INNOVATION

ICT Centric Innovation Ecosystem
COUNTRY REVIEW: Republic of MOLDOVA

Report

Telecommunication Development Sector

ICT-centric innovation ecosystem country review: Republic of Moldova

July 2017

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Foreword

Preface by BDT Director

The International Telecommunication Union (ITU) identified innovation as a priority for development at the World Telecommunication Development Conference and at the Plenipotentiary Conference in 2014. This was reconfirmed by the World Telecommunication Development Conference in 2017. Innovation is also highlighted in Goal 9 of the Sustainable Development Goals: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation*.

Innovation plays a major role in the global development agenda by enabling digital transformation and creating new and improved services for citizens. Bringing multiple stakeholders and sectors together to strengthen innovation ecosystems is essential to unlocking opportunities and ensuring sustainability. Shaping and nurturing national ICT centric innovation ecosystems are key to accelerating development and fostering digital economies. Additionally, enhancing innovation ecosystems can accelerate the development of ICT enabled industries and sustainable digital employment.

With this in mind, I am proud to present this study, which is part of a series of country reviews that can help strengthen the capacity of ITU Member States to integrate ICT innovation in their national development agendas. This ICT-centric innovation ecosystem country review provides a roadmap and a framework for the journey toward a digital economy. ITU is working together with other international organizations, global experts and key stakeholders to shape its innovation agenda, with the objective of accelerating digital transformation in countries.

The preparation of the ICT Centric Innovation Country Review for Moldova has engaged key stakeholders from both public and private sectors, financial and development agencies, academia, and entrepreneurs. Their participation ensures that the analysis and guidance provided reflect the circumstances and needs of the country.

In the past few years, the reforms undertaken in Moldova highlight the country's commitment to the ICT ecosystem, the ICT industry at large, and innovation. The country's national strategies have provided an opportunity for the ecosystem to grow. This report will help lay the foundation for further growth through a strong ICT centric innovation ecosystem.

I hope ITU can be a key partner in cooperating with Moldova to accelerate the transformation of its economy towards an inclusive innovation-driven economy, and to achieve the 2030 Agenda for Sustainable Development .

Brahima Sanou
Director, Telecommunication Development Bureau, ITU

Foreword by Deputy Minister of Information Technology and Communication

The ICTcentric innovation ecosystem country review for the Republic of Moldova emphasizes the International Telecommunication Union support towards our commitment to empower an innovation driven economy. It recognizes the importance of innovation in driving a strong and strategic ICT sector and in accelerating economic development in the country. Thus, we are grateful for the willingness of ITU to unleash its resources and the intellectual capacity of the Innovation Service of the Telecommunication Development Bureau to provide Moldova with this new tool.

Moldova identifies itself among the countries with a strong focus on enhancing the growth of the IT industry, as well as expanding its potential. This vector is highlighted by successful implementation of such strategic documents as the National Strategy for information society development "Digital Moldova 2020", and by the Strategy for the "IT Industry Competitiveness and Growth" Moldova has almost fully leverage the potential of these two strategies, and these new insights from ITU are timely to further provides the Republic of Moldova with new opportunities to develop its ICT centric Innovation ecosystem.

As the IT industry is strongly tight with innovation, this holistic analysis through the critical lenses of stakeholders was needed to unlock and further leverage economic and social opportunities. This brings us to the crucial importance of the joint work performed during the last six months meant to accelerate the transformation by capitalizing on the advantages the ecosystem has, and by creating a common vision on how reforms can meet the needs of various stakeholders.

In essence, this report provides a snapshot of challenges and opportunities currently faced by stakeholders, and is complemented by seven key recommendations based on the needs analysis. These specific policies, programmes, or flagship projects recommendations will serve as a reference tool to help guide and support innovation with aim to make Moldova attractive as a potential hub for emerging technologies. These new approaches to policy making became the basis for the new Strategy for fostering the digital innovation ecosystem currently being developed in the country.

Hon Vitalie Tarlev
Deputy Minister of Information Technology and Communications

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1 Executive summary

Introduction and who is targeted

This report examines the dynamics of the ICT centric innovation ecosystem in Moldova, and makes recommendations to strengthen ICT innovation in the Moldova national development agenda, and leverage the economic and social opportunities provided by innovative technologies. The primary goal is to work together with stakeholders in the innovation ecosystem and policy leaders and experts to understand the ecosystem challenges, needs and opportunities, and to develop coherent approaches to move Moldova towards an innovation driven economy.

Moldova has a number of key advantages and a number of positive changes underway. In particular, it has strong connections to global markets, a good basis for research and excellent communications infrastructure. As soft infrastructure and entrepreneurial communities develop, Moldova will be able to use those as opportunities to succeed, as long as issues of business environment and brain drain can be effectively addressed. Through careful planning and ongoing, diligent efforts, the country can see significant growth in ICT centric innovation, and become a leader in a number of innovative fields.

This report will provide an analysis of the current situation, recommendations for programmes and policies, and present a framework and tools to unleash the potential of the Moldova ICT innovation ecosystem. It is intended for policy makers, ICT entrepreneurs, academia, research institutions, financial stakeholders, private sector firms, and entrepreneurial support organizations.

The mandate

The ITU Telecommunication Development Bureau (BDT) has been actively fostering ICT led development. In 2014, at the ITU World Telecommunication Development Conference in Dubai (United Arab Emirates), its membership approved a strategic and operational plan for the BDT that includes output 2.3 calling for the strengthening of ITU Member State capacity to integrate ICT innovation in national development agenda. This priority can also be found in the new Sustainable Development Goals, namely Goal 9: *Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.*

In this context, ITU has worked together with other international organizations, global experts, and key national stakeholders to elaborate this country case study on ICT centric innovation ecosystem for sustainable development. This report is furthermore part of a series of reports, defining and shaping an international knowledge base and series good practices intended to strengthen the innovation capacity not just of Moldova, but of all ITU Member States.

Addressing challenges in Moldova

Moldova's rich history and unique position provides it many opportunities to develop a vibrant ICT centric innovation ecosystem. As with much of the region, Moldova has succeeded at maintaining advantages in areas of education and hard infrastructure. There are internationally recognized researchers and institutes in a number of areas in the country, though they are under leveraged in terms of commercialization of their research.

There is a clear interest and drive on the part of both the government and population of Moldova to provide a strong role for ICT centric innovation as a support for the economy and there have been many efforts to support the ICT sector and innovation activities through policy and projects across the country. These have been supported by international partners and some in the private sector, though they remain at an early stage. Beyond this, the integration of Moldova into regional trade agreements has greatly expanded the markets available to entrepreneurs in the country. By building on these strengths and resolving key issues that currently present barriers to this development, a number of possibilities present themselves. However, there are serious challenges to overcome in order to put Moldova's ICT centric innovation ecosystem on a road to success.

Issues with transparency and bureaucracy in the public sector represent barriers to commerce. Processes can be slow, expensive and unpredictable. Reform efforts are underway in many areas, but remain somewhat scattered and their final impact has yet to be seen.

The ICT sector is heavily focused on catering to international markets, because the domestic markets are not seen as sufficient to support large scale ICT innovation. In particular, the business process outsourcing BPO sector has a projected growth of 22 per cent annually from 2012 to 2018, noting a number of large players involved. This growth is positive, but is not oriented to serving domestic needs. This, along with the connections of the Moldova economy and population to various regional trade agreements, leads to a serious problem with brain drain wherein many of the best talent in Moldova are going abroad, both to work for international firms and to incorporate potential start-ups.

This skills issue is amplified by training that is not strongly focused on private sector needs or on providing hands-on experience to graduates. This is made worse by the separation of the research and university systems, and the paucity of engagement with the private sector by both systems.

None of these issues are insurmountable, and, as noted, there is enthusiasm for resolving them from many stakeholders in the ecosystem. Careful guidance will be needed, but with that guidance, the ecosystem can be developed into a regional and leader in several areas.

Current state

Currently, Moldova is in an early stage of development toward developing a strong innovation ecosystem. It has several key features across many factors representing strengths and weaknesses, and some clear signals that show signs of positive ongoing changes. With specific actions to continue advancing on the progress made by these successes, Moldova's transition toward an innovation driven economy can be fostered. The views of key stakeholders vis-à-vis their interaction with the essential pillars of an ICT centric innovation ecosystem are outlined in Table 1.

Table 1: Stakeholder views on essential pillars of an ICT centric innovation ecosystem

Vision and Strategy	Awareness of, support of, and adherence to a clear national strategy; sense of the situation and direction of the ecosystem and perceived consensus around major issues.
Infrastructure and Programmes	State of "hard" infrastructure (ICT connectivity, electricity, transportation); "soft" infrastructure (skills training, knowledge sharing and support platforms) and clusters to share resources.
Talent and Champions	Skills readiness, human capacity development, and champions taking on leadership roles in the ecosystem.
Capital and Resources	Investment available for start-ups and R&D; presence of FDI, tech transfer and licensed production; and funding available for projects to support innovation
Networks and Markets	Business associations or formal networks in the ecosystem, access to domestic and international markets, and public procurement.
Culture and Communities	Activities to gather and support the innovation ecosystem, the presence of entrepreneurial culture in society, even opportunity to participate in innovation activities.
Policy and Regulation	Public sector awareness of their role and connection to other stakeholders, views on specific policies regarding R&D, IP, trade, finance and other areas.
Central Space	The "central space" of the ICT-centric innovation ecosystem canvas includes the components of each other pillar which are densely interlinked to support innovation as opposed to supporting the overall economy.

Vision and strategy: There are a number of strategies aimed at reforming the public sector to better support innovation in Moldova. However, these strategies could be better coordinated with one another, and oriented to what roles other stakeholders can play in delivering those strategies and how the strategies can more directly support the ecosystem. As these revised strategies are developed, they will need to look at the specific potential advantages the ecosystem has and how reforms can meet the needs of domestic stakeholders. Currently, international considerations drive many strategies, and those strategies are sometimes shaped to meet international agendas, rather than finding how international agendas can be shaped to fit domestic concerns.

> "We need more focus. We can't grow bananas in Moldova, but we can grow potatoes."
>
> Ecosystem Stakeholder

Infrastructure and programmes: In terms of communications, hard infrastructure in Moldova was widely reported as being very good, though less so in other sectors, with roads and electricity being less well maintained. In spite of these strengths, usage remains somewhat low because of high consumer costs and low perceived value of ICTs by many citizens. In terms of soft infrastructure, there are many efforts to develop incubators, co-working spaces, and other features, which are positive signs, even though they remain at early phases. A major gap in soft infrastructure came because many university students and staff feel that they have limited access to either private or public research facilities and funding, an issue that needs to be resolved. As in many countries, infrastructure is weaker outside of major cities, though this difference was generally not seen as dramatic.

> "There aren't enough hubs or co-working spaces to spread the culture."
>
> Ecosystem Stakeholder

Talent and champions: Basic education has been relatively well maintained in Moldova, and investments, especially in early ICT education are seen as positive for the system. However, at a higher level, education is not well matched to the needs of the ICT sector, both in terms of what students learn, and in terms of hands on training. The need for more skilled trainers and of domestic programmes in many areas, notably business skills, adds to this issue. Training is a contributing factor to a serious skills gap in Moldova, and is made far worse by both brain drain drawing the best ICT professionals and innovators abroad, and poaching of the skilled by larger firms from start-ups and SMEs.

> "Our best salaries are 100 or 200 euro, an outside company comes in and offers 3000, we lose our people."
>
> Ecosystem Stakeholder

Capital and resources: Very little financing is available for innovation in Moldova. Much of the financing comes from abroad, in terms of foreign direct investment (FDI), foreign aid, and remittances. However, international financing is not necessarily sustainable, and needs to be leveraged carefully. Research funding is available, but it is limited and the nature of the allocation process drives it into areas of pure research over more applied or commercialized areas. In terms of other forms of capital, especially risk finance, poor perceptions of the domestic investment climate, and issues with specific financial regulations, notably regarding early stage funding to start-ups, hold back investment.

> "VCs, no. Angels, no. Crowdfunding, no."
>
> Ecosystem Stakeholder

Markets and networks: Formal networks in Moldova are fairly robust and do a good job of advocating for the needs of the private sector in the country, though they could do more to engage their members directly in supporting innovation activities through open innovation or investment in ecosystem supporting projects. Low ICT use, limited incomes and a lack of perceived value hold back domestic markets for innovative ICT products and, so far, public procurement is not successful at filling in the gap, because of limited incentives for ICT innovation. However, integration into international markets helps to supplement domestic demand, notably through integration with the EU and CIS[1], though even this comes with risk of aggravating issues of brain drain.

> "Most of the talented companies are interested in the international market. The number of consumers and size of the domestic market are lower, but that doesn't need to be a barrier."
>
> Ecosystem Stakeholder

Culture and communities: There is a need to develop more trust and collaboration between almost all ecosystem stakeholder groups in Moldova. This is partially driven by diverging interests, but also by issues with the business culture. Currently, the culture of business in Moldova often fails to meet international standards of transparency, enforcement of contracts and treatment of partners, leading to the trust gap. Improved community building efforts and promotion of good practices may be able to address both the business culture and trust gap. These issues, together with concerns regarding finance, poor markets, the efficiency and transparency of public services, and others result in high barriers to entry in terms of starting a business in the country, and a high perceived risk of failure. This leads many potential innovators to emigrate, or to form their businesses abroad, or to operate informally rather than register at all.

> "We have young, talented people who could open start-ups and be ready to jump into adventures. But the opportunities to open start-ups are not very sexy."
>
> Ecosystem Stakeholder

Policy and regulation: In a number of areas, public services were seen as being overly bureaucratic and insufficiently transparent. A number of specific policies or regulations were singled out by respondents as requiring reform. For many of these, reforms were reported as being underway, but often were not completely implemented or insufficiently comprehensive to address the issue. There was a clear interest from many stakeholders in improving feedback and consultation on ICT and innovation policy. This should be coupled with a comprehensive digital innovation framework, which includes not just government reform, but a clear direction for the ICT sector and the innovation ecosystem, along with recognition of the strategic importance of those areas to the economic development of Moldova.

[1] The CIS region is formed from 12 ITU Member States: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan.

> "The system is designed to be so complicated you'd rather do your real work than waste your time fighting through."
>
> Ecosystem Stakeholder

Central Space: Broadly, efforts to strengthen the innovation ecosystem in Moldova are positive and represent clear progress in recent years. However, they are at an early phase and will need to be expanded and fostered to succeed in developing the ecosystem. In particular there is a need to bring them together in a more cohesive strategic vision. Funding for ecosystem support was often readily available from international donors, this is a key support, but care needs to be taken to ensure that the projects meet the needs of the domestic ecosystem over the agenda of the donor. Champions were known, but underutilized. These success stories and ecosystem leaders can help prevent brain drain and strengthen the business culture in the country. Formal networks are doing good work in developing ecosystem supports, but their members need to be encouraged to take a more active role through partnerships, B2B services, open innovation and support to projects in the ecosystem.

Major implications

In general, the ecosystem in Moldova is at an early stage, but there are positive signs. Education, research and infrastructure benefit from well preserved and managed legacy systems. Programmes to support the ecosystem are being developed, but need support and time to bear fruit. Capital and talent are serious needs in the country, especially given perceptions of the investment climate and issues of brain drain. Many public policies and regulations are barriers to doing business in the country, though some are undergoing reform. Many of the developments and successes come about because of the work of Moldova's neighbours, with international donors supporting many of the key programmes and reform processes and access to international markets being a key source of demand for innovators. Those supports come at a cost in terms of brain drain and of stable domestic sources of support and funding, but if properly leveraged, can result in long term, robust and sustainable growth of the innovation ecosystem. Overall, the greatest need is for collaboration and cooperation between ecosystem stakeholders. Part of this will come about by developing stronger communities and networks and by developing trust between the different stakeholder groups. These efforts will need to be supported further by the developing of innovation strategies that incorporate roles for and the needs of other stakeholder groups into their agendas, and which represent comprehensive visions for the development of the ICT centric innovation ecosystem and the ICT sector overall.

Priority objectives

To gather support for more comprehensive policy actions, as outlined in the recommendations below (see also section 7) and to ensure that the programmes overall have a high-profile impact, the following priority objectives have been identified: Modernize and digitize public services, Develop a competitive ICT sector, and Focus innovation on domestic needs.

Modernize and digitize public services

Issues with the public services, related to transparency, bureaucratic barriers, duplications, complexity and ambiguous or irregular enforcement were broadly reported as issues in the ecosystem. There are existing efforts to reform and modernize these services in a number of areas, which were often recognized as positive changes in the ecosystem that at this time remain somewhat uncoordinated and presently do no focus on collaboration with other stakeholders. Specific focus is needed on what role entrepreneurship and private sector initiatives can play in transforming public services, and on what role that transformation plays in supporting the efforts of the innovation ecosystem.

There is a need to prioritize efforts to accelerate public service transformation, reform key areas of public policy and develop a dedicated innovation agency to ensure that public services are modernized in a comprehensive and effective manner. Doing so will generally strengthen the enabling environment for businesses operating in Moldova and improve transparency in the ecosystem.

Develop a competitive ICT sector

Moldova has a number of key advantages in developing its ICT sector. It has relatively low labour costs, good infrastructure, the basis for good skills development and strong integration into the regional markets. However, a range of factors hold back the sector. These have included brain drain, the need for increased awareness, support and better leverage of the academic sector for research and human capital. A focus on developing the sector needs to work with both sets of circumstances to succeed.

Many of the recommendations underpinning the success of the sectors are interrelated, and will need to happen more or less simultaneously. A need to improve linkages between skills training, research and the private sector goes hand in hand with improved early stage support in the ecosystem. A phased anti-brain drain programme is needed, along with domestic and international promotion of the ICT sector. Taken together, these can lead to a more robust ICT sector, which will strengthen the economy on its own, and, with strong strategic planning, lend support and innovation to other key sectors as well.

Focus Innovation on domestic needs

Presently, many innovators in Moldova are focusing not on the domestic marker, but on creating products for an international market, generally either the European Union (EU) or the CIS region. Others are developing projects that have no substantial, lasting impact, or which are mismatched from market needs. This, in part, leads to the slow adoption of ICT products and services, which is part of a vicious cycle, since it drives more relevant projects into international markets, further reducing the perceived value of ICTs.

By accelerating public service transformation, smaller firms will gain more experience creating products for the domestic market and opportunities for new products will grow from public data sets and experienced innovators. Improved linkages between research, academia and private sector would create opportunities for research and therefore start-ups and spinoffs that are more focused on market needs. An anti-brain drain initiative would help bring companies back into the country and a dedicated agency would help focus innovators on specific areas through programmes and strategies. These measures would help develop the ICT sector, but also would help ensure that its benefits migrate to the country as a whole.

Recommendations

The key recommendations of the report are:

- Develop a Dedicated Innovation Agency
- Accelerate Public Service Transformation
- Develop a Phased Diaspora Engagement Programme
- Promote a Cross Cutting ICT Sector for Moldova
- Improve Connections between Private Sector, Human Capital and Research
- Develop Early Stage Support for Innovation
- Undertake Specific Reforms of Key Policies

Whether developed from an existing agency or as a new one, there is a need to *Develop a Dedicated Innovation Agency* for Moldova. This agency would be able to tackle many of the problems of coordination, trust, and cooperation that currently confront the ecosystem. It would be able to oversee many

of the reforms noted in this report and advocate for the needs of ecosystem stakeholders to various public sector actors, and helping to create public private partnerships (PPPs) and memorandums of understanding (MOUs) underpinning shared projects. It could also take a key role in regular reviews of the ecosystem, developing strategies and initiatives to address stakeholder needs.

To ensure efficient service delivery, there is a need to *Accelerate Public Service Transformation*. This would include coordination of existing reform efforts, both in terms of strategy and in terms of technology, using APIs and shared frameworks. Connected with this, new regulations regarding procurement and PPPs need to open up cooperation on public service transformation with the private sector. It also includes data sandbox labs to provide opportunities for entrepreneurs to use public data, both to reform public services and to develop new products based on it; and competitions and hackathons to focus entrepreneurs on specific areas of public service. Overall, there is a need to expand existing reform and transformation efforts using entrepreneurial initiative.

A Phased Diaspora Engagement Programme would initially focus on outreach and promotion activities strengthening networks, connections and awareness between the ecosystem and the diaspora community. Using those connections, platforms, programmes and incentives for crowdfunding, skill sharing (from abroad) and mentorship (within country) by emigrants would help develop the ecosystem. Finally, these would lead to expanded efforts to repatriate funds and entrepreneurs based on domestic developments, and the integration of domestic entrepreneurs into international networks.

With a combination of strategic positioning and outreach, the *Promotion of a Cross Cutting ICT Sector for Moldova* could lead to critical growth for the ecosystem. First, there is a need for a strategic vision for the domestic ICT market, orienting efforts toward a few key cross cutting sectors and supported with the development of clusters and other resources can help build an identity and brand for the country. Then there is a need to use that vision to promote internationally to secure support and investment, and domestically to foster potential start-ups and encourage innovators.

A key issue was the need to *Improve Connections between Private Sector, Human Capital and Research*. These three areas must be in sync to develop an innovation ecosystem. Research agendas and classroom curricula should be developed in collaboration with the private sector in order to ensure their relevance in terms of market demand. In turn, the private sector needs to ensure that it is supporting research through co-financing and development of facilities, and skill development through internships and mentorship. Students should also further benefit from access to hands on research during formation.

Throughout the country, but especially outside of Chisinau, there is a need to *Develop Early Stage Support for Innovation*. This will require the identification of key needs in the ecosystem and the coordination and fostering of efforts to address them. These needs might be thematic in terms of the kind of service or geographic in terms of specific regions where needs exist. Along with this, an investment fund with a PPP character would greatly help in providing early stage capital to innovators.

Though reforms are underway certain *Specific Reforms of Key Policies* were noted as being needed during interviews and should be addressed. These included a single window service, financial regulation including both incentives for investment and crowdfunding, support for the ICT sector, research frameworks, and more innovation friendly public procurement. Each of these areas is presented in the report with international good practices as the basis for policy experimentation in the future.

