine, agroforum	dmitry@tytarenko.com.ua +38 050 400 2533
Nataliya Matkovska	Chairman Expert	Regional Center for Sustainable Development, a NGO, Kherson, Ukraine Team Europe, an EU project	matkovska.nataliya@gmail.com +30 067 552 49 10
Andriy Zaikin	Founder & CEO	YEP!, a network of academic start-up incubators	zaikin.andriy@gmail.com +38 091 338 2600 +38 096 438 2600
Olga Krasovska	Leading Research Fellow/ Projects Coordinator Senior SME Policy Advisor	Institute for Economic Research and Policy Consulting FORBIZ, EU-funded project	olha.krasovska@gmail.com +38 067 763 9999

Vitalii Gryga, PhD	Senior Research Fellow	Institute of Economics and Forecasting at the National Academy of Sciences of Ukraine	v.gryga@gmail.com +30 097 627 2366
Igor Yegorov, Doctor of Science in Economics	Head of Department of Innovation Policy and High Technologies	Institute of Economics and Forecasting at the National Academy of Sciences of Ukraine	igor_yegorov1@ukr.net +38 044 280 1402 +38 099 152-4749

List of interviewees (Denmark)

Name	Position	Organisation	Contact info
Majken Præstbro	Relationschef	Center for Offentlig Innovation	mmp@coi.dk +45 61813104
Nicolai Hellmann	Chefkonsulent/Team Leader	Erhvervsstyrelsen (Danish Business Authority)	NicHel@erst.dk +45 3529 1000
Ronnie Nielsen	Chief Advisor (International Cooperation)	SKAT (Danish Tax Authorities)	Ronnie.Nielsen@Skat.dk +45 723 76677
Jane Baad Jensen	Sekretariatschef	Business Region Aarhus	jjaba@aarhus.dk +45 2372 1014