To implement and develop these recommendations, specific initiatives and flagship projects have been suggested, totalling USD 40 million approximately, and to be funded by resources from both public sector, private sector, as well as international organizations with vested interest in the common regional agenda. These suggestions offer by no means definitive budgets or project plans, but rather meant to give a good example of what it will take to start changing the direction of digital innovation in Moldova.

Structure of the report

The Moldova report is divided into five parts.

First, the Introduction and Methodology section discusses the work undertaken, gives an overview of the methodology used, and lays out the basic background information. This section introduces common language on innovation and ICT. The impact of ICT centric innovation on business models, processes, organizational methods, services, and ultimately jobs and growth is discussed. It also introduces the stakeholder groups concerned in this study and their respective roles. Then, a new framework is introduced as the basis of measuring performance of an ecosystem. The framework with its seven pillars will serve as a basis for qualitative assessments done to support the study.

The Current State section reviews the findings of the study for Moldova based on the framework articulated above. The current state is primarily derived from inputs gathered during several workshops, and one-on-one interviews with the stakeholders, supported where possible with desk research and available statistics. A qualitative approach has been favoured over a quantitative one in order to understand scope and innovation dynamics at play. Key findings are reported for each pillar inferring key points about strengths and gaps, as well as giving a review of available analyses and documentation for each pillar.

The Holistic Review section provides an overall analysis of the ecosystem stakeholders views based on data inferred from interviews. The section introduces a tool, the Stakeholder Interface Canvas, by which one can analyse the activities of stakeholders in an ICT innovation ecosystem. The entrepreneurial lifecycle is the underpinning for this framework, showing some key supports needed from each stakeholder group during each phase of the lifecycle. This new tool will serve as a basis for identifying best practices of an ecosystem as well as gaps. The section ends with a review of the overall findings from our Current State and Holistic analyses with overarching themes.

Fourth, the Priority Objectives section provides a set of high profile political goals, which will help to promote more specific policy efforts and to provide highly visible successes in the context of the ICT centric innovation ecosystem. The background of each is discussed, in terms of how it relates to the various political goals on the ground. Then ties are explicitly made between that goal and a later recommendation. Finally, overall benefits for the society and ecosystem are outlined.

The Recommendations section focuses on enhancing building blocks fostering the ecosystem. Each recommendation works on the simple principle of removing barriers where they exist, and amplifying the working best practices in Moldova. Many good practices exists outside Moldova for solutions to gaps found in the ecosystem, these will be explored so that they can leveraged to fill gaps in the ecosystem. Overall, there is a focus on new thinking on growth and policy experimentation, where all stakeholders can be engaged to foster a vibrant innovation ecosystem.

Limitations

The main approach used for this study was qualitative interviewing with diverse stakeholder groups complemented by background research. The strength of the methodology is the in-depth analysis, an especially important criteria when it comes to innovation. The concerns are limitations of statistical relevance, and quality and knowledge of respondents. Although over many experts were interviewed in the course of this country study, it is recognized that additional quantitative data could be used to further enhance the results. Finally, the timeline for the production of this report is much shorter than a typical report of this kind. While this is a strategic choice in order to provide more current information on the fast changing conditions of the ecosystem, it must be recognized that this limits the depth of research which can be accomplished.

Conclusion

This report offers an overall review of the Moldova ICT innovation ecosystem, through the critical lenses of stakeholders, and their journey through their environment. The study broadly captures a snapshot of the challenges and opportunities facing stakeholders, and it should serve as a good reference tool to help guide support of innovation, especially in concert with greater quantitative analyses.

Moldova has a number of key advantages and a number of positive changes that are underway. Through careful planning and ongoing, diligent efforts, the country can see significant growth in ICT centric innovation, and become a leader in a number of innovative fields. The implementation and any final decision about what priorities and recommendations are important remains the choice of stakeholders in Moldova.

2 Introduction

Recognizing the importance of innovation, the International Telecommunication Union membership, at the World Telecommunication Development Conference (WTDC) in 2014 adopted a new output on innovation and partnership, and as an ITU-wide goal at the Plenipotentiary Conference 2014 in Busan. The WTDC also approved a set of Regional Initiatives, including the Regional Initiative for Europe on Entrepreneurship, Innovation and Youth. The innovation mandate aims to strengthen Member States capacity to integrate ICT innovation in national development agenda. Accordingly, ITU-D strategic objectives foster the creation of an enabling environment and build capacities at national, regional, and global level aimed at promoting the growth of ICT entrepreneurship, start-ups, and increased innovation in the ICT ecosystem, while encouraging empowerment of young men and women and creating new opportunities for them in the ICT sector.

In this context, ITU joined forces with the United Nations Trade Conference on Trade and Development (UNCTAD), and the United Nations Industrial Development Organization (UNIDO) in order to elaborate the first country case study on ICT centric innovation ecosystem for sustainable development in Albania. This report is part of an ongoing series of similar reports ITU is undertaking. It benefits from the previous multi-stakeholder collaboration of leading United Nations organizations in innovation matters, and lessons learned from the initial country review as well as other ongoing country reviews.

2.1 Purpose

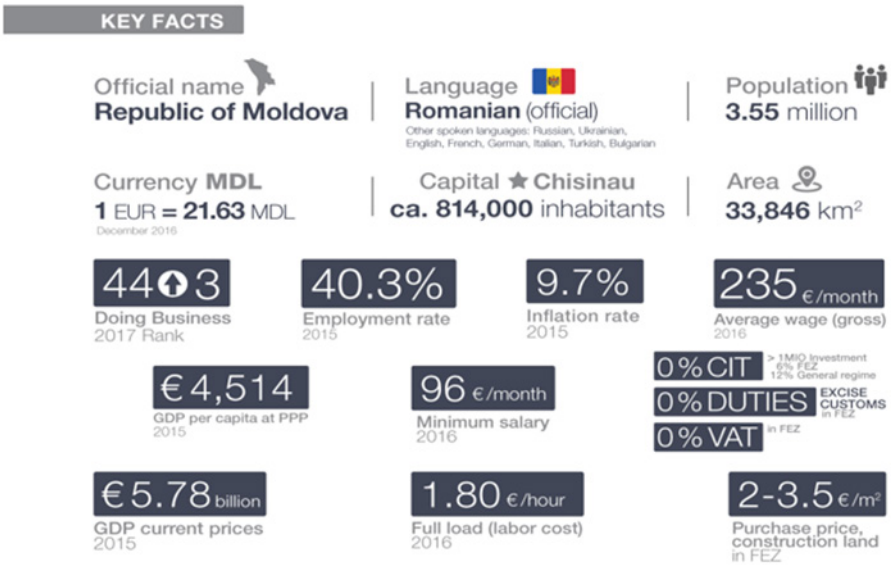
The ICT policies are evolving fast from a focus on infrastructure requirement such as broadband, or spectrum to other enabling conditions such as new pillars based on innovation and entrepreneurship. Traditional innovation policies, based on a more linear understanding of innovation have not fully transformed or supported the ecosystem and in order to accelerate socio-economic transformation and promote inclusive development. New strategies and tactics are needed to enable ICT policies in-line with the changing telecommunication/ICT environment and the development landscape.

The main objective of this process is to carry out a comprehensive review and strengthen the ICT centric national innovation ecosystem and increase its impact on the broader economy. In addition, it is hoped that this report will support the development and implementation of a new national digital strategy and its connected documents. Working together with the MTIC (Ministry of Information Technology and Communication), ITU and its partners have developed this report to provide the results of the review, and deepen the understanding of the dynamics of the ICT ecosystem in Moldova, its role in fostering socio-economic development, and to promote evidence based recommendations to improve the current direction of the ICT ecosystem. It is hoped that this study will bring new insights to policy makers, private sector actors, innovators, development actors, financial actors, entrepreneurs, and other ICT ecosystem stakeholders.

2.2 Current context in Moldova

Moldova is a lower-middle income country, with a largely factor driven economy, especially focused on agriculture and remittance driven consumption. It has a GDP per capita of USD 5200 (PPP) with an average of 5 per cent growth per year. In particular, this leads to low average monthly wages of approximately USD 270. Connections to international free trade agreements, especially the CIS and EU are critical supports to the economy.

Figure 1: Key facts on Moldova



Source: Moldovan Investment and Export Promotion Organization (MIEPO)

As with much of the region, the ICT Development Index[2] reflects strengths in education and hard infrastructure. Moldova has a dynamic and competitive telecommunication market which is characterized by high Internet access speeds, good mobile services accessibility and technological development. Telecommunication authorities try to apply best practices of market regulation in order to create favourable environment for information society development while having minimum intervention from the government. The Global Innovation Index[3] report indicates that investment in research and education are strong, but with weaker linkages between innovation and industry. The report from MIEPO on the ICT and BPO sectors in Moldova[4] showed both growing steadily. In particular the BPO sector has a projected growth of 22 per cent annually from 2012 to 2018, noting a number of large players getting involved, both domestic firms focused on outsourcing and international firms joining the Moldova market. For both sectors, the development of free economic zones and IT parks, along with other incentives and reforms are anticipated to accelerate growth in those sectors.

The World Bank Enterprise Survey[5]and Doing Business[6]reports reflect several issues with the enabling environment for business in Moldova. One set of issues are procedural hurdles and bureaucracy, causing many process to take significantly longer, and making them more complex and expensive than in comparable economies. While issues with transparency, bureaucracy and regularity contribute to these problems, it should be noted that similar issues were reported for many countries in the region.

2.3 Role of technology and innovation

The Organization for Economic Cooperation and Development (OECD), in the 'Oslo Manual' defines innovation as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations". Innovation in this context can also be new to the world, new to the market, or new to firm.

2 ITU, 2016 www.itu.int/net4/ITU-D/idi/2016/#idi2016countrycard-tab&MDA
3 Cornell University, INSEAD, and WIPO, 2017
4 Bunha, 2017
5 World Bank, International Finance Corporation, 2013
6 World Bank, 2016

There is a clear interest and drive on the part of both the government and population of Moldova to provide a strong role for ICT centric innovation as a support for the economy. There have been many efforts to support the ICT sector and innovation activities through policy and projects across the country. There have also been efforts to strengthen the basis for innovation by improving public services, improving education and research and reaching out for new sources of funding for projects and start-ups. This report intends to build on those efforts and seeks ways to bring them together in strategic directions.

2.4 Opportunities in the new industrial age

The first and second industrial revolutions, ushered in by new technologies and sources of energy such as mechanized industries, steam engines, coal and electricity, gave dramatic competitive advantage to some countries that had the proper foresight to set STI policies with strategic priorities leveraging these opportunities.

In the past, countries had more policy options to achieve knowledge accumulation with use of multiple policy instruments such as export oriented strategies and R&D investment. The opportunity now is to establish competitive smart industries and markets without all the burden of the past (e.g. heavy R&D), nor its advantages (e.g. trade control). They need to establish vision and strategies aligned to their capabilities and potential, fostering ICT centric innovation as the core enabler for their economies.

Today, with the spread of ICTs, many countries are at the eve of a fourth industrial revolution with the convergence of several technological and scientific progress rooted in the use of ICTs. Hierarchies, borders and organizational structures that were once the cornerstone of competitiveness are now hindering markets and opportunities. Thanks to ICTs, a new sharing economy is taking place changing the rules of innovation. Collaboration, co-creation and trust between networks of resources, people, and needs are the critical behaviour for success. New business models are blurring the distances between physical and virtual.

2.5 ICT centric economic development: The elusive scenarios

Moldova's rich history and unique position provides it many opportunities to develop a vibrant ICT centric innovation ecosystem. By building on these strengths and resolving key issues that currently present barriers to this development, a number of possibilities present themselves.

Moldova has a long history as regional centre for research, learning and technology. That legacy has not been translated into leadership in innovation, but certain aspects of it have remained. The communications infrastructure and early education have remained quite strong, building on and updating existing systems to match newer challenges. In certain areas of research, Moldovan academics are recognized as experts, advancing their fields. Moving forward, these legacies can be leveraged in ways that will create significant advantages. A strong research base in nanotechnology or in aerospace technology, as examples, can be developed in ways that support those sectors with innovation, research and training of qualified experts. Combined with efforts to maintain and develop national infrastructure, can make the country attractive as a potential hub for certain emerging technologies.

The Moldova position allows it to benefit from the strengths of both the EU and CIS region and serve as a bridge between them. With reforms in public policy and business culture to make the business environment more attractive, businesses can use the country as a base from which to access tremendous global markets, and as a destination for expansion and outsourcing. The key is to reverse some current trends that are leading to brain drain as people use international connections to leave the country, and to develop incentives that will use the diaspora community to support domestic innovation and encourage emigrants to return and build businesses in the country.

2.6 Transforming Moldova through innovation

To understand the scope and the dynamics playing out in Moldova, with the aim to build a vibrant ecosystem that will help Moldova unleash its digital potential, this report will take a grassroots approach to diagnosing the issues and come up with recommendations. The methodology is based on the good practices of fostering working elements, to remove barriers of the innovation ecosystem, and to promote organic systems that can reach critical momentum to unleash innovation.

The methodology offers new approaches to policy making in-line with empowering policy makers to undertake policy experimentation. The ultimate goal of this report is to empower the stakeholders to take advantage of the preparations that have laid the groundwork for success and to drive their own destiny in creating a vibrant ecosystem.

3 Methodology

The ITU-D country review methodology focuses on the interaction of two core components. The first is a process of desk research, data analysis and expert driven policy advisory, resembling processes used by many international organizations and consultancies. The second is a consultative process focused on working with the key stakeholders in the innovation ecosystem to gather information based on the views of grassroots actors.

In the interaction of these components, it is possible to develop a stronger understanding of the eco-system, holistic and narrowly focused, top-down and bottom up, expert driven and user driven. It also leads to a mixture of outcomes and recommendations, some driven top down by the government, and others bottom up by direct actions of stakeholders, leading to more unified plans of action and grassroots engagement.

This working methodology came about from a series of global consultations with the ICT centric innovation ecosystems experts at various workshop, meetings, interviews, research, and seminars. It is practical, with solid theoretical grounding in methodologies such as organizational management, lean thinking, human centred design, competitive strategies and STI.

The process is evolving and with every country review, this methodology will improve and enable new thinking on policy experimentation.

3.1 A systems of innovation primer

The increasing importance of innovation systems particularly within policy cycles is noteworthy and is reflected by discussions as early as 2004 in academic circles on the number of specific Google hits on the concept of innovation "*…policy makers at the national level and experts in international organizations for economic cooperation such as OECD, UNCTAD, the World Bank and the EU-Commission have adopted the concept. This rate of diffusion is quite dramatic taking into account that 15 years ago only a handful of scholars had heard about the concept*"[7].

The typology of innovation is dichotomous- linear or systems-oriented. The linear model of innovation emanates from supply side dynamics and supporting policies, in that "science leads to technology and technology satisfies market needs". This absence of feedback implies that the 'shortcomings and failures', which are an essential part of the learning process are ignored, are not reflected upon and are therefore not available to the overall innovative process. The linear model of innovation assumes that more R&D in terms of capacity and capability (effort, expenditure, assets, skills, etc.) would generate discoveries leading to more innovation and that low R&D capacity and capability could explain low innovative output.

[7] Lundvall 2004: www.druid.dk/conferences/Summer2005/Papers/Lundvall.pdf

Lessons from the post Fordist era brought criticisms to the 'orthodox' linear model of innovation and led to the evolution of a more 'heterodox' approach, with empirical evidence indicating firstly that there is no directionality associated with the innovation process; and secondly that innovation may occur independently of scientific interaction. Rather different rates and intensities of feedback exist between upstream (technology related) and downstream (market related) phases of the innovation process.

However, from a systems perspective, concurrently Lundvall, in his description of user producer relationships, presented the concept of systems of innovation. In this seminal body of work Lundvall describes innovation systems as having the following key characteristics:

- Key institutions play a role in differing types of innovative activities and while the vertical division of labour between them is intractable or unclear, certain institution types predominantly undertake certain types of activity.
- Science is not the mainstay of universities. Private firms and public agencies also possess this competence. The research emanating from public and private firms is more applied because it is demand driven.
- Between universities and private bodies, there are a multitude of specialized research organizations that are connected to either, and, as such, they react to incentives, to engage in basic research, applied research, or both.
- There are research units that are closely connected to production, which is associated with a level of dependency. Dependent units work within firms and public organizations, whereas independent units function as technological institutes. The main function of both organizational types is the conversion of scientific results into practical solutions rather than the stockpiling of scientific knowledge.
- Innovative activities are distributed and take place in many scientific units. The recognition of 'bottlenecks' in the production process is vital and the removal of blockages is facilitated by learning-by-doing and learning-by-using. Experience gained in production will act to stimulate new aspects of both applied and basic research these may not be accountable by science.

The discourse on innovation has been characterized by the movement away from a linear orthodox perspective to the systemic heterodox approach. This systemic approach views innovation as a 'stock' and 'flow' dynamism constituted by a complex network of feedback and interactive relations involving science, technology, learning, institutions, production, public policy, industrial supply and market demand factors.

The concept of systems of innovation provides extensive utility in the development of policy design as it enables an understanding of "… non-linear development of knowledge based on exchanges of information among interdependent actors"[8]. These interdependent actors are critical in building the framework for an innovation system to work. Key actors needs to understand their roles, their relationships with other actors, and the process of innovation. Thus, an innovation system is driven by the working relationship of these actors, their behaviours and transactions to facilitate opportunities (needs) and resources.

[8] Edquist and Hommen: 1999, page75

3.2 ICT centric innovation ecosystem

The ICT centric innovation ecosystem is a concept that draws and expands on systems of innovation theory. It recognizes that the ICT sector is one of the fastest evolving fields in the modern economy and lies at the centre of much of the innovation that is happening today. That innovation in the field of ICTs, as stated in systems of innovation theory, relies on an interconnected group of stakeholders who support potential innovators through a lifecycle. However, the benefits of innovation in the field of ICTs are not limited to ICT as a sector. The impact of ICTs is cross-cutting touching on almost every sector of the economy and almost every aspect of people's lives. Technology allows people to do things they always wanted to do, but better, faster, easier, and cheaper, for example:

- Farmers want to make better crops, they need to understand where to get the best seeds, know when the weather will change, plant the right seed at the right time, and sell to buyers who are willing to pay fair prices.
- Citizens want to know that their government is working for them, and that their taxes are being used for good causes, which requires transparency on spending, and accountability for public service.
- Businesses want to attract more customers, and to understand which products their customers want, want to use efficiency tools and systems to manage inventory, and to reach customers, etc.

Administrations, including policy makers and civil society, are always looking to be more efficient with public spending, to offer better services for citizens, to create more jobs and economic growth for their communities. The solutions, due to limited resources, need to have an exponential impact. Basic information problems, efficiency and scalability are easily addressed using information and communication technologies, for example, previously un-servable customers or resources (known as the long tail problem), can be easily reached through the mobile networks or the Internet, and businesses can become more efficient through ICTs increasing productivity and reducing costs, bringing higher profits and better return on investment.

Another major challenge is global competition. In the open economy, talent, resources and opportunities can come together to address emerging needs at a velocity unseen before, thanks to ICTs. From crowdfunding platforms like kick-starter funding entrepreneurs, to massive open online courses (MOOC), providers enabling access to the best educational content, new business models are transforming society and personalized learning is now a reality.

And so, a range of sectors are caught up in an innovation ecosystem that centres on the ICT sector, but has benefits across the whole of the economy and of society, the ICT centric innovation ecosystem. ICT led innovation is significantly contributing to economic growth by bringing higher productivity factors, lower cost of goods and services, offering newer products and services, re-inventing traditional industries, and enabling new organizational and business models.

Systems of innovation reading list

The following resources are useful for readers who wish to continue research in systems of innovation.

Effectiveness and Efficiency of National Systems of Innovation: the importance of ICT, the Cases of Ghana and Kenya, UNIDO, 2014: http://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=6880616

Industrial Development Report 2016, UNIDO, 2016: https://www.unido.org/fileadmin/user_media_upgrade/Resources/Publications/EBOOK_IDR2016_FULLREPORT.pdf

The Innovation Process and Network Activities of Manufacturing Firms, Fischer, 1998: https://www.researchgate.net/profile/Manfred_Fischer/publication/251393792_The_Innovation_Process_and_Network_Activities_of_Manufacturing_Firms/links/02e7e53a7db001abb5000000.pdf

The Theoretical Basis and the Empirical Treatment of National Innovation Systems, Balzat, 2002: www.wiwi.uni-augsburg.de/vwl/institut/paper/232.pdf

An Evolutionary Theory of Economic Change, Nelson & Winter, 1982: http://inctpped.ie.ufrj.br/spiderweb/pdf_2/Dosi_1_An_evolutionary-theory-of_economic_change..pdf

Local Clusters, Innovation Systems and Sustained Competitiveness, Mytelka & Farinelli, 2000: www.intech.unu.edu/publications/discussion-papers/2000-5.pdf

Product Innovation and User-Producer Interaction, Lundvall, 1985: http://vbn.aau.dk/ws/files/7556474/user-producer.pdf

Innovation: The Five Disciplines for Creating What Customers Want, Carlson, 2007: http://onlinelibrary.wiley.com/doi/10.1111/j.1540-5885.2007.00266.x/abstract

3.3 Changing requirement of policy

Innovation policies rely on a range of factors to succeed that go beyond investment into traditional inputs such as R&D, infrastructure, education. Building an innovation framework that only invests in inputs or only fosters a favourable business environment is not sufficient. In the Global Innovation Index (GII) 2015[9], many countries have inefficiencies reflected in their innovation output to input ratios. The GII 2015 reasons that innovation institutions make significant contribution to innovation performance. Policies based on heavy intervention, or those based on a free market approach will only work in certain contexts. To become competitive and grow, countries need to develop new industrial policies based on highly skilled jobs, high-growth industries and global export.

One factor affecting results is the presence or absence of keystone institutions. If keystone institutions do not exist, the chances of success is dramatically reduced despite investment made by a country in innovation inputs. Previous OECD work considers that the failure of traditional top-down innovation policies are due to three critical risks: *the lack of capabilities for successful policy making, the lack of information on the economy, and the power of the rent seekers in influencing policy*.

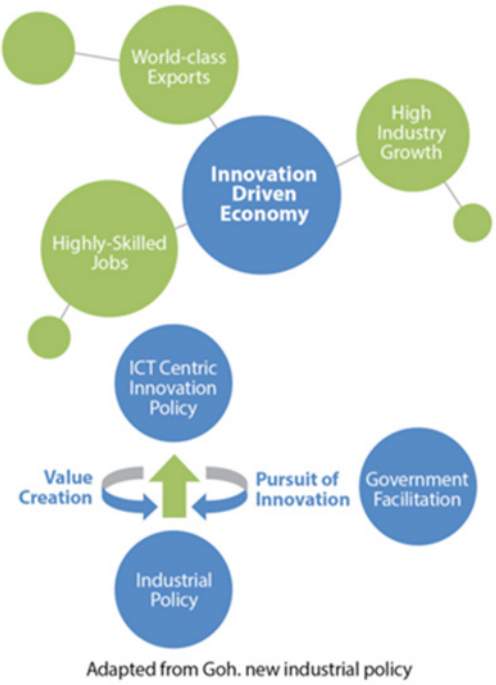
The GII 2015 report also notes that 'novel institutions' are needed to manage this 'search process'. The search process executes three primary tasks: "first linking the better performing segments of private

[9] https://www.globalinnovationindex.org/content/page/GII-Home

and public institutions, alleviate existing institutional constraints and help develop new solutions"; second reducing rent seeking because "the policy start at the periphery of policy making"; and third, "linking better performing segments of an existing institutional framework and searching for out-of-box solutions to familiar problems".

This implies a new model for government facilitation, one where the private sector has the lead, and government intervention is highly effective, timely and evidence based. One way to accelerate the move to innovation driven economies, therefor requires coordinating a traditional industrial policy with an ICT centric innovation policy. Figure 2 shows a modified graphic inspired by Goh's 2005 paper on new industrial policy that highlights this principle. This combination will mobilize existing potential in the ICT centric ecosystem to transform industries with sophisticated business models, to upskill the workforce and to enable access to global markets.

Figure 2: Policy driving innovation



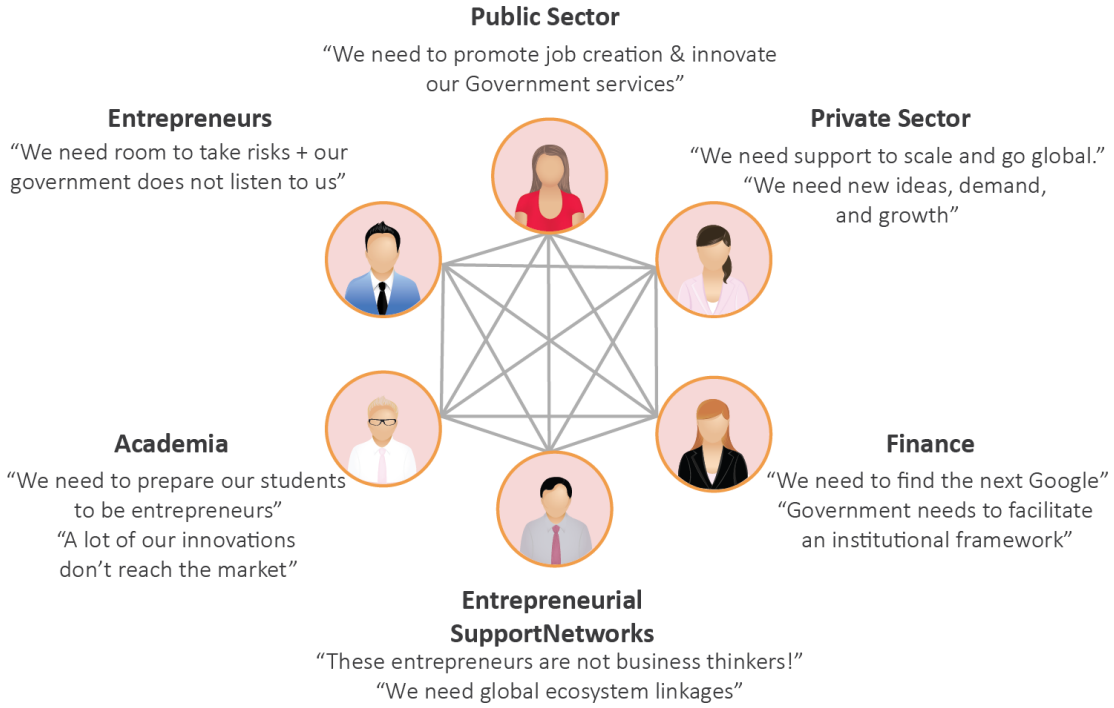
Source: Adapted from Goh

To achieve this aim, an organic ecosystem approach to understanding the problems and drafting evidence-based policies are needed to spark vibrant, efficient, and sustainable ICT centric innovation systems.

3.4 Stakeholder groups

The interdependent actors defined by our methodology consist of six key stakeholder groups, essential to the good functioning of the ecosystem: entrepreneurs, public sector actors, financial actors, academics, private sector actors, and entrepreneurial support networks. These groups interact in many ways throughout the ecosystem, and each group works in many pillars (discussed below) and throughout the innovation lifecycle. Since much of the analysis and further discussion is based on these stakeholders, a brief introduction to each group is outlined in Figure 3.

Figure 3: Ecosystem stakeholder groups



Source: ITU

- Public sector: This group consists of public sector policymakers, regulators, programmes, and decision makers in entities connected to the ICT centric innovation ecosystem, directly or indirectly. Since innovation is a cross-cutting issue, this can incorporate a range of governance areas, including finance, trade, technology and communications, education, infrastructure and a range of others, even verticals such as energy or agriculture.
- Entrepreneurs: This group includes stakeholders who have decided to create their own firm with the aim to deliver new innovative solutions. They exist throughout the innovation lifecycle, starting from research and inspiration, through start-ups and SMEs and into more established firms. Much of their contribution to the ecosystem comes from their interactions with fellow entrepreneurs and their work to bring innovations to market.
- Academia: This group includes stakeholders from primary, secondary and tertiary education, research institutions and affiliated education and ICT centric innovation development centres. They contribute to innovation in terms of basic research work and the development of the ecosystem human capital, and to a lesser degree, foster the movement of innovation from research to start-up.
- Support network: This group incorporates stakeholders providing specialized services for entrepreneurship and innovation: incubators, accelerators, business associations, communities, gatherings, events, mentors, accountants, lawyers, etc. Their work facilitates the process of developing new businesses and innovations, and taking them through their lifecycle. There is some overlap between this and other groups as their work is often organized by actors from stakeholder groups.
- Private sector: This group represents established industry players and businesses engaged in internal innovation, business-to-business service provision, infrastructure development and support of outside innovators. They generally seek rent for their services or seek to integrate innovations into their existing organization. There is overlap between this group and entrepreneurs, especially in terms of SMEs. For our purposes, entrepreneurs are working as small firms and being supported, while private sector actors are working as part of larger firms and supporting the ecosystem.

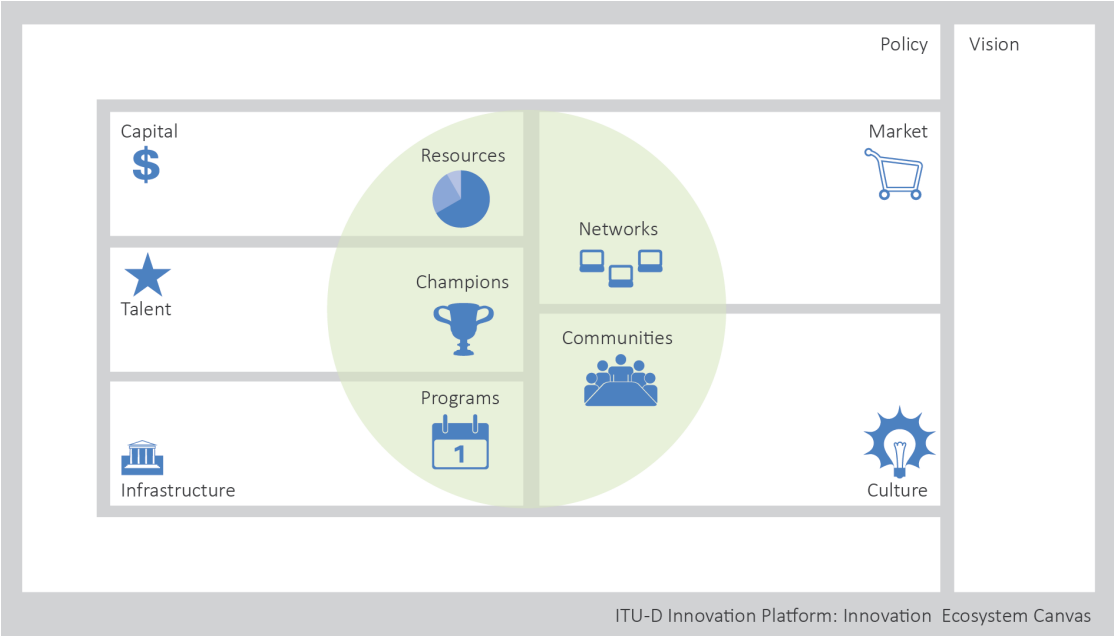
- Financial institutions: This group includes banks, seed funds, investors, peer-to-peer and crowdfunding communities, and others who fund innovation in the ecosystem, from funding research to investment in start-ups and SMEs, to loans and IPOs for established businesses and organizations. This can also incorporate those who facilitate the process and build connections, as well as international actors interested in investing in the ecosystem.

3.5 Ecosystem canvas

A good innovation framework will have a clear understanding of the market needs (demand driven), foster good collaboration and coordination between various actors and create a structure within which innovation can be supported throughout its lifecycle, beginning with the underlying cultural and social factors, through basic research, into the development of innovations and firms, and through to where those become profitable and create the potential for social change.

To achieve these objective, the following ecosystem canvas was developed. It draws on traditional innovation input pillars as well as pillars to support building a sustainable innovation culture. It embraces a holistic view of the problem, and acts as an easy to use guide for diagnosing, changing, and monitoring an ICT centric ecosystem.

Figure 4: Innovation: Ecosystem canvas



Source: ITU

The canvas covers seven pillars: Vision and Strategy, Infrastructure and Programmes, Talents and Champions, Capital and Funds, Markets and Networks, Culture and Institutions, and Policy and Regulation. Policy, being a pillar with particularly important connections to all of the others is shown wrapping around them. Vision is set as the direction the ecosystem moves toward. In the centre, the other pillars show the inputs and outputs of innovation activities.

3.5.1 Vision and strategy pillar

This pillar is the guiding map for the stakeholders of an ICT centric innovation ecosystem. Everyone in the ecosystem needs to have a clear understanding of the aim, the role of various actors, and how the initiative is connected to a common vision. It focuses the ecosystem on market needs.

Vision can be as wide as fostering an entrepreneurial society where citizens are empowering and empowered by innovation. It can be also as narrow as a specific sector. But a comprehensive, inclusive vision is preferred at country level incorporating all major economic sectors and covering all major stakeholders. Different cities or communities can run their own strategies based on narrower visions to empower their local ecosystems.

3.5.2 Infrastructure and context pillar

Infrastructure and context represent the field on which the game of innovation is played. They encompass the core components (typical inputs) of general economic competitiveness; 'hard' infrastructure, such as power supply, connectivity, transportation, and so on; 'soft' or knowledge infrastructure, such as entrepreneurial support networks, co-working spaces, skills training and research institutions; and the accessibility, affordability and distribution of all of these core resources.

The programmes that make up much of the soft infrastructure of the country represent the infrastructure function for the central circle, specifically working to support innovation processes. They provide the spaces and resources needed to develop innovation and entrepreneurship, and share knowledge and skills in order to foster innovative technologies and businesses.

3.5.3 Talents and champions pillar

The notion of talents concerns the input side of people with skills, including technical skills such as IT training and engineering, and soft skills such as management and business planning. It incorporates training programmes and distribution, notably looking at whether appropriate talent is available and whether there are issues stemming from brain-drain or certain industries pulling talent away from areas of innovation.

Champions go a step beyond talent, taking on leadership and mentorship roles within the ecosystem. They serve as mentors and success stories to other stakeholders and create and guide the projects and initiatives that foster the ecosystem.

3.5.4 Capital and resources pillar

Capital represents the access of innovators and entrepreneurs to finance and investment. Various types of capital are required at the various stages of a project lifecycle. Investment in research is needed, followed by seed funding, angel investment, venture capital, investment rounds, and loans, as innovations develop. This pillar incorporates foreign direct investment and other forms of international trade flows, along with programmes such as government procurement and support programmes that provide funding to supplement private sector finance. To support all of these, the pillar also includes financial policy and efforts to facilitate the connection of investors and projects.

Resources are focused financing for programmes and communities that build up the ecosystem, primarily from the national government or international organizations, but also from various private sector actors. This financing is needed in order to run the activities that support the ecosystem.

3.5.5 Networks and markets pillar

Markets are an essential component of the innovation ecosystem, as the goal is ultimately not just to create innovations, but to develop innovations that can be profitably brought to market. The pillar examines whether the markets are present, whether businesses have access to foreign markets, the interest and purchasing power of local populations, and whether public procurement is providing appropriate demand without distorting markets.

Networks represent the need for different stakeholders to connect and the connections between them. It incorporates the formal and informal networks that foster ecosystem building activities, and the awareness of stakeholders of those networks, especially in the form of formal mapping exercises.

3.5.6 Culture pillar

Innovation and entrepreneurship require a set of cultural values, especially putting a premium on creating rather than seeking jobs, an interest in doing novel research and innovation to create something new, and a comfort with risk and failure as part of entrepreneurship. Communities foster this innovation culture, providing platforms and groups for knowledge sharing, and inspirational success stories are important building elements of this pillar that help build an entrepreneurial mind-set and bring together a group of passionate actors to create initiatives.

3.5.7 Regulation and policy pillar

Policy and regulatory frameworks are essential to fostering a favourable innovation ecosystem. A wide range of policy areas are important for innovation, including finance, trade, ICT and education policies. Not only should all of these areas structure their actions in ways that foster innovation, but the regulators, policymakers and programmes should be aware of their roles in the ecosystem. Taxes for start-ups and established firms, regulatory support in established businesses, technology transfer policies, measures promoting high growth SME, funding for research, are all examples.

ICT environments are fast changing and require flexible support. Stakeholders driven policy management (co-created and co-manage with stakeholders), evidence base policy making, and demand drive policies are essential ingredient for success with this pillar.

3.5.8 Central pillar

As noted, the central pillar represents a series of key elements that function together to help build up the ecosystem. These elements, detailed above, are interconnected and interdependent, forming a tighter set of activities than the rest of the pillars, which can move forward more or less independently. They also represent activities that are broadly undertaken altruistically with an eye toward building up the ecosystem rather than personal gain, and which specifically benefit innovation, rather than the economy in more general terms. Taken together, these can be seen as the work of the core actors of the ecosystem, and represent active efforts to strengthen innovation, rather than more incidental actions that create beneficial conditions.

3.6 Process outline

A typical country review is carried out in five phases leading to common goals, diagnosis of the ecosystem, evidence based recommendations, an implementation framework, and monitoring and evaluation.

Figure 5: Process flow for country review

Source: ITU

1. The common goal: An initial workshop, between stakeholders is conducted to launch the process and ensure alignment with stakeholders. This bottom up process begins with a workshop, bringing together representatives of various stakeholder groups. Using a modified world-café format, the participants collaboratively identify key issues confronting the innovation ecosystem, and work to create an initial draft agenda and set of priorities for the stakeholders as a community. The outcome generates a community manifesto.

2. The diagnosis phase: There is a series of interviews with key stakeholders and a review of current information and available statistics. The interviews are analysed to provide a numeric score reflecting the respondent's perception of the strength of each pillar. Those scores are aggregated to provide data that can be broken out by pillar and by stakeholder group. The key points from the stakeholders are aggregated by pillar to provide overall analysis, identifying strengths, weaknesses and gaps. Using this analysis, a holistic view of the ecosystem is possible, identifying specific gaps regarding the resources available in the ecosystem, and identifying overarching issues and themes, strengths and weaknesses of the ecosystem. These key issues are further developed into collaborative grassroots building blocks to strengthen the ecosystem. Additional interviews are added to support some of the analysis where appropriate.

3. Recommended action: A critical review of all data allows for overarching needs to be identified, along with key areas of action. A workshop is then held to discuss the findings and collect further clarity from key stakeholders. Some proposals and recommendations require intervention and leadership by the public sector, and others can be better accomplished through a collaboration between ecosystem stakeholders. External partners can be brought on board during the recommendation planning to develop concrete projects whenever possible.

4. Implementation: Because innovation happens at the periphery of an ICT ecosystem, an implementation framework discussion is facilitated with key ecosystem leaders (champions). One critical aspect is to engage key champions in taking ownership of the steps forward. An informal working group is a critical enabler toward a formal institution. Institutions play a very important role in unlocking innovation potential for a country. Innovation should be facilitated by the government, but led by the private sector.

5. Monitoring and evaluation: This last phase is an engagement for the stakeholders to move recommendations forward and engage in real policy experimentation. ITU has many activities to continue supporting the country through dialogue, toolkits, and partnerships. Key stakeholders are encouraged to begin activities that require no resources, or follow through the recommendation especially the implementation framework that will determine success factors. Government has

a critical role to continue the discussion in trust building, and act on policy recommendations where they fit the national agenda.

3.7 Guiding principles

Throughout this report, there is a tacit focus on the idea of policy experimentation as a core principle. This concept focuses on developing policy in close partnership with the stakeholders it is meant to serve, which is based on best practices and existing activities whenever possible and which can be iterated based on rapid feedback loops. It bears close connection to contemporary design thinking, lean development and user centered design processes, and is an ideal fit for innovation policy because it represents the distributed knowledge bases and evolving nature of the issues. The key principles we focus on are as follows:

- User centered approach (e.g. demand driven);
- Private sector led innovation;
- Light and efficient resource utilization (e.g. find and invest in working good practices);
- Replicable feedback loops to keep up with fast changing contexts;
- Common language between all stakeholders (e.g. common understanding);
- Everyone should have skin in the game (e.g. engaged);
- Sustainable and predictable (including political stability), etc.

4 Current situation

4.1 Vision and strategy

4.1.1 Literature review: Vision and strategy

The primary strategy in Moldova related to the ICT centric innovation ecosystem is called Moldova 2020, and subsequently the Digital Moldova 2020[10], which is based on it. Moldova 2020 seeks to ensure qualitative economic development and poverty reduction, and to do so lays out seven main priorities:

1. Aligning the education system to labour market needs in order to enhance labour productivity and increase employment in the economy.
2. Increasing public investment in the national and local road infrastructure, in order to reduce transportation costs and increase the speed of access.
3. Reducing financing costs by increasing competition in the financial sector and developing risk management tools.
4. Improving the business climate, promoting competition policies, streamlining the regulatory framework and applying information technologies in public services for businesses and citizens.
5. Reducing energy consumption by increasing energy efficiency and using renewable energy sources.
6. Ensuring financial sustainability of the pension system in order to secure an appropriate rate of wage replacement.
7. Increasing the quality and efficiency of justice and fighting corruption in order to ensure an equitable access to public goods for all citizens.

Digital Moldova 2020 connects these with a further three priorities:

1. Access and infrastructure: improvement of connectivity and network access.
2. Digital content and electronic services: promoting digital content and generating services.
3. Capacities and utilization: strengthening literacy and digital skills to enable innovation and stimulate usage.

These are broadly positive objectives and would, taken together, have a large scale positive impact on the ICT-centric innovation ecosystem and, more broadly, the economy of Moldova. However, these strategies generally represent a vision just for the government of the country. They provide little place for the private sector or other stakeholders to take up a role other than passive beneficiary or service provider. Digital Moldova 2020 is somewhat better on this front, but still fails to provide clear leadership or guidance for the private sector or extensive opportunities to develop PPPs.

Both Moldova 2020 and Digital Moldova 2020 include significant objectives regarding public service transformation. The presentation "ICT driven innovation for Public Administration modernization"[11] describes a more specific agenda in this area, with an effort to make government more accountable, transparent and efficient. These strategies and programmes are often strong means of "kick starting" an ecosystem, though they represent a vision for a fairly narrow set of activities.

The Agency for Innovation and Technology Transfer (AITT) strategy includes greater provisions for the role of the private sector, setting goals and targets. However the range of strategies and visions rather than explicit programmes raises the issue of coordination, with different parts of government

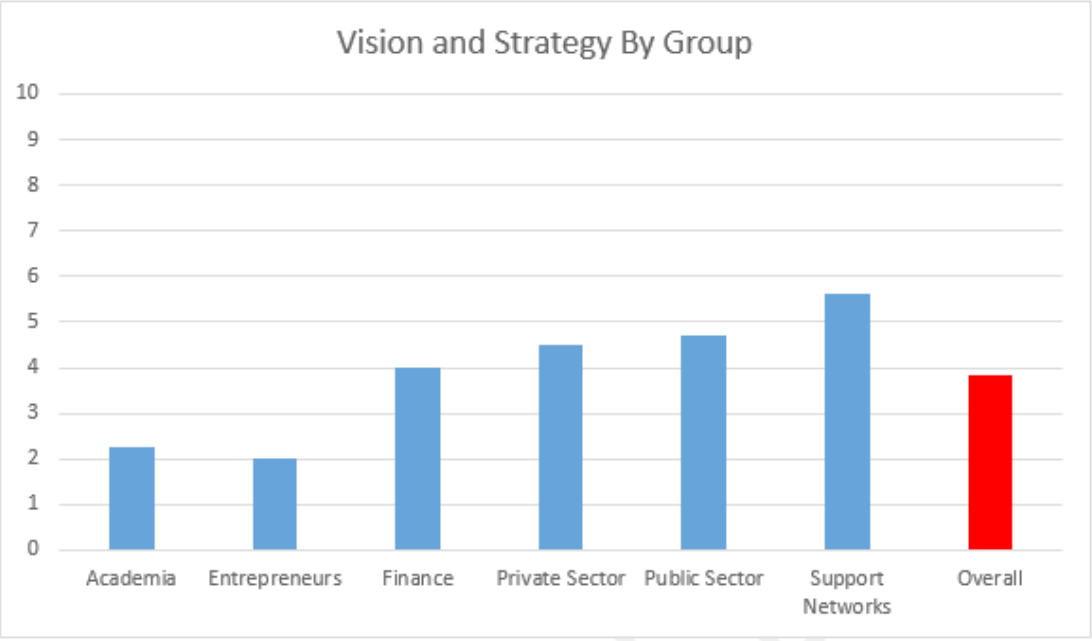
[10] Government of the Republic of Moldova, 2013
[11] Amihalachioae, 2015

generally coordinating, but not necessarily effectively connected. The private sector has put forward their own visions for the ecosystem, including the European Business Association (EBA) analysis[12]. In addition, with the EU Neighbourhood Programme[13], the USAID Competitiveness Enhancement and Enterprise Development II Project (CEED II)[14], the Republic of Moldova Country Strategy from the Austrian Development Cooperation[15], and project plans from other donor groups, the international community has a powerful influence on the agenda of the ecosystem.

4.1.2 Pillar strength: Vision

Based on the interviews, the scores reflected respondent views on the strength of vision and strategy in the ecosystem. The scores (combining scores of 0-2) were based on whether respondents had a good overall view of the ecosystem, whether they felt there was a clear vision, common consensus, and whether they were working in concert with and running activities to support this vision.

Figure 6: Pillar strength by stakeholders: Vision and strategy



Source: ITU

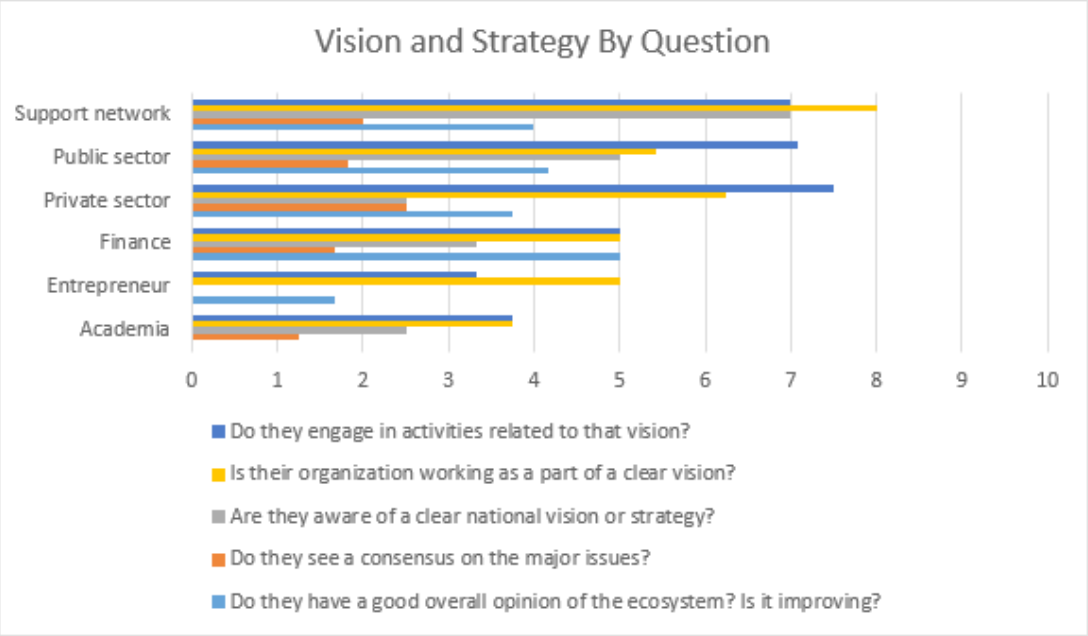
[12] EBA recently published the Key Business Environment Issues Affective Private Sector Development, covering aspects of political and macroeconomic stability, legislative and tax frameworks, infrastructure, access to financial services, and human resources. http://dcfta.md/eng/key-business-environment-issues-affecting-private-sector-development

[13] https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/countries/moldova_en

[14] www.chemonics.com/OurWork/OurProjects/Pages/Competitiveness-Enhancement-and-Enterprise-Development-II.aspx

[15] Federal Ministry for Europe, Integration and Foreign Affairs, Directorate-General for Development, 2016.

Figure 7: Responses from respondents: vision and strategy by question



Source: ITU

Few of the stakeholders had a strong positive opinion of the state of vision and strategy for the ecosystem. In particular, academics and entrepreneurs recognised were mush less positive on the question of vision. Most stakeholders did not see a strong national strategy, other than the public sector and support networks, though their work would typically be directly governed by such a strategy. Most stakeholders also had a stronger view of their personal vision and their engagement with it, but weaker impressions of consensus, indicating that each actor has their own agenda and direction, but that they are not working well together. As one stakeholder commented “Everyone has a public agenda and a private agenda”.

4.1.3 Main points and themes - Vision and strategy

More comprehensive strategies to foster innovation in the economy

A number of government strategies in areas related to innovation have been produced by various ministries, agencies and groups in recent years. While they work along similar lines, there is apparently a lack of comprehensive strategies to bring together the priorities of the various actors into a single cohesive vision. Each agenda or strategy focuses on a specific area of work, often a set of reforms or issues under the mandate of the organization, with limited reference to other strategies or areas of work. These siloes and no overarching strategy mean that many opportunities for synergy are not leveraged as they could be, and that strategies can work in different directions, and at times even at cross purposes. With these strategies not supporting one another, they have a less holistic, transformative impact.

National strategies focus on public sector, need for broader vision with roles for all stakeholders

The majority of the strategies which have been put forward have focused primarily on reforms within the government, rather than on the work of the ecosystem and economy as a whole. Many respondents outside the public sector felt that they did not have roles to play in the strategies, or an ability to work to support them. A more comprehensive agenda is needed, one that will provide direction not just to government work, but to the other stakeholders, in academia, finance, entrepreneurship, the private sector and support networks, along with the overall ICT sector and the broader economy. This

might incorporate both broader guidance and collaborative projects or PPPs. In particular, identifying key, strategic sectors to invest in and support is a necessary step toward allowing the private sector and financial actors to fully incorporate their efforts in achieving the vision put forward.

Strategies currently focus on international priorities, need to refocus on national strengths

Many stakeholders raised specific areas of ICT or other economic sectors or specialized niches that should be prioritized under a comprehensive strategy. Some of the suggested areas were nanotechnology, e-agriculture or aerospace, among a range of others. Similarly, there are specific features of the ecosystem in Moldova, notably the strong history of scientific research, the quality of communications infrastructure and the access to free trade areas, which were noted as potential sources of specific advantage for the country in terms of international competition. Currently, strategic priorities are often set by outside forces, either international organizations, donor communities, business associations or others, and so emphasize the interests of those groups. While these interests are not necessarily inappropriate as guidance, and as a more comprehensive strategy is elaborated, the primary goal should be to identify sectors and features that will be sources of competitive advantage and to highlight those. This would require a more thorough economic survey at a national and regional level. With those features as hallmarks of a comprehensive strategy, the guidance of outside groups can be shaped to fit the strategy, rather than the current regime, which was often reported as strategies being shaped to fit the outside guidance.

4.1.4 Gaps and strengths: Vision and strategy

Strengths

There is a distinct effort to develop strategies for many areas of the government, which is doing a good job of identifying needed reforms and targets, taking into account the issues raised by various stakeholders, both domestic and international. These strategies seem to be well implemented and are broadly reported as making good progress toward key goals.

Gaps

The strategies developed have no strong coordination or umbrella strategies to guide their direction. Strategies are isolated from different areas of government and other stakeholders. This leads stakeholders outside the public sector to feel they have no role to play in delivering the strategies. A comprehensive strategy is needed to provide a clear direction for both the government and the economy as a whole, with an eye toward using domestic strengths as comparative advantage regionally and globally.

4.2 Infrastructure and programmes

4.2.1 Literature review: Infrastructure and programmes

Most of the literature gives positive reports of ICT infrastructure in Moldova. The ICT Development Index[16] highlights high bandwidth and mobile usage in the country. Individual usage, in terms of households with computers or Internet connection, lag behind this somewhat, but do not represent dramatic weaknesses, compared to the regional average. The report from the Moldova Investment and Export Promotion Organization (MIEPO)[17] also makes note of these trends, in particular the speed of Internet access, given the high usage of fibre optic connectivity throughout the country.

[16] www.itu.int/net4/ITU-D/idi/2016/#idi2016countrycard-tab&MDA
[17] Bunha, 2017: Economic Policy Advice to the Moldovan Government

The Digital Moldova 2020 strategy has a thorough SWOT analysis of ICT infrastructure and access in Moldova. It makes specific note of issues of unequal distribution of access, in particular the fact that connectivity does not spread equally to rural and remote areas. This issue is compounded by high costs compared to GDP. These two issues contribute to lower usage. There are also specific legal and regulatory issues noted both in the SWOT analysis and the EBA issue analysis. Notably, both made reference to a need for more open competition in terms of construction, shared infrastructure, shared usage and the predominance of big players. Both also noted that there are issues with transparency and cooperation with the private sector in the creation and enforcement of regulations, combined instruments and policies that allow too much flexibility in terms of enforcement, leading to inconsistent and potentially arbitrary actions.

Moldova 2020[18] includes many of the above observations regarding ICT infrastructure, but includes a discussion of other components of physical infrastructure, such as roads, water, and ports. The EBA analysis touches on these topics as well. In general, the reports of the physical infrastructure reflect a limited maintenance and investment in these areas. This limits, to a degree, the ability of the country to absorb and support innovation projects and businesses, especially in rural areas. This impact is more pronounced in sectors other than ICT, but still relevant in the technology sector.

In terms of soft infrastructure, such as facilities for training, incubation, co-working and other supports to ICT centric innovation, there are some emerging programmes. The majority, such as Tekwill,[19] Dreamups,[20] Generator Hub,[21] iHub,[22] and the Starnet Academy Plus programme,[23] are clustered in Chisinau. Each has a specific role that they seek to play, and fits into needs identified in terms of business culture, skills training, entrepreneurial support and other areas. Getting outside of the city of Chisinau, the agenda of the Novateca Libraries Programme[24] is to develop resource centres throughout the country, building on the existing space in libraries.

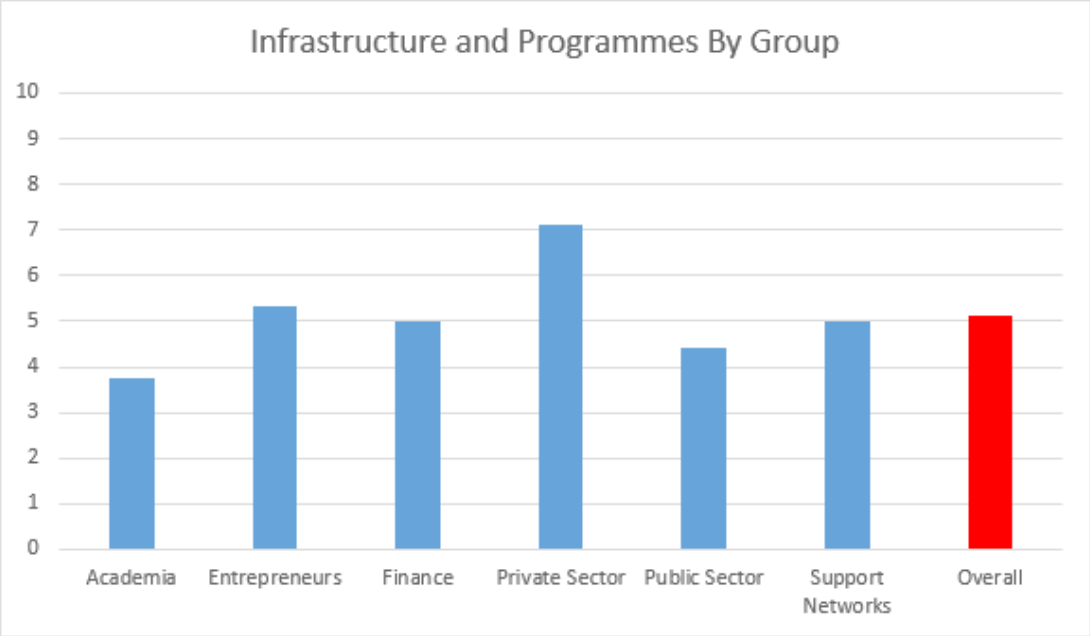
Another set of soft infrastructure resources which are in development are the efforts to develop clusters and technology parks, including through the Law on IT Parks[25]. This will provide incentives to gather in clusters, providing soft infrastructure benefits in a number of specific areas of the country, better distributing access. However, since the IT parks legislation was only recently approved and is still at an early phase of implementation, the actual impact remains to be seen.

4.2.2 Pillar strength: Infrastructure and programmes

Scores shown in Figure 7 reflect respondent views on the strength of infrastructure in the ecosystem. The scores were based combining scores of 0-2 on whether respondents saw sufficient hard and soft infrastructure and good access to it, and whether clusters were present and well developed.

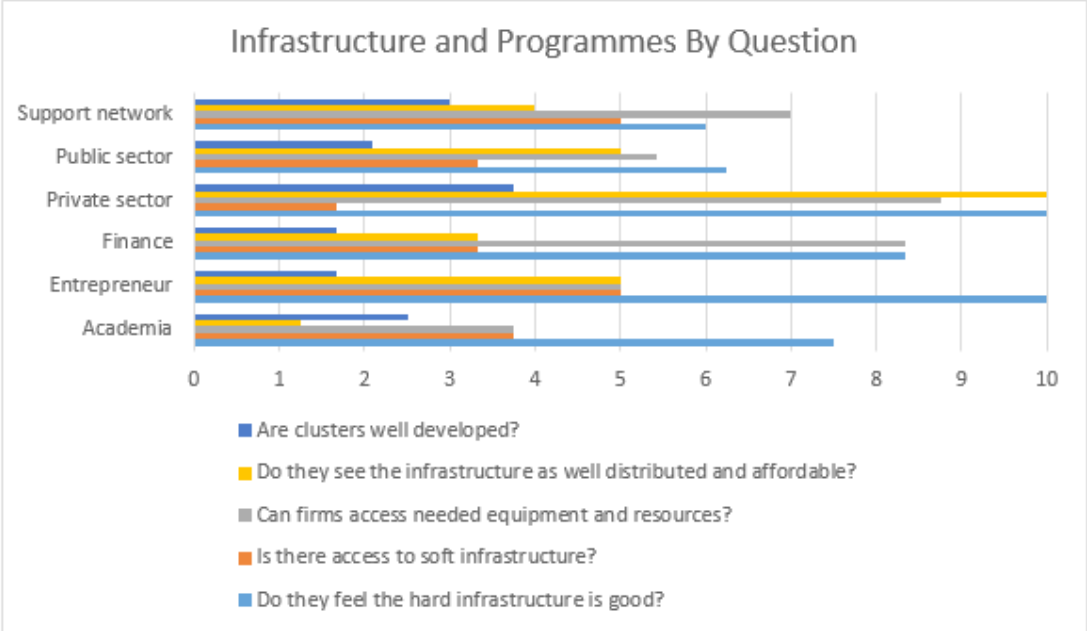
18 Government of the Republic of Moldova, 2013.
19 “What is Tekwill”, 2017: https://www.tekwill.md/about
20 "Dreamups- Primul Accelerator de Afaceri din Moldova", 2016: www.dreamups.com
21 “Generator Hub”, 2016: https://hub.md/en
22 “Chisinau – iHub”, 2017: http://ihub.world/en/chisinau-en/
23 "Academy Born To Code", n.d.: http://academyplus.md/en/home/
24 “Novateca”, n.d.: www.novateca.md/en/
25 “The first IT parks will be created in Moldova. The Law on IT parks was adopted by the Parliament.” 2016: http://mtic.gov.md/en/news/first-it-parks-will-be-created-moldova-law-it-parks-was-adopted-parliament

Figure 8: Pillar strengths by stakeholder: Infrastructure and programmes



Source: ITU

Figure 9: Pillar strength by survey question: Infrastructure and programmes



Source: ITU

In general, views on infrastructure were positive. In particular, most respondents were confident with the hard infrastructure and access to equipment, and felt that distribution was generally equitable, though distribution issues were noted by some participants, especially in rural regions. The development of clusters and soft infrastructure were noted as weak points, but were also regularly regarded as works in progress, with many noting efforts to develop, but saying they were planned or recent, and needed expansion for full impact.

4.2.3 Main points and themes: Infrastructure and context

Generally good reports on hard infrastructure

Most stakeholders gave good or excellent reports of the connectivity in Moldova. Speed and reliability was generally seen as a major strength for the ICT sector in the country, both in terms of mobile and fixed line access. There were some concerns in terms of coordination and shared use between telecom firms and their ability to deploy new infrastructure, but for the time being these have not been seen as leading to reduced service, and can be dealt with via legislative or regulatory changes fairly quickly.

This does not necessarily extend to other components of hard infrastructure. A number of stakeholders reported issues with the reliability of power and with the quality of roads, ports and other transportation infrastructure. These issues were worse outside of cities, especially outside Chisinau, as was connectivity, though there were only a few statements regarding substantial drop off in connectivity.

Costs for both consumers and businesses limit use

In spite of having very good connectivity available, there were reports that ICT usage is not particularly strong in the country, especially outside the cities. Costs remain high, especially in terms of PPP, and with many people having low incomes, hardware and connectivity can be prohibitively expensive. The issue of cost is amplified by a lack of interest or perceived value. Some businesses also reported needing to import hardware and equipment from regional suppliers, which drove up their operating expenses, alongside higher costs for connectivity.

Current efforts and upcoming frameworks on soft infrastructure, are positive steps

In terms of soft infrastructure, the Moldova remains at an early phase, especially outside Chisinau. Several co-working spaces and hubs have been established, helping to develop facilities for the ecosystem to work, train and exchange knowledge. Tekwill clearly stands out among these, especially given its relationship to the Technical University, but others including Generator Hub, iHub, and the Academy Plus programme were noted as being valuable components of the ecosystem by several stakeholders. However, these resources are all within the confines of Chisinau. They are also recent additions to the ecosystem, which have not fully matured in terms of developing the networks and community they need to have full impact, achieving some early successes that can be seen as inspiration for the community, and developing areas of focus and specialization in those they serve and the services they provide. These developments and the establishment of new projects will come, but should be actively fostered and encouraged in the ecosystem.

In terms of developing the rest of the country, one of the highlights is the Novateca project, which has the potential to develop soft infrastructure in libraries across the country. Further, the law on IT parks and the development of free economic zones both have the potential to bring clusters into various areas of the country and sectors of the economy. Both of these need to be carefully implemented to reach their full potential, but can be the basis for developing a network of soft infrastructure throughout the country.

Access to research facilities is limited, and focused on pure research

Respondents generally identified that there is a good base for research in Moldova. However, there was a general understanding that the system was relatively opaque, overly focused on basic research and isolated from the rest of the ecosystem. Research centres and clusters exist in key areas and sectors, but private sector firms felt that they had little ability to engage with them to steer or commercialize research. Other academic institutions had a similar sense that they did not have opportunities to reach out for any substantial share of available research funding or access to facilities. Some efforts have been made to partner between private sector firms and researchers, but they remain

small scale for the most part. Overall, research activities in Moldova were working in parallel with broader innovation in the economy. These have the potential to be a powerful component if better integrated into overall innovation efforts.

4.2.4 Gaps and strength: Infrastructure and context

Strengths

Many features of infrastructure in Moldova are either well established, have been making good progress recently or have improvements underway. Connectivity is generally seen as strong. A number of projects and policies are working to develop soft infrastructure, especially in Chisinau. Even with the issues reported, most respondents had the sense that the research base in the country has significant potential.

Gaps

Hard infrastructure other than connectivity has significant issues, and all infrastructure declines outside of the major cities. Research needs to be a more open process focused more on applied research and collaboration, if it will contribute to the ecosystem meaningfully. Almost all areas need ongoing improvement, and that represents a potential risk, if implementation and development aren't well managed.

4.3 Talent and champions

4.3.1 Literature review: Talents and champions

The literature regarding human capital in Moldova consistently covers three major topics: level and appropriateness of training, experience of graduates, and brain drain.

Digital Moldova 2020 notes that one of the issues the limited number of qualified teachers. Most of the strategy focuses on skills in the general population, not among ICT specialists, but the number of skilled trainers, appropriate curricula, and specialist facilities and equipment.

The MIEPO report[26] notes that Moldova produces 1 500 ICT graduates annually, with an additional 5 000 mathematics or engineering graduates, resulting in a workforce of 21 000 employees. However, the report specifically notes some issues with this training. A need for a wider range of skills and especially graduates with appropriate, real world experience was noted. It notes Tekwill as a project with some potential to help with this issue, but that there is more to be done. In particular, developing staff skills and experience possibly in collaboration with international partners, would be a positive development.

These themes are reflected in the Moldova 2020 strategy. It notes that 85 per cent of employers have issues with underqualified labour force, along with many employers noting issues with working culture. It identified reorganization of the university system, both in terms of research and training. It also explicitly mentions the problem of brain drain. In particular, it raises concerns over a vicious cycle: A lack of human capital depresses wages and weakens domestic firms. Those low wages drive the best talent to migrate to other markets. This in turn results in a lack of human capital. This cycle is made far worse by the conditions in the country in terms of quality of life, health care, and so on. One of the biggest concerns in this respect is that the diaspora is the possibility of a loss of connection to Moldova. A Moldovan emigrant with family remaining in country is likely to maintain connections, send remittances, and potentially repatriate. As the diaspora community ages, and as some families join the emigrants, this connection is seen as being at risk of decline. As noted, the living conditions

[26] Bunha, 2017.

in Moldova make this a more serious issue, since the diaspora are less interested in returning, and feel less connection to a "good life" they could have back home.

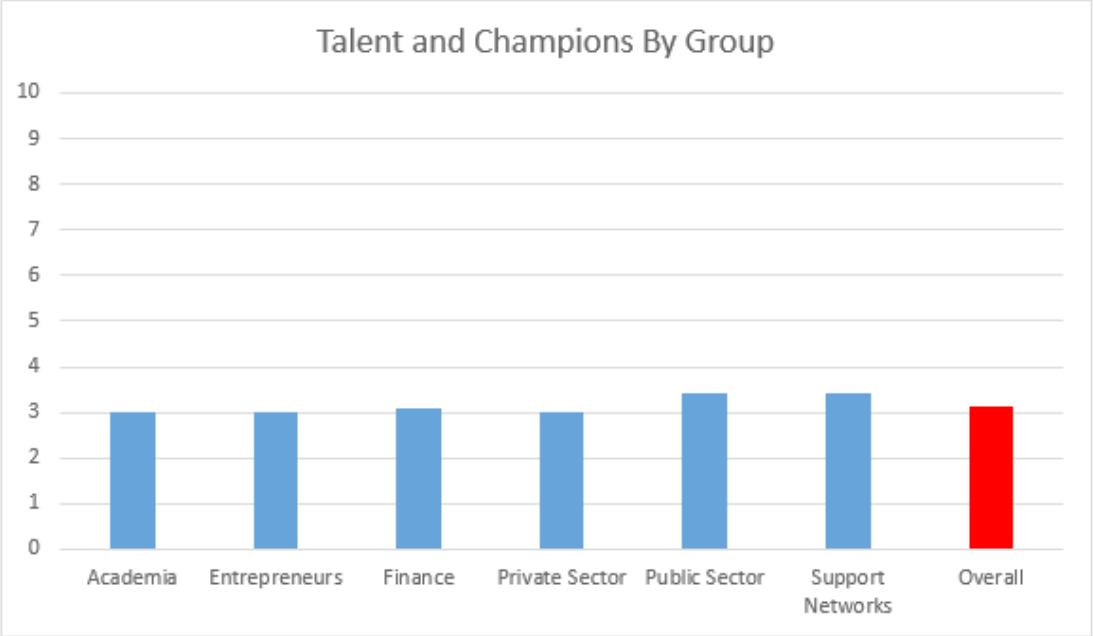
The USAID report ICT Education in Moldova: Meeting Industry Needs[27] noted much of the above. It specified serious needs in terms of both technical skills in specific areas and general business skills, including languages. It notes a shortfall of 1 000 staff, but a more serious issue of shortfall in terms of the quality of human capital, rather than quantity. It also makes note of issues related to poaching of staff by larger firms, brain drain and low wages, and it recommends strengthening soft infrastructure, curricula, upskilling teaching staff and improving the policy regime on education. Likewise, the World Bank Enterprise Survey[28] notes that the need for skilled staff is a common problem for businesses of all sizes in Moldova.

There are projects aimed at improving these issues. The Starnet Academy Plus[29] is working to provide more concrete hands-on experience in areas that are in demand in the private sector. STEP IT[30] is working to develop more accessible private sector training centres. The Erasmus+ programme by the EU[31] improves access to European Universities where students from Moldova can strengthen their skills. This can be both a benefit and a drawback, given the situation with brain drain, but it would be better to focus on actively countering brain drain, than to prevent it through isolation.

4.3.2 Pillar strength: Talent and champions

Based on the interviews, scores were assigned reflecting respondent views on the strength of the workforce and champions in the ecosystem. The scores were based combining scores of 0-2 on whether respondents saw sufficient technical and soft skills in the ecosystem, whether these were supporting innovation activities, how the education system is serving to provide human capital and whether champions were present and active.

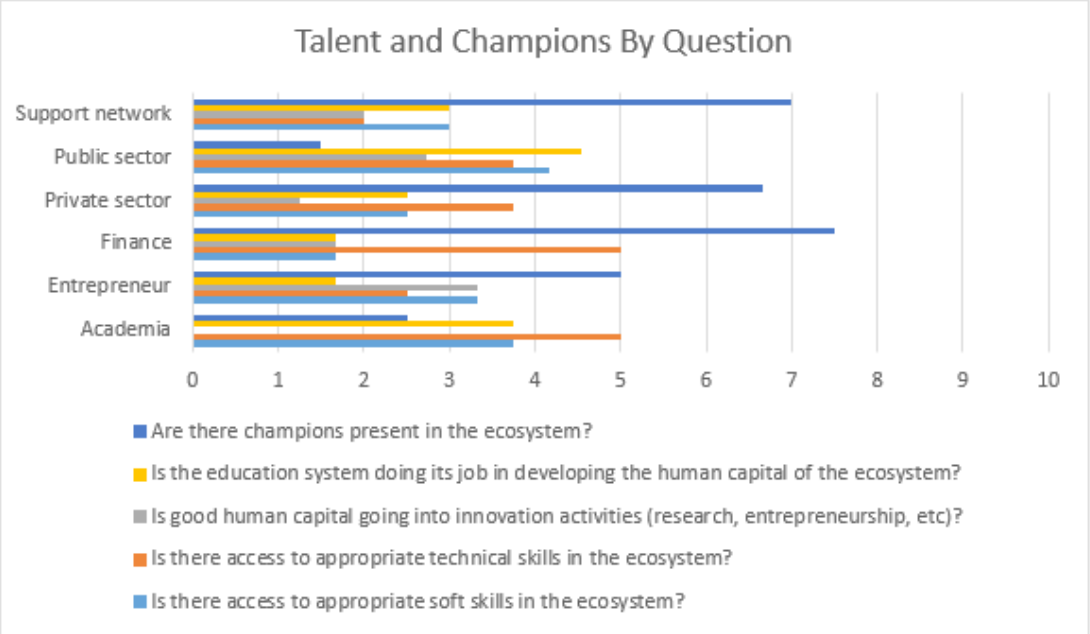
Figure 10: Pillar strengths by stakeholder: Talent and champions



Source: ITU

[27] USAID, 2012: http://eba.md/app/webroot/uploaded/ICT/Education_in_ICT_Sector.pdf
[28] World Bank, International Finance Corporation, 2013.
[29] "Academy Born To Code", n.d.: http://academyplus.md/en/home/
[30] "About STEP Computer Academy", 2017: https://itstep.org/en/about/
[31] "Erasmus+ Moldova", 2017: www.erasmusplus.md/en

Figure 11: Pillar strength by survey question: Talent and champions



Source: ITU

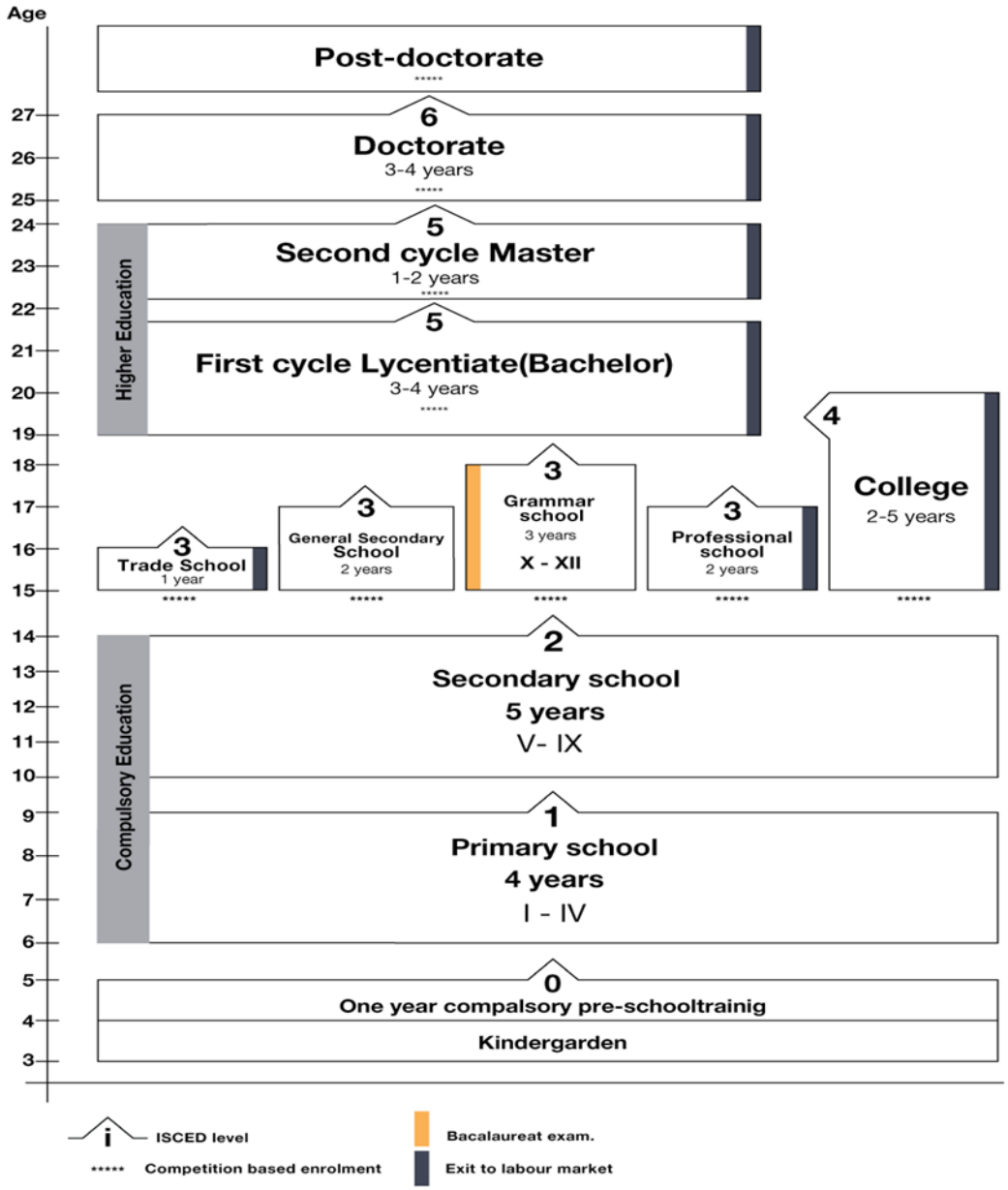
Stakeholders had a generally dim view of talent in the Moldova ICT centric innovation ecosystem. Technical skills were generally seen to be more available, but otherwise, few stakeholders had a high opinion of the situation. Champions were often reported as being active, though not necessarily well leveraged in the ecosystem and were not often entrepreneurs themselves.

4.3.3 Main points and themes: Talents and champions

Basic skills available through a well-maintained education system

Education in Moldova has generally have been well maintained and broadly well-funded. Schools and universities have funding, support, and equipment for basic training, at least through secondary and early university levels, though issues persist in terms of more advanced education and research. Basic training is effective, improved ICT training is being built into the system under the Digital Moldova 2020 strategy and there are efforts to build more ICT tools for education into the system through the ministry for education. Though there are issues the system has been maintained in a way that will provide a good basis for further development.

Figure 12: Education path in Moldova



Source: ITU

Skills gaps in all areas associated with brain drain and poaching of skills

Throughout the stakeholder groups, there were concerns about the availability of both technical and soft skills. In terms of the soft skills, much of this was attributed to the number of students and graduates with training in communication, business, administration, management and so on. For technical skills there are quite a number of students pursuing IT, engineering, programming and other STEM fields (science, technology, engineering and mathematics), with varying skill levels and content as discussed below. However, the best of these students are being drawn away from innovative firms. Higher wages internationally work together with high levels of talent mobility provided by the trade agreements, notably with the EU, to create a serious problem of brain drain in Moldova. Even within the country, this is seen as an issue. Stakeholders in Balti reported difficulties with highly skill staff traveling to Chisinau, lured by high wages; and entrepreneurs and small business owners reported problems with larger private sector firms poaching their staff as well.

Skills mismatch with private sector needs, lack of critical mass in certain skill sets

In terms of soft skills, a lack of talent was expressed. For technical skills, on the other hand, there were issues with scope of skills and quality of training. In both cases, the major issue was a gap between the needs of the private sector and the skills being trained at the university level. Private sector firms need staff with more skills in project development, business management and communications. They specifically need more people able to work to an international standard, which is key because the business culture in Moldova has issues in terms of matching international norms, as will be addressed below. For technical skills, the specializations coming out of universities are not those being sought by the private sector. They need staff with training in particular coding languages, fields and specializations. Presently, many, if not most, staff require periods of retraining before being hired as technicians, because their training is too theoretical. This is a particular issue if the strategy is to orient the ecosystem toward specialized fields, such as big data, Internet of things, or other areas that will require a certain critical mass of staff able to work in those fields in different firms collaborating through clusters.

Curricula increased relevance and increased hands on training

Connected with the topical mismatch, there was a sense that students are leaving the universities with a limited of hands-on training. Without having worked on research or private sector projects, graduates needed more hands on experience to be effective staff in the private sector. This could be managed through partnerships, apprenticeships, collaborative curriculum development, guest lecturers, private training programmes, labs or other means. Some private firms spoke about providing internships, or supporting university laboratory programmes, but these were seen, even by those undertaking those projects, as insufficient to meet the needs of the labour market. Their impact is relatively limited; they need to be amplified and further fostered to have a more systemic impact, and in particular, should be developed in terms of a strategic framework to define and encourage collaboration between the private sector and academia.

Shortage of skilled trainers, both academic and private, largely due to low wages

One of the issue identified, in particular by the academic stakeholders, was a need for more skilled trainers and professors. This was identified as a need in both the universities and in the private sector. In particular, there is a need for teachers with private sector experience, in order to provide the hands on training mentioned above. One of the major issues underpinning this was the low wages of trainers and professors. In particular, if there is a need to draw staff away from private sector careers, wages will need to be raised significantly. Moreover, as professors gain experience and develop networks, they will often be drawn away from academia, because wages are too low to retain them. Some of these issues can also be partially addressed through frameworks similar to those mentioned above to foster collaboration between the private sector and academia.

Many go abroad for education

Taken together, these issues reflect fundamental needs in terms of skill training in Moldova. Because of this, whether for more advanced technical training, soft skill development to international standards, private sector experience or Erasmus studies, students often go abroad for part of their university education. In addition to this, it was noted that private training programmes, such as those provided by Cisco or Microsoft, are often unavailable in Moldova, or available less often, at a lower level or with fewer options. These programmes are often provided on a regional level, and so students will travel to Romania, Russia, Ukraine or further abroad to take part in them. This becomes a major issue, because it contributes to the issues of brain drain since students establish networks abroad, and opportunities can open up for them to move overseas. In particular, there is a disruptive filter, since the, more talented, motivated and skilled students are more likely to develop those connections,

depriving Moldova of not just a portion of its human capital, but a portion that draws from the best talent available.

4.3.4 Gaps and strengths: Talent and champions

Strengths

There is a good basis for human capital development in Moldova, with a strong network of universities. International networks provide access to international training, both from universities and private training programmes. There are efforts by the private sector to support labs and internship programmes.

Gaps

Advanced training is not meeting the needs of the labour market in Moldova. Soft skills are not well represented, and technical skills are often mismatched to the experience required, in part because of the need for improved frameworks for private sector-academic collaboration, and higher wages for trainers and professors. Because of this, international training has become a key part of the system. The skills gap is made worse by issues of brain drain and poaching.

4.4 Capital and resources

4.4.1 Literature review: Capital and resources

The Moldova 2020 strategy includes a discussion about the situation of finance in the country. Currently, the financial sector is over-reliant on traditional banking, which are too slow moving and risk averse to properly innovative projects. Moreover, it notes that the banking sector is in need of reform in itself, in terms of regulation that will be in line with international norms. This issue, along with a lack of strong business culture and issues with transparency and accountability, leads to a reduction in trust and confidence by international and domestic investors and higher charges for credit. The strategy recommends streamlining costs and regulatory barriers.

The National Bank of Moldova[32] has a number of strategies, analyses and discussions of the financial system and banking sector. Broadly, it seeks to reduce risk and improve transparency and good governance within the sector. It breaks down five priorities in this area; transparency of shareholders; credit risk, including non-performing loans, “large” exposures, and exposures to affiliated persons; operational risk; internal governance; and, anti-money laundering and terrorist financing.

These are broadly included in efforts to bring the banking sector into alignment with the Basel III accord standards. This incorporated a twinning project working together with guidance from The Netherlands and Romania, which identified three main areas of work: Adjustment requirements of the legal and normative framework to the best and modern European practices and standards in the field; Insufficient National Bank of Moldova institutional capacity in exercising its banking supervision functions; opaque quality and transparency of institutions organizational structure.

MIEPO focuses on attracting outside investment into the country. It notes favourable tax rates for investors coming from abroad, in part through double taxation treaties and structures designed to ease tax burdens on foreigners residing in Moldova. These benefits are amplified by the international associations and trade agreements which Moldova is party to, allowing a relatively free flow of investment between Moldova and neighbouring countries, notably those included in the CIS and EU. It also notes the special tax policies for the ICT sector, in particular the waiving of income taxes for

[32] www.bnm.org/en/

employees in the sector, and the 'virtual tech park' system that will provide many tax benefits. These policies do not necessarily provide investment, but they may make potential investors more interested.

One project noted in the Moldova 2020 strategy, and other documents, to address the shortage of capital is Pare 1+1[33]. This programme is designed to provide both support and matching investment for migrants who return to Moldova to create new firms. It is supported by EU initiatives and represents a regularly cited good practice, having been in place since 2010.

The EU, alongside programmes like Pare 1+1, maintains the Neighbourhood Programme[34] and other efforts[35] to finance start-ups and innovation in Moldova. This includes support in seeking grants and investment from European institutions, such as the European Bank for Reconstruction and Development (EBRD) and European Investment Bank (EIB), and projects like the Neighbourhood Investment Facility, which pools financing from various partners into early stage financing for projects working in specific sectors in Moldova and other countries with close ties to Europe. In addition, resources for projects to support the innovation ecosystem directly have received significant funding from the international donor community.

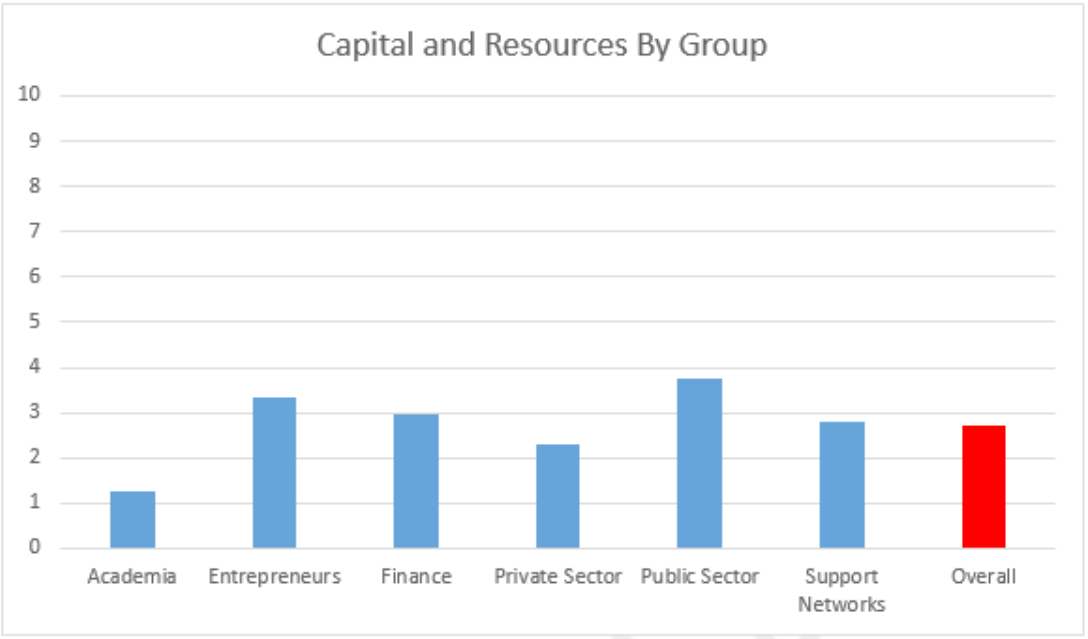
One specific area of financing noted in the East Horizon ICT Strategy Review[36] is that of R&D financing. The low rate of investment in R&D is noted in several areas, such as the GII[37], along with the concern that while research is being conducted, it is not being efficiently monetized. The Strategy Review, among other documents, made note of the fact that the Academy of Science represents a central distributor of R&D funding, setting research priorities, and primarily funding projects managed by its internal research institutions. Reforms are underway, but because of this structure, research is seen as parallel and separate from innovation, which would make its way to market.

4.4.2 Pillar strength: Capital and resources

Based on interviews, scores were assigned reflecting respondent views on the strength of talent and champions in the ecosystem. The scores were based combining scores of 0-2 on whether respondents saw investment in innovation, research and entrepreneurship being available, whether investment from abroad was possible, and whether capital markets were well developed.

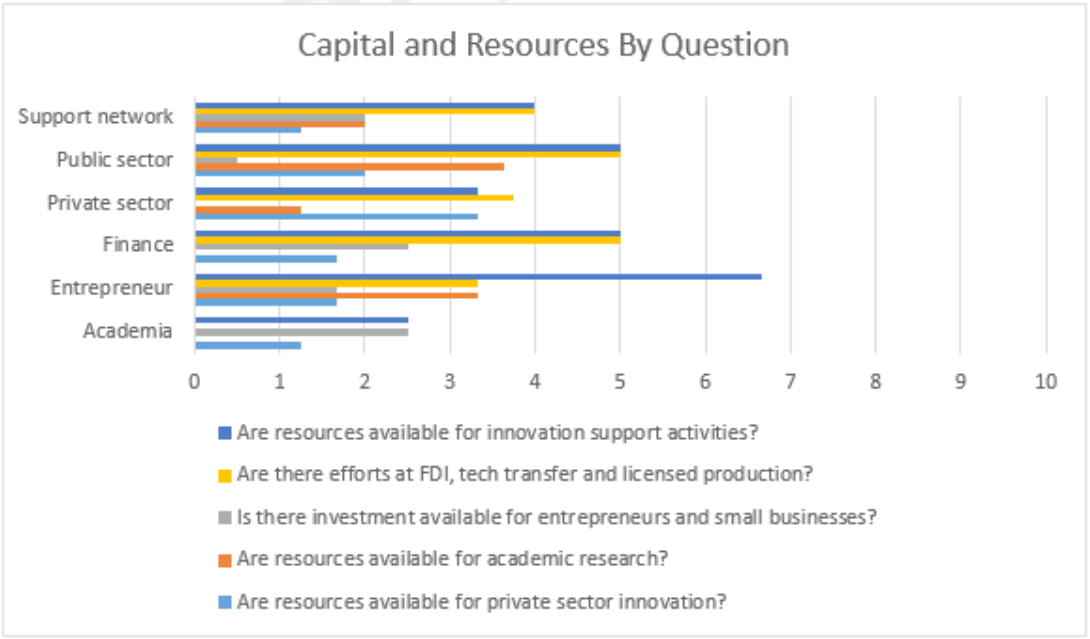
[33] "About Pare 1+1", 2017: http://odimm.md/en/menu-types/despre-program.html
[34] "Neighbourhood Investment Facility", 2016: https://ec.europa.eu/neighbourhood-enlargement/neighbourhood/neighbourhood-wide/neighbourhood-investment-facility_en
[35] "Looking for Finance", 2017: www.eu4business.eu/moldova/finance-your-investment
[36] EECA Cluster, n.d.
[37] Cornell University, INSEAD, and WIPO, 2017.

Figure 13: Pillar strength by stakeholder group: Capital and resources



Source: ITU

Figure 14: Pillar strength by survey question: Capital and resources



Source: ITU

Capital was generally seen as a weak point in the ecosystem. Other than outside investment coming in through FDI and resources being available to develop projects in the ecosystem, there was a widespread sense that little capital was available. As shown in Figure 14, some groups had the sense that there was research funding available, though it is worth noting that academic stakeholders did not share this view.

4.4.3 Main points and themes: Capital and resources

Appropriate finance at all stages of innovation

Most stakeholders reported serious concerns regarding investment and risk finance for innovation activity. This was a concern across the lifecycle of innovation, with stakeholders noting needs for seed funding, angel investment, venture capital, equity finance and crowdfunding. There are some programmes that bring in support, especially in terms of seed funding, but they are limited and not well coordinated or organized. Where financing is available, for example in loans from banks, it was limited by financial regulations and described as being expensive involving high interest and difficult terms.

Limited and misallocated research funding

One of the areas where many stakeholders felt that financing was available was in research. Though, when speaking with academic stakeholders, they said even though financing is available for research, it remains too little to support a vibrant innovation ecosystem. In particular, very little private sector investment is being made into R&D processes. More than this, they had issues with the allocation of research funding. The methods of allocating public sector research funding was seen as opaque, emphasizing basic research over priorities that would be more likely to produce spin offs, and as privileging certain groups of researchers over others. It should be noted that several stakeholders discussed reform efforts which are underway, apparently focused on resolving some of these issues.

International funding and remittances are key

One way of making up for gaps in financing is investment from abroad. This includes international organizations and other groups providing seed funding, investments from international financial actors and repatriation of funds from the diaspora community. The work of MIEPO in attracting outside investment was noted as useful in developing in these areas. The Pare 1+1 programme was broadly noted as a good practice in efforts to repatriate funds from the diaspora. These outside sources of finance are useful in terms of filling in gaps, but can represent a vulnerability long term. The international funding can decline or be withdrawn at any point based on a range of factors not under the control of the ecosystem, for example, donor and investor priorities might change and the diaspora community may become more focused on investing in and developing their host communities. More than this, it can shift substantial control over strategic direction to actors outside of the ecosystem, letting international donors and investors drive priorities. These vulnerabilities are not necessarily fatal, but the outside funding needs to be leveraged carefully, in particular with a focus on using it to support the development of a durable ecosystem focused on national strategies, rather than shorter term investments dictated by outside priorities. By guiding the funding into start-ups working in key sectors and specializations and into projects that support the ecosystem, it will help ensure the stability of finance in the ecosystem.

Domestic investment climate is a barrier for domestic and international investors

One barrier to both outside and domestic efforts to develop investment is the overall investment climate in Moldova. Bureaucracy leads to significant delays and complications in terms of efforts to invest in the country. Transparency is a major concern since investors feel that investment will not be secure, or that they will have legal protection should anything happen. This concern extends beyond the legal framework and bureaucracy, and to the broader business culture. Business is seen as not being conducted to international standards in terms of legal protections, consistency and transparency, and this leads to a lack of trust in the ecosystem. Whatever the true depth of these issues, they represent a perception that many potential investors have regarding the ecosystem, one which presents a barrier to their investment. Potential investors focus on failures of Moldova banks and embezzlement of funds from them, when approached to potentially invest in Moldova. These issues,

both in terms of legal frameworks and business culture need to be addressed in order to encourage investment in the innovation ecosystem.

Key financial regulations missing

As mentioned, there are issues related to the regulatory framework related to finance in Moldova. These include few legal definitions and regimes for angel investors, venture capital, crowdfunding and other risk capital instruments that are needed to provide start-ups with funding. There are gaps in accountability, credit risk protection and transparency. There are also issues related to requirements, such as maximum risk exposure for traditional banking, which limit the ability of banks to provide capital to innovators and make that capital more complex and expensive to provide. The regulatory frameworks are being revised, but those reforms will take time, especially for investor perceptions of the country's financial market to shift, which is a key component of drawing investors.

4.4.4 Gaps and strengths: Capital and resources

Strengths

Although available investment is weak, there have been some successes in drawing international financing to Moldova along various lines. Research funding is seen as more available than other forms of financing. To address the availability of investment, reforms are underway.

Gaps

Financing for all phases of innovation is broadly unavailable. This is due largely to a poor domestic investment climate and few specific financial regulations. Those areas where investment is available, research and international support, still have some concerns. Research funding is not allocated in areas that support innovation, and international support needs to be handled carefully to ensure that it is sustainable and does not distort strategies for the ecosystem.

4.5 Networks and markets

4.5.1 Literature review: Networks and markets

Strengthening the underpinning of the markets is a key component of the Moldova 2020 strategy. The document describes the economy as heavily reliant on remittances from the diaspora community and a combination of trade and development assistance from neighbours. While this has provided support to the economy and market, the situation has led to some long term instabilities and risks. First, by having the markets reliant on outside actors, there are many political, economic and social scenarios that could lead to the withdrawal of those actors. Second, the market and economy are not necessarily tied to durable development, especially development of the innovation ecosystem, especially because remittances are not likely to be reinvested into the development of new projects. Third, the inflow of financing from remittances, while beneficial to a family, distorts domestic markets in ways that make it very hard for domestic firms to compete. To address these issues, it identified the need for education, investment, infrastructure, and improvement of the business and regulatory environment.

The IDI[38] findings regarding ICT usage, especially households online and those having access to hardware have a bearing on the market for ICT products. This ties in with some of the elements in the SWOT analysis in the Digital Moldova 2020 strategy[39]. In that document, it was noted that although the

[38] ITU Global ICT Development Index, 2016.
[39] Government of the Republic of Moldova, 2013.

infrastructure is broadly good, the costs were high and last mile solutions limited in some areas. Both of these take a country with a small population and low incomes, and further limit the market available for ICT firms. Beyond this, it is noted in Digital Moldova 2020, that the population of the country, even when they have access to the technology, are not necessarily interested in or digitally literate enough to use it in ways that would benefit ICT firms. They are reticent to buy products online or use online services, in particular e-governance services. In the public perception survey by the E-Government Centre[40] only 27 per cent of respondents had access government services online, despite a significant improvement in satisfaction. This number is increasing over time, and some of this resistance can be dealt with by education and outreach, but it remains a limiting factor on domestic markets.

The MIEPO report discusses the market situation in Moldova primarily in the context of trade. Trade is a powerful component of the Moldova ICT market. The country is both geographically and politically positioned to access the markets of the EU, CIS, and CEFTA, giving companies in Moldova reach from the Pacific coast of Russia to the Atlantic coast of Portugal, missing few countries in between. Throughout the literature that addressed remittances and brain drain, this factor was noted as well. This reflects the trade off in terms of trade openness, if Moldova has access to all of these markets, the population also has the ability to move and relocate. In particular, as noted in Moldova 2020, if the primary target market for many of the innovative firms in Moldova is to export, it makes more sense to move abroad in many cases, unless strong incentives are given to remain or return.

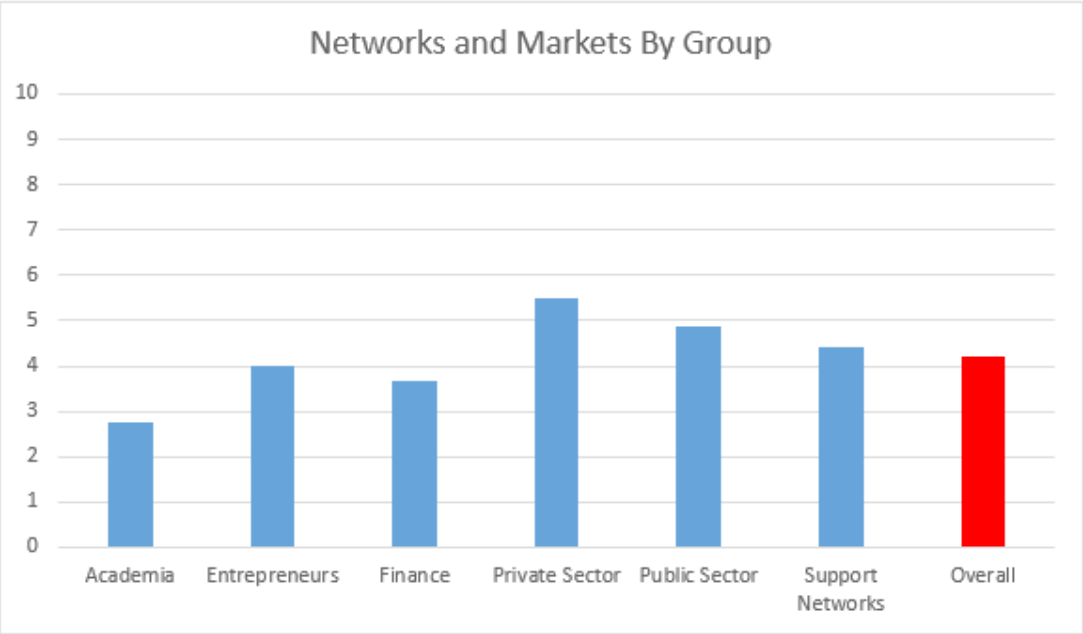
The MIEPO report touches on some themes of networks as well. It analyses the technical park initiatives that will form the basis of the formal networks that evolve around clusters. There are a few other formal networks active in the country. The EBA helps private companies connect to resources and advocate on key issues in the country. The National Association of ICT Companies[41] has a range of activities to support the development of companies, and also provides them with close ties to various entities through its collaborations with academia and the public sector. The Information Society Development Institute[42] also plays a role, connecting businesses to one another and advocating for them to various institutions.

4.5.2 Pillar strength: Networks and markets

Based on the interviews, scores were assigned reflecting respondent views on the strength of networks and markets in the ecosystem. The scores were based on combining scores of 0-2 on whether respondents felt the domestic markets were well developed, whether trade flows were possible, whether public procurement was at an appropriate level, whether they had a clear mapping of the ecosystem, and whether networks were present.

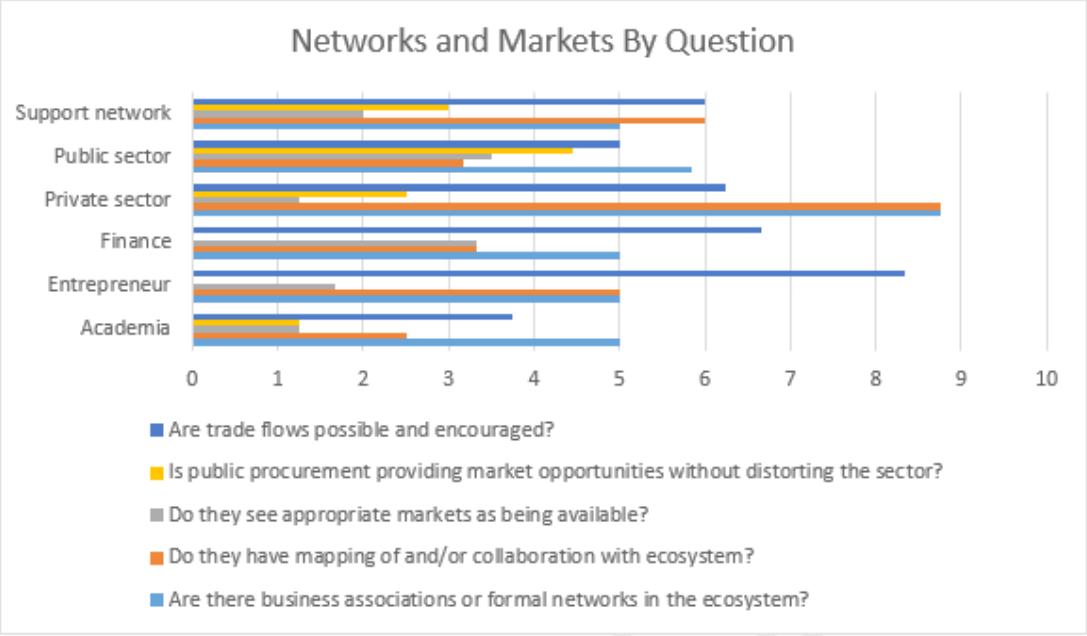
[40] Amihalachioae, C., 2016.
[41] ATIC programmes, 2017: http://ict.md/programs
[42] "IDSI", 2017: https://idsi.md/en/home

Figure 15: Pillar strength by stakeholder group: Networks and markets



Source: ITU

Figure 16: Pillar strength by survey question: networks and markets



Source: ITU

Views on networks and markets in Moldova were divided. Mapping and networks were generally seen as strong, as was access to international markets, while domestic markets and the work of public procurement to support them were generally seen as concerns. These views were broadly shared, though the public sector and support networks had more positive views of public procurement.

4.5.3 Main points and themes: Networks and markets

Formal networks are playing their role

There are a number of formal networks for the ICT sector in Moldova. These networks have strong connections to the public sector and are doing good work in terms of advocating for the needs of the private sector. They connect key players and provide platforms and events for them to collaborate. They are also working to support the innovation ecosystem through projects, events, soft infrastructure, training programmes and mapping activities. These efforts are developing the ecosystem, but that development remains at an early phase, and efforts to strengthen the ecosystem need to be fostered and leveraged going forward. The work of the networks is not fully integrated into strategies for the innovation ecosystem, and therefore work in diverging directions at times. More than this, some networks have been developed by outside actors and represent objectives from outside the ecosystem. Strengthened strategies to bring these networks into comprehensive thinking about the innovation ecosystem would help leverage their efforts toward broader development of the ICT sector and innovation ecosystem.

Domestic markets are held back

The ICT sector in Moldova, especially smaller firms, has a difficult time capturing enough market share to establish sustainable businesses. The key cause behind this is poor market share. The findings of the ICT Development Index were confirmed and expanded by a number of respondents. They noted that, although the ICT infrastructure is good, high costs and low incomes limit usage. Further limiting usage was the sense that many consumers fail to see a strong value in the use of ICTs, or the relevance of available solutions in their lives. They may have an interest in products offered by larger, international actors, but there is a poor perception of the relevance and quality of domestic solutions, which limits the potential market.

Access to EU and CIS markets are key supports

With smaller domestic markets, Moldovan innovators have found it valuable to seek potential consumers outside of the country. The ties between Moldova and the regional free trade agreements provide the ICT sector access to a market of 880 million people, as opposed to the Moldova market of 3.55 million. This access is particularly important because many of Moldova's neighbours have better business climates with lower barriers to doing business, more transparency and stronger business cultures. They also have many ecosystem supports to help businesses develop. This is a valuable boost to the strength of available markets, but needs to be handled carefully. Businesses will often incorporate outside Moldova because of the ease of doing business, the stronger supports and the larger markets. Because of absence of trade barriers, the businesses can still do business in Moldova, enjoying access to the country's markets, without needed to navigate its more difficult business environment. Specific incentives and advantages should be developed or explored for businesses based in Moldova in order to prevent this issue.

Public procurement systems have gaps, especially for small businesses

In other environments with small domestic markets, public procurement often provides a vital support. The government can be the biggest customer in many places. There was a broad interest from Moldova entrepreneurs and small business owners in seeking out government contracts, but also a sense that the tender process is a barrier to that opportunity. There were reported problems with complex and burdensome procedures, favouritism, a lack of transparency and support for innovative projects or those executed by small or domestic firms. Some of these issues are being addressed, at least in part, by reforms and efforts at public sector transformation, such as the digitization of the procurement system. There were concerns that a preference toward smaller firms may lead to issues with compatibility or quality, but if managed properly, these risks can be mitigated, and the whole

system can provide a powerful support to domestic innovation. If the procedure cannot factor in preference to small or domestic firms, it might be feasible to require winning firms to support tech transfer efforts. In this case, larger international firms are required to twin with smaller, local ones, providing a knowledge base for ongoing support for projects and building capacity for future needs and the development of the ICT sector.

Private sector firms not fully engaging in their role in the ecosystem

One issue referred to by many smaller firms and entrepreneurs concerned the paucity of support of larger firms in terms of B2B services, partnerships and activities to strengthen the ecosystem, such as laboratories and open innovation efforts. Part of this stems from trust and confidence, where small firms approach larger ones with suspicion, and larger firms approach smaller ones with doubt. It also stems from larger firms being more invested in international ecosystems than domestic, orienting themselves toward strategies that develop projects abroad and bring them to the market in Moldova. Another issue is that current strategies, as mentioned above, do not have a strong role for the private sector to play in the innovation ecosystem. Strategic documents might call on the private sector to support research, innovation, entrepreneurship and the work of smaller ICT firms in Moldova, and might call for government leadership, coordination and support in those efforts. However, currently the larger private sector firms don not see this role for them reflected in the documents.

4.5.4 Gaps and strengths: Networks and markets

Strengths

The market in Moldova is supported by free trade agreements. The ability to work together with regional and global ecosystems provides significant opportunities to innovators. Networks are doing good work in terms of representing, connecting and supporting the ecosystem, but should be better coordinated and leveraged.

Gaps

Moldova's ICT market demand is small, due to population size, incomes, costs, and perceived value. The private sector and public procurement are not being properly leveraged to support demand. Though the international markets are doing a good job of supporting the market, there is a significant risk that entrepreneurs will decide to incorporate abroad rather than domestically.

4.6 Culture

4.6.1 Literature review: Culture and communities

Issues with Moldovan business culture are a thread running through concerns about transparency, finance, education and other areas. This is present in particular in the Moldova 2020 strategy. The business culture is held back by the issue of transparency and a range of ambiguous processes. While these are clearly policy related issues, they speak to a business culture that needs clearly defined rules and they provide a lot of space for negative actors to manipulate the system to their advantage. This leads to trust and confidence issues, and by extension, a low number of business start-ups. There is a specific need for improvements in terms of reporting of violations, rule of law within the business community and visible success stories to inspire innovators. This can be seen as tied to the quality of life and brain drain issues cited elsewhere in the strategy. If lifestyles are seen as better elsewhere in Europe, it is difficult to draw migrants back into the country, especially if they are high skilled. This is compounded if the country is seen to have a poor business culture in terms of transparency, trust, and probability of success. The World Bank Enterprise Survey (REF) supports the issues regarding

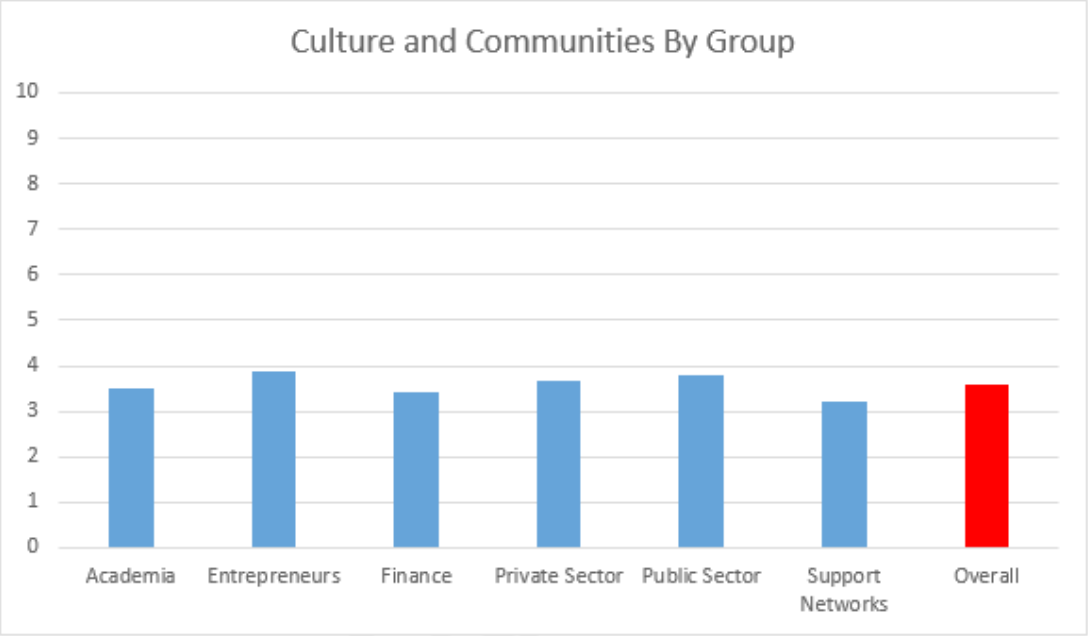
transparency and irregularity, noting that instability and corruption are common barriers to operation for both small and medium firms.

The Enterprise Europe Network[43], Rockstart[44], Tekwill[45], InfoInvent[46] and other projects working on developing innovation communities in Moldova collectively are focusing on a number of key themes related to entrepreneurial culture in the country. First, they are often seeking to highlight success stories, combatting the sense that the barriers to entry are too high. Second, they are developing projects and skills to an international standard and developing a business culture that would build confidence in terms of outside investment and allow for easier integration into regional and global markets. Finally, they are working to build a community with greater levels of trust and collaboration, something that is limited by the issues of transparency mentioned above. They are doing this through events in Moldova, through developing co-working spaces and hubs, or through engagement with international actors, placing Moldova entrepreneurs in international ecosystems.

4.6.2 Pillar strength: Culture and communities

Based on the interviews, scores were assigned reflecting respondent views on the innovation culture in the ecosystem. The scores were based combining scores of 0-2 on whether respondents were part of communities in the ecosystem, whether they were aware of regular gatherings, how they saw perceptions of entrepreneurship, risk and failure, and their views on diversity in the ecosystem.

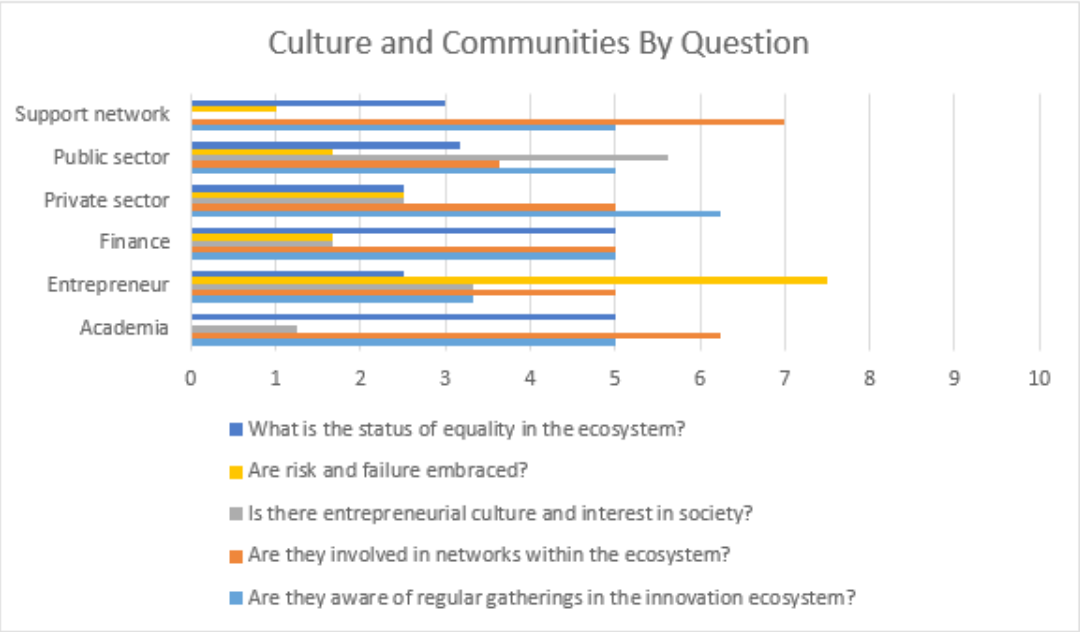
Figure 17: Pillar strength by stakeholder group: culture and communities



Source: ITU

[43] "Are You Ready To Go International?", 2017: http://een.ec.europa.eu/news/are-you-ready-go-international
[44] "Rockstart Launchtrack Moldova", 2017: https://www.rockstart.com/launchtrack-moldova
[45] "What is Tekwill", 2017: https://www.tekwill.md/
[46] "Infoinvent", 2017: www.infoinvent.moldexpo.md

Figure 18: Pillar strength by survey question: culture and communities



Source: ITU

Views on culture and community in Moldova were scattered in detail, though they are quite close in aggregate. Most stakeholders were engaged in networks, though they do not see them as fully active. Equality was marginal, with most respondents noting issues, but not attributing them to obvious systemic problems. Other than this, entrepreneurial culture was seen as stronger by the public sector and risk acceptance by entrepreneurs themselves. Entrepreneurs are surrounded by others who take on risks regularly, so this is to be anticipated. The public sector may be focused more on the potential of the ecosystem, rather than current status.

4.6.3 Main points and themes: Culture and communities

Lack of trust and collaboration in the ecosystem is a serious issue

Overall, one of the major issues in the Moldova ICT centric innovation ecosystem was that of trust. For various reasons, stakeholders have little trust for one another. There are suspicions about the motives, reliability or transparency in many, if not most of the relationships discussed with respondents. This, in turn, becomes a barrier to collaboration among stakeholders, leading to issues in developing investment, B2B services, cooperation between entrepreneurs and more. Cooperation is particularly important for the success of entrepreneurs, who often rely on shared resources, skills and experience to do their work.

Issues with business culture, especially connected to transparency and good practices

Mus of the trust issues are related to the business culture and climate in Moldova. This includes concerns in terms of transparency, relationships with partners, collaborations, contracts, business ethics, informality and other issues. At the higher end, there are concerns about many businesses operating in the grey economy or engaging in corruption. As noted above, this can become a barrier to many participants collaborating and issues with trust in the ecosystem. Efforts to strengthen business culture and bring management and administration up to international standards would help resolve some of these problems.

Need for community building activities

Another aspect of trust in the ecosystem is having regular community building activities. There are some opportunities for stakeholders to gather and collaborate, but they are intermittent and tend to represent more formal networking than informal gatherings. Some of the soft infrastructure projects are working to establish these kinds of gatherings, but as with many of the activities to support the ecosystem, they are at an early phase and need to be further developed. These kinds of events can build in significant opportunities for trust building and collaboration, while also influencing business culture toward international good practices. These events would also give much more visible opportunities for champions to take on leadership roles and to provide more visibility for success stories and good practices.

Barriers to success mix with risk aversion

The issues with business culture, along with bureaucracy, taxation, barriers to entry and an overall need for more support in terms of investment and soft infrastructure, make successfully establishing a start up in Moldova difficult. The awareness of these issues is increased by a limited number of highly visible success stories in the ecosystem. The concern over barriers to entry become a major problem when they interact with risk aversion in the culture. Potential entrepreneurs are culturally hesitant to take risks, and see the business climate and being very high risk with few paths to substantial success, so, they will often decide not to pursue their projects because of the risk and barriers to entry, seeking out safer opportunities instead.

Entrepreneurs likely to go abroad or operate informally

If entrepreneurs do decide to push start-ups forward in spite of the barriers to entry and low levels of support, they may choose to do so in ways that do not fully support the ecosystem. In order to avoid the taxes and bureaucracy, many start-ups could remain in the grey economy, doing business without formally incorporating. Others may look to incorporate abroad in countries with lower barriers to entry and better business cultures, this process being made easier because of the free trade agreements, which is discussed above. In both of these cases, the start-ups are not contributing to the tax base and not providing full support to the ecosystem, but are also not benefitting from the potential support the ecosystem can provide. If ecosystem supports were developed and barriers to entry lowered, it might be possible to mitigate these issues by providing supports to those start-ups that are formally established in country.

4.6.4 Gaps and strengths: Culture

Strengths

There is interest in entrepreneurship in Moldova. Certainly, many young people, especially in the tech sector are interested in developing innovations and businesses. There are nascent efforts to develop communities to foster these potential innovators, even though they need to be expanded.

Gaps

Currently, the business culture in Moldova suffers from serious issues related to trust, transparency, business ethics and collaboration. This leads to a trust deficit among stakeholders, which, along with other factors, can tend to drive entrepreneurs abroad and into the grey market. Currently, the events and communities are not doing enough to resolve this problem, but seem to be growing into that role.

4.7 Regulation and policy

4.7.1 Literature review: Regulation and policy

Political stability, transparency, and bureaucratic barriers are noted widely throughout the literature on the political situation in Moldova. These concerns are reflected in the Moldova 2020 strategy. Notably, the business environment section specifically references the Doing Business Report[47] several times in terms of areas that need to be reformed in order to ensure that there is a legislative regime which would ensure a good enabling environment for businesses. The strategy also lays out the fact that there are also needed reforms in the justice system in terms of trust, integrity, and transparency. These reforms will help to solidify the other reforms, allowing for both better enforcement and greater trust that those reforms are being performed in an open and positive fashion. The Moldova 2020 strategy also provides clear structures for its implementation, laying out hierarchies of oversight and responsibility and reporting mechanisms on the planning and progress of the implementation process.

The EBA report[48] includes a number of specific areas which they feel would benefit or are benefitting from reform in terms of policy and regulation in Moldova. These related to the labour code, permitting and licensing, inspections, data protection, waste management, electronic communication, domestic trade, taxation, customs, and the regulatory bodies for food safety, energy, and the financial market. In many cases, they represent issues where reform is underway, but further changes would be of assistance, often related to efforts to develop e-government systems or other forms of public service transformation. Their concerns cover a wide area, and are often connected to those raised by other stakeholders. However, they do represent a very specific perspective, working to create a better environment for the businesses they represent, and their input should be considered in that light.

A number of measures have been undertaken recently, as noted in the EBA report, to improve the legal regime related to business in the country. Tax reforms[49] prevent double taxation for those moving across international borders, and provide exceptions for taxes on workers in the ICT sector. This is amplified by the law on tech parks[50], which allows for a number of exemptions for firms registered as part of those programmes. New codes on IP laws[51] and financial regulations[52] represent efforts to align Moldova to international standards in those areas. However, The World Bank Doing Business Report[53] still notes procedural and bureaucratic barriers in several areas, in terms of taxes, permitting, opening and closing businesses and enforcement of contracts.

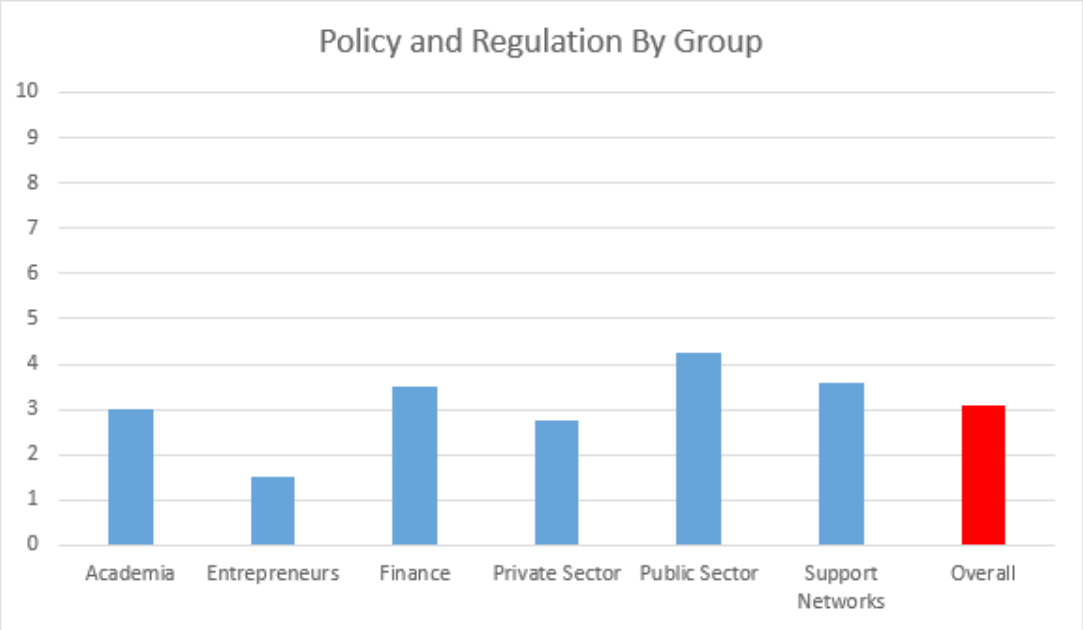
Resolution 710 on E Transformation[54] represents a more comprehensive effort to resolve many of the issues related to bureaucracy and transparency in the public sector. By transforming the public sector and digitizing many processes, it is possible to reduce duplication and ensure that there is less space for arbitrary decisions in the enforcement of policies. As noted above in the Public Perception Survey[55] usage of digital services remains somewhat limited among the Moldova population, though this may be partially attributed to education and skills. For a digital public service transformation to reach its full impact, however, the issue of usage will need to be addressed.

47 World Bank, 2016: www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB16-Full-Report.pdf
48 European Business Association, 2017.
49 "Tax Framework", 2017: http://miepo.md/investment-guide/tax-framework
50 "The first IT parks will be created in Moldova. The Law on IT parks was adopted by the Parliament." 2016. http://mtic.gov.md/en/news/first-it-parks-will-be-created-moldova-law-it-parks-was-adopted-parliament
51 "The Government of the Republic of Moldova has approved the National Intellectual Property Strategy until 2020", 2012: http://agepi.gov.md/en/news/government-republic-moldova-has-approved-national-intellectual-property-strategy-until-2020
52 "National Bank of Moldova", 2017: www.bnm.org/en/
53 World Bank, 2016
54 The Strategic Program for Governance Technological Modernization (E-Transformation), 2011.
55 Amihalachioae, C., 2016.

4.7.2 Pillar strength: Regulatory and policy

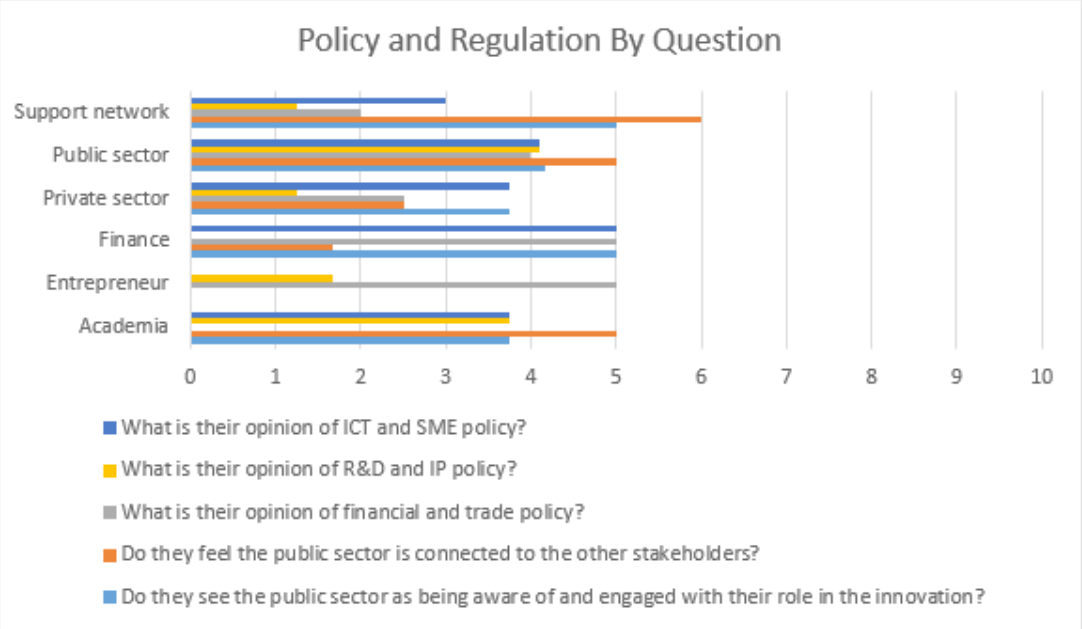
Based on the interviews, scores were assigned reflecting respondent views on the strength of talents and champions in the ecosystem. The scores were based combining scores of 0-2 on whether respondents felt policy in IP, R&D, ICT, SMEs, finance, and trade were appropriate, and whether they saw the public sector as being well connected and aware of their role.

Figure 19: Pillar strength by stakeholder group: Policy and regulation



Source: ITU

Figure 20: Pillar strength by survey question: Policy and regulation



Source: ITU

The views on policy and regulation are highly scattered. There were many questions entrepreneurs did not answer, so although their views were broadly negative, it is hard draw more nuanced judgements about their views. Academia, the public sector and support networks had more positive views of the connections of the public sector to the ecosystem, because those three groups all have closer relationships than others. The private sector and support networks are particularly removed from the R&D system in Moldova, and therefore see it as a weaker area. The public sector and financial actors had higher views of financial policy, broadly based on being closely associated with it.

4.7.3 Main points and theme: Regulatory and policy

Transparency, compliance and bureaucracy are barriers

Throughout our discussions with stakeholders, many cited issues with policy and regulation that were more general than dealing with specific problems. The procedures were often noted, as seen in the literature review, as not being sufficiently transparent, and allowing too much room for arbitrary decisions by the public sector. Procedures were also seen as unnecessarily bureaucratic and burdensome. Requirements and documentation are duplicated, or more elaborate than necessary, issues with the efficiency and availability of offices are seen as slowing down and further complicating the process. Compliance issues in terms of licensing, taxation and other areas were also raised as concerns. In particular, tax compliance, between bookkeeping, inspections and documentation was often noted as something which would consume substantial amounts of time and energy for businesses, being seen as more of a burden than the actual tax rates.

Issues reported in many areas need for reform and good practice models

There were a number of specific issues that were noted by respondents in terms of policy and regulation. IP was seen as good in principle, but many respondents noted that the procedures were very extensive for registrations that were not recognized as widely as those from other countries. The procedures to create a company are very simple, but those to dissolve companies are much more complex. The ICT sector is regulated as a service sector and mobile devices are treated as luxury goods, creating significant issues in terms of taxation and regulation. Licensing for financial services is difficult, and this creates a bottleneck for the development of a 'fintech' sector and investment and risk capital in the country. The demands for collateral also restrict the loans available to support businesses from traditional banks. Issues with zoning and construction laws related to the development of communications infrastructure were seen as restrictive and more broadly, the laws related to real estate created barriers for business. Finally, policies related to research led to research institutions and structures with reduced flexibility to pursue lines of research that could lead to spinoffs.

Specific reforms and incentives exist, but are generally at early phases

Several of the issues stakeholders had with policy and regulation were under review. The reviews and reforms related to IT parks, financial regulations, IP law, R&D processes amongst others show movement in positive directions. Since many of these are still being planned or are currently in process, it is hard to determine whether their outcomes will be appropriate or sufficient as such, but their stated intentions indicate positive change. In particular, the efforts at public sector transformation, digitization of governance and e-governance are strong steps toward creating more efficient, transparent and coordinated public services. For all of these processes, there is a specific need for ongoing efforts to foster them. As noted, few of the reforms have been completed and so they will need to be amplified and moved forward and their ongoing implementation will need to be ensured. Further reforms should be undertaken to complete the process of reform throughout the government. These efforts will need to take into account domestic and international good practices, the needs of the ecosystem and overarching strategic concerns.

Need for strengthened consultation and communication

There were broad concerns about coordination in the development and reform of policy and regulation. The private sector and entrepreneurs felt that their needs and concerns were not generally well reflected, financial stakeholders and academia felt a similar sense of mismatch. More than this, many of the public sector actors felt a sense of siloes between different agencies and ministries or described a lack of understanding about the various efforts. This kind of issue was also reflected in discussions with local administrations, who had the sense that the national level public sector did not take their needs into account or coordinate with them. There are counter examples to these issues, the private sector networks certainly have a close connection with the public sector and have some ability to influence them, there are consultative processes with local governments for the Ministry of Regional Development and Construction and a measure of coordination between the ministries related to research activities. That said, these efforts do not totally resolve the issues above, though they can be looked to as good practices to be amplified going forward.

No comprehensive digital innovation framework, nor recognition of ICT as strategic sector

A driving cause of the coordination issues above can be seen as the lack of a comprehensive framework for digital innovation. This kind of strategic document, which would encompass the work and needs of all the relevant stakeholders, both inside and outside the government, would allow a more coordinated effort not just to develop policies, but also to structure the ecosystem overall. One key component would be the recognition of the ICT sector as a strategic sector for economic development, along with the definition of certain cross sectoral connections and specializations as areas of importance. Presently, investment projects “of national importance” are not seen as appropriate to the ecosystem needs and are also not seen as sufficiently focused. The development of these priorities will provide the basis for policy reform and also direct action in order to develop the ICT sector in strategic directions.

4.7.4 Gaps and strengths: Regulatory and policy

Strengths

There are a number of reform programmes underway in Moldova to attempt to address the issues that have been identified over time by various stakeholders. This includes efforts at public service transformation that would improve the transparency, efficiency and efficacy of public services.

Gaps

There is a general need for improved coordination and a more comprehensive strategy in order to strengthen issues related to policy and regulation in Moldova. There are specific issues related to particular areas of policy that need to be resolved in order to strengthen the working of the ecosystem.

5 Holistic review of the ecosystem

5.1 Collected analysis

Central Space: Most forms of support for the ecosystem, soft infrastructure, champions taking leadership roles, networks and communities are still at a relatively early phase of development. Most are progressing, but they need to be fostered over time and will require further investment. In particular there is a need to bring them together into a more cohesive strategic vision.

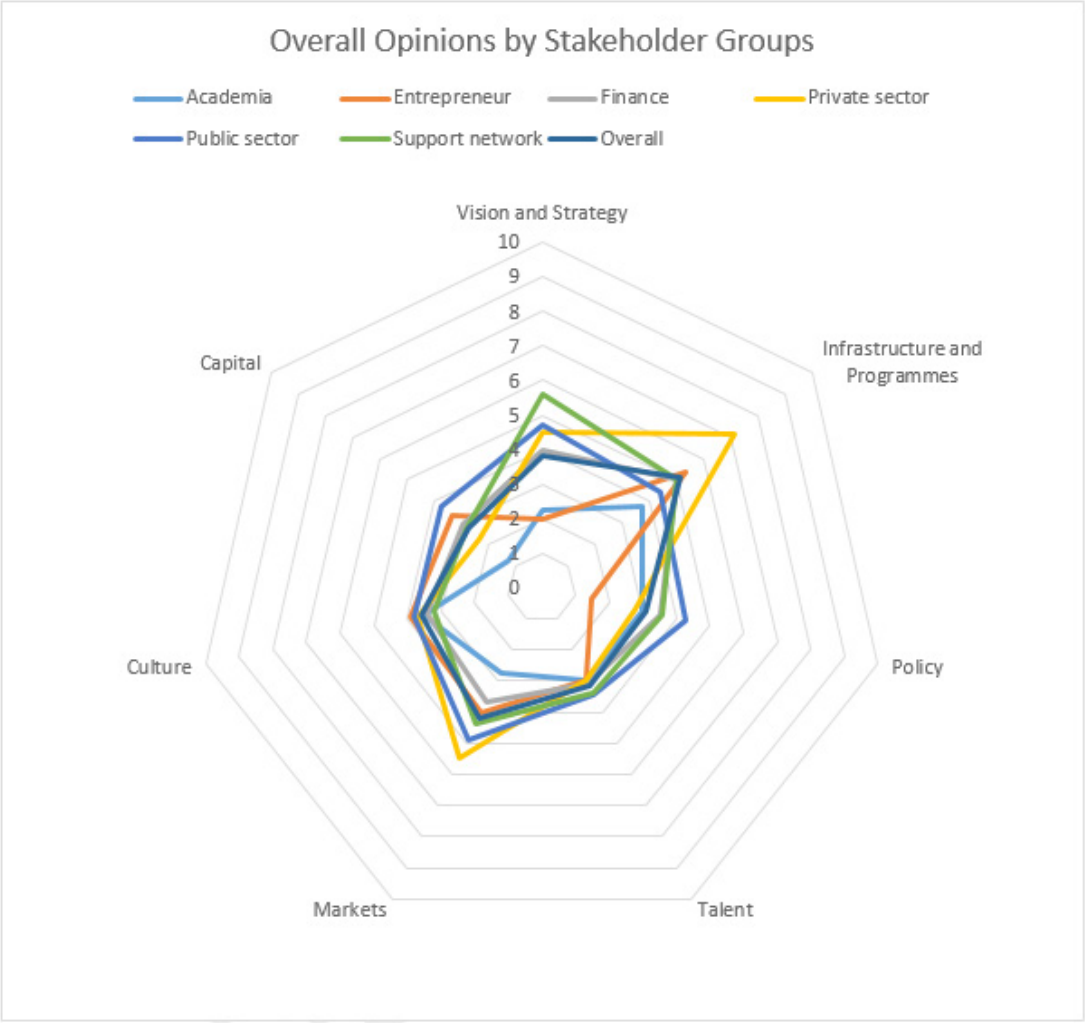
The analysis has shown that funding for projects in the ecosystem is generally one of the stronger components of the central space. In particular, international donors have been willing to bring significant resources into the ecosystem with the goal of developing many of the needed projects. This is a critical support for the work of the ecosystem, as noted in the section on capital and resources, but it brings with it concerns about sustainability, and strategy. In terms of sustainability, because the financing is coming from an external source, which can be withdrawn at any time based on changing political agendas and other outside factors. So, there should be a push to use the money in durable ways that require as little ongoing financing as possible. In terms of strategy, financing from external sources will broadly be aligned with the objectives of the donor, unless a strong innovation strategy and agency are in place to shape its application.

One common theme was that many champions were known within the ecosystem, but they seemed to need to be better connected and made more visible to potential innovators. Further enabling them to take on leadership in the ecosystem would be a step toward having a more robust ecosystem overall. In particular, finding success stories in the private sector and promoting their roles in the ecosystem would give more inspiration to innovators, and help to strengthen entrepreneurial culture and awareness, both domestically and abroad.

The formal networks in the ecosystem are broadly active in Moldova, and are doing good work in many cases in developing and shaping the ecosystem in the country. Their work could be better coordinated and leveraged, again, with a stronger, more cohesive strategy. In addition, it would be positive to have them working more closely with actors, in particular in finance and academia, and doing more work to push the private sector in the country to take an active role in the ecosystem, whether through open innovation, training services, collaboration with academia, or B2B services.

Comparative analysis of pillars: Broadly, opinions across the ecosystem were well grouped. Academics and entrepreneurs were more pessimistic about vision and strategy, academics also had lower views on infrastructure, markets and capital, and entrepreneurs had lower views of policy. The entrepreneurial views on policy, as stated above, are likely due to a low response rate. The views on strategy come from being less closely involved in the process and implementation, in particular the setting of research agendas for the academic respondents. Academia is less well linked into networks, and more concerned about financing for research and distribution of infrastructure. The private sector felt more secure about infrastructure, and more confident in the markets, being key players in networks and well connected internationally. Other variances do not appear inconsistent with the analysis below.

Figure 21: Overall opinions by stakeholder group



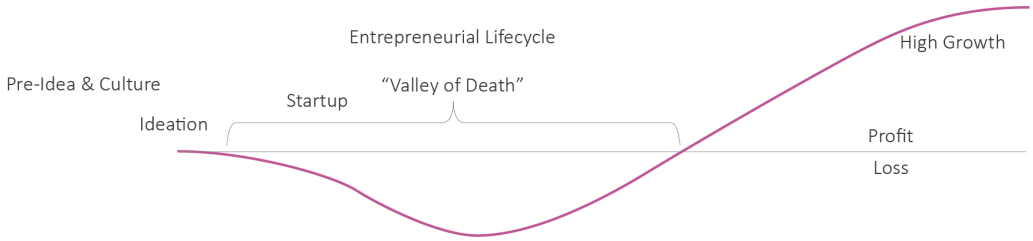
Source: ITU

Talent suffered critically from brain drain and insufficient experience. Culture had issues in terms of business practices and risk aversion problems. Overall, capital was seen as being almost non-existent. For most actors, vision was seen as middling, with many scattered strategies not coming together in a comprehensive fashion. Policy had similar issues, along with problems of bureaucratic and transparency barriers. Infrastructure was relatively strong, in particular hard infrastructure and markets were seen as strong, though primarily based on the strength of international connections and active formal networks.

Stakeholder interface canvas: The stakeholder interface canvas quickly analyses the work of the ecosystem in covering the key activities needed in order to take innovations from pre-ideation to high growth. It describes the role each stakeholder group can take on to support entrepreneurs and innovators at each stage of their lifecycle.

The canvas is based on the 'Valley of Death Curve', which shows the lifecycle of innovation and entrepreneurship. The lifecycle reflects growing companies, and notably identifies the 'Valley of Death', a period after ideation when innovators require significant investment and support, and where there is a high risk of failure as a business. This is possibly the most critical period for the ecosystem to provide support, though support throughout the lifecycle is critically needed. Similar to the need for support from all pillars of the ecosystem, if any part of the entrepreneurial lifecycle becomes a common failure point, it will vastly reduce the chances of success for all entrepreneurship in the ecosystem.

Figure 22: Stakeholder interface canvas



Entrepreneurship Phase	Pre-Idea	Ideation	Startup	The "Valley of Death"	SME
Entrepreneurs	Entrepreneurial interest	Problem discovery	Develop business models	Build collaboration	Expand & exit
Finance	Research funding	Seed funding	Angel investment	Venture capital	Business finance, equity & loans
Entrepreneurial Support	Gatherings & events	Hackathons & competitions	Coworking & soft infrastructure	Incubators & accelerators	Business associations & networks
Private Sector	Success stories	R&D programs	Internal incubator	B2B services	Skill training programs
Academia	Entrepreneurial inspiration	Basic research	Spin off facilitation	Skill training for entrepreneurs	Develop human capital
Public Sector	Vision & strategy	IP & R&D support	Public procurement	Tax support	Trade & finance policy

Source: ITU

Each stakeholder group has a specific group of actions representing the role they play in supporting innovators through the lifecycle discussed above. The roles mentioned under "Entrepreneurs" are unique in that entrepreneurs, rather than primarily providing support to the ecosystem, primarily receive support from the ecosystem, and are expected to perform the work of entrepreneurship and innovation. The roles for each stakeholder group are noted in the stakeholder interface canvas are explained here:

Entrepreneurs:

- Pre-Idea: Entrepreneurial interest: Before creating a start-up, potential innovators must have an interest in entrepreneurship.
- Ideation: Problem discovery: Entrepreneurs must discover and focus their work on relevant problems as they ideate a new innovation.
- Start-up: Develop business models: In creating start-ups, entrepreneurs need the skills to develop strong business models.
- The "Valley of Death": Build collaboration: To get one another through the "Valley of Death" entrepreneurs need to be ready to collaborate and share resources.
- SME: Expand and exit: As start-ups develop into proven SMEs, entrepreneurs will need to have the opportunity to expand, becoming high growth SMEs, or to exit through buy-outs or IPOs.

Finance:

- Pre-Idea: Research funding: Resources need to be provided in order to do basic research, leading to innovations.

- Ideation: Seed funding: Early stage, high risk investment, generally under USD 100 000, is needed to launch a start-up. It comes from various sources, including investors and the public and private sectors.
- Start-up: Angel investment: Start-ups need small, one time, early phase investment, provided by angel investors or networks in order to operate and develop their business.
- The 'Valley of Death': Venture capital: In the 'Valley of Death' firms require significant, still high risk funding in order to bridge the gap between growth potential and profitability.
- SME: Business financing, equity and loans: Once well established, firms need more traditional sources of lower risk finance. This comes in various forms, but all focus on SMEs and late stage start-ups.

Entrepreneurial support:

- Pre-Idea: Gatherings and events: Events for innovators and potential innovators spread entrepreneurial culture and provide the support needed to begin the entrepreneurial lifecycle.
- Ideation: Hackathons and competitions: Ideation processes and competitions reward innovators for successful ideation and help to build connections to foster the process.
- Start-up: Co-working and soft infrastructure: Knowledge sharing institutions and resources are needed by early phase start-ups in order to develop and gain necessary skills.
- The 'Valley of Death': Accelerators and incubators: As start-ups develop, accelerators and incubators help them to develop their businesses through coaching, mentorship and connections with investors and other resources.
- SME: Business associations and networks: Associations and chambers advocate for and support businesses in the market and with the public sector. They also provide key networking and other services.

Private Sector:

- Pre-Idea: Success stories: Successful innovators need to be visible and accessible to younger entrepreneurs as mentors and inspiration.
- Ideation: R&D programmes: Funding and support for R&D by private firms is often a major source of support for upcoming innovations, both within the firm and outside.
- Start-up: Internal incubator: Often, start-ups and entrepreneurs are supported by in house incubators run by established industry firms in their field.
- The 'Valley of Death': B2B services: Start-ups in the valley of death rely on B2B services, often at special rate, in order to make their transition to profitable businesses.
- SME: Skill training programmes: As businesses grow, private skill training is needed in order to provide human resources needed in the sector.

Academia:

- Pre-Idea: Entrepreneurial inspiration: Universities need to provide environments and communities which inspire and foster new entrepreneurs.
- Ideation: Basic research: Basic research contributes to the ideation process by working on practical problems and developing valuable innovations.
- Start-up: Spin off facilitation: Universities need to foster and support spinoffs, start-ups which emerge from the research environment based on basic research.
- The "Valley of Death": Skill training for entrepreneurs: Start-ups in the valley of death require training in business skills and soft skills from academia to survive.

- SME: Develop human capital: Academic institutions are responsible for ensuring that there is sufficient and appropriate human capital available in the ecosystem.

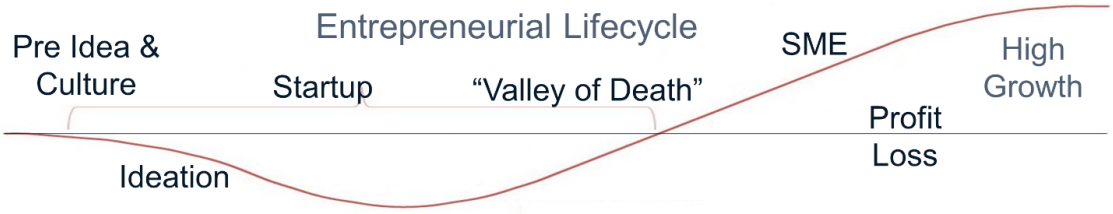
Public Sector:

- Pre-Idea: Vision and strategy: The government needs to provide a clear vision and strategy for the innovation ecosystem, and bring together stakeholders in support of them.
- Ideation: IP and R&D support: Public policy needs to support IP rights and research activities, through funding, legal protections, and other measures.
- Start-up: Public procurement: Public procurement and tenders is an essential source of contracts for many early stage start-ups, is properly organized and implemented.
- The 'Valley of Death': Tax support: Start-ups in the valley of death often survive in part because supportive tax policies reduce operating costs and provide some added capital.
- SME: Trade and finance policy: As innovative business grow, they rely increasingly on international markets and capital investments. Policies are needed to foster those activities.

Taking this canvas, it is possible to identify gaps and areas of strength to quickly develop a 'heat map' of activities in the innovation ecosystem. Below is the same canvas with commentary on the areas, and colour coded to show gaps. The colours were based on survey data, desk research and interviews, and represent the following:

- green cells were reported as being well supported;
- yellow were partially, but insufficient supported;
- red were largely unsupported;
- blue were unsupported, but programmes to improve them were reported as ongoing.

Figure 23: Completed stakeholder interface canvas for Moldova



Entrepreneurship Phase	Pre-Idea	Ideation	Startup	The "Valley of Death"	SME
Entrepreneurs	Entrepreneurial interest	Engage with problems	Develop business models	Build collaboration	Expand
Finance	Research funding	Seed funding	Angel investment	Venture capital	Business finance & loans
Entrepreneurial Support	Entrepreneurial events	Hackathons & competitions	Coworking & support	Incubators & accelerators	Business associations
Private Sector	Success stories	Research programs	Lab programs	B2B & Support services	Skill training programs
Academia	Entrepreneur community	Basic research	Spin offs	Soft skill training	Human capital
Public Sector	Vision & strategy	IP & R&D support	Tax support	Public procurement	Trade policy

Source: ITU

The following are further explanations of the above ratings:

Entrepreneurs:

- Pre-Idea: Entrepreneurial interest: There is entrepreneurial interest in Moldova, but barrier to entry and risk aversion present problems.
- Ideation: Problem discovery: Most innovators have an eye toward international markets rather than focusing on problems in Moldova.
- Start-up: Develop business models: There is some ability to develop business models, but soft skills are not being well developed.
- The 'Valley of Death': Build collaboration: A serious absence of trust in the ecosystem limits collaboration.
- SME: Expand and exit: Businesses have many opportunities to expand and develop internationally, though factors, such as business climate and finance, limit domestic expansion.

Finance:

- Pre-Idea: Research funding: Research funding may be available, but not as widely as desired, and not well allocated toward private sector innovation.
- Ideation: Seed funding: Little finance is available for early phase projects.
- Start-up: Angel investment: Currently, angel investment doesn't exist in a structured form.
- The 'Valley of Death': Venture capital: Some projects can draw foreign venture capital, but not domestically.
- SME: Business finance and loans: Some banks are interested in delivering loans, but financial regulations limit their ability to do so.

Entrepreneurial support:

- Pre-Idea: Gathering and events: There are some events getting started to inspire innovators in Moldova, but need to be expanded and coordinated better.
- Ideation: Hackathons and competitions: Some hackathons and competitions are active, but very few, and not focused.
- Start-up: Co-working and soft infrastructure: Soft infrastructure is in development, especially in Chisinau, but needs significant development.
- The 'Valley of Death': Incubators and accelerators: No true incubation or acceleration exists.
- SME: Business associations: There are formal networks in Moldova, and they are doing a good job of representing the interests of the private sector, but less so in engaging them to support the ecosystem.

Private Sector:

- Pre-Idea: Success stories: There are successes, but very few and they are not effectively put forward as inspiration or mentors.
- Ideation: Research programmes: Research by private firms is not occurring widely.
- Start-up: Lab programmes: There aren't significant private sector labs in the country.
- The 'Valley of Death': B2B services: The larger private firms in Moldova weren't reported as providing substantial support for innovation.
- SME: Skill training programmes: There are some skill training programmes being undertaken by the private sector, but often across borders or hard to access.

Academia:

- Pre-Idea: Entrepreneur Community: Especially as soft infrastructure becomes available, some institutions working to develop communities.
- Ideation: Basic research: Research is occurring in Moldova, but it is not successfully connecting to the private sector in terms of developing start-ups or commercially viable ideas.
- Start-up: Spin offs: Academic institutions are not successfully creating spinoffs at this time.
- The 'Valley of Death': Soft skill training: Business skills are not a sufficient part of education at universities.
- SME: Human capital: Despite efforts at IT training, there are major gaps between needs and skills being trained, and significant losses due to brain drain.

Public sector:

- Pre-Idea: Vision and strategy: The strategies for the ecosystem fail to create a comprehensive vision, or elaborate roles for all stakeholders.
- Ideation: IP and R&D support: R&D is supported, but the process of allocation is bureaucratic and needs reform.
- Start-up: Tax support: The current structure of taxation, in particular demands of tax compliance, represents a serious barrier to entry.
- The 'Valley of Death': Public procurement: Public procurement isn't structured in a way to benefit small or innovative firms.
- SME: Trade and finance policies: The connections to international markets are well maintained and represent an opportunity for Moldova innovators.

Taken together with the other elements of our analysis, it can be seen that there are many activities that are underdeveloped or not present at this time. Early phase and late stage innovators have some degree of support, but even for these phases, support is incomplete. For early stage start-ups however, especially those going through the valley of death phase, very little support is available, and significant additional resources are needed. That said, there are moves in the right direction. Some of these, such as efforts to develop soft infrastructure and events, can be seen having a positive impact already. Others, such as policy reforms, are promised, but haven't yet changed the situation.

5.2 Overarching themes

The biggest issue confronting the ICT centric innovation ecosystem in Moldova is early phase of development. There are needs to develop or strengthen many pillars of the ecosystem canvas. There are issues with policies in terms of the transparency and efficiency and with how they function in terms of presenting barriers to entry and supporting the ecosystem. Capital is very limited, talent is not being fully developed with skills that the ecosystem needs, domestic markets are small, business culture needs to be strengthened along with risk acceptance and there are concerns about soft infrastructure. Only a few of these problems appear to be difficult to resolve, but they will require time and energy in developing the ecosystem.

There are several strengths in the ecosystem that stem from well preserved and managed legacy systems in place. The communications infrastructure was often noted as a high point in the ecosystem, which built on older systems. The research and education systems have significant potential, even if their energies need to be better steered to be optimally leveraged. Specifically, there is a need to ensure that graduates have more practical skills and that research is focused on areas that can be commercialized effectively. Also, the relationships with neighbouring countries provide a significant foundation for support to the ecosystem, as will be addressed in more detail below.

There are substantial efforts at reform and development in the ecosystem, based on some of the existing strengths and addressing some of the major issues. Public sector reforms, including a fairly extensive digitization process and the development of reform strategies for a number of policy areas show that there is an interest in working to resolve some of the policy and regulatory issues. There are efforts to develop soft infrastructure and communities, through Tekwill, Generator Hub and the Novateca Libraries programme. There are also efforts to develop investment and support through the Pare 1+1 programme and international investors such as the Western NIS Enterprise Fund or EU Neighbourhood projects. All of these efforts represent good starting places in terms of developing the ecosystem, but need to be better focused and coordinated, since they tend to move in different directions; and fostered with further investment and support from across the ecosystem.

One factor underpinning many of these efforts to develop the ecosystem is the support of international actors. There have been international efforts at investment, advocacy for policy reform and development of soft infrastructure. In addition, the international trade agreements play a key role in supporting market access and international travel is a key support for skill training and experience development. All of these play key roles in the ecosystem, but carry risks as well. One of the major problems confronting talent is brain drain, either through graduates seeking opportunities abroad, or through businesses who would be doing business in the EU or CIS incorporating abroad to avoid barriers to entry. Another is stability, in that these projects and investments need to be guided into durable and sustainable areas that can continue in case priorities shift and international support is removed. Strategy is where care needs to be taken in order to ensure that international priorities are shaped to fit the domestic strategy and not the other way around, which would lead to a strategy which is not properly focused on domestic priorities and needs.

Overall, as the ecosystem moves forward, cooperation, coordination and collaboration will be critical. Current strategies and efforts at ecosystem development and reform tend to run in different directions, and tend to be siloed between different groups of actors. There is also an issue with trust and collaboration between various groups of stakeholders. An overarching strategy focused on the development of the ecosystem and providing roles for all of the ecosystem stakeholders will provide the framework for more coordinated efforts to develop the ecosystem, ensuring support for innovators throughout their lifecycle. Improved means for consultation and sharing of needs and experiences will ensure that the needs of all stakeholders are taken into account. Finally strengthened communities and efforts to build trust, both directly and by removing barriers, will facilitate collaboration between different actors, building up the networks that will support the process of ecosystem development.

5.3 Good practices from Moldova

Generator Hub

Generator Hub is one of the first soft infrastructure services in Chisinau. It provides 24/7 support to a community of 50 innovators, and is focused on not only being a co-working space, but also a hub for community building and skill training. They incorporate programmes in technical, soft skills and design for adults and programmes for children as well. They are starting to look into various specific verticals along with ICT. A key element of the programme is that it engages the community in an organic, sustainable fashion and represents a model of how investment can be used to develop something that will be self-sustaining over time.

Tekwill

Tekwill is a newly developed programme by ATIC and UTM, funded by USAID and the Swedish International Development Agency. It focuses on providing better skills and hands on experience for students at UTM, along with office space, skill training and support for innovators. It serves as a gathering and event space for the community and, in particular, and environment where the private sector, entrepreneurs, support network, the public sector, and academia can come together to collaborate in meaningful ways. Tekwill is a step toward the kind of soft infrastructure needed in

Moldova, developing skills and strengthening business culture. It also provides the basis for a stronger community and collaboration between key stakeholders. The major concerns are whether it can be scaled to meet the needs of the whole ecosystem, and how to ensure that it develops without relying on international funding.

Pare 1+1

Pare 1+1 is an investment matching scheme managed by ODIMM. The core of the project is to provide matching funds, up to a cap, for investment coming from or connected to the Moldova diaspora community, which can include investment, returnees, and those receiving and sending remittances. This is paired with skill training activities to ensure that the businesses are supported beyond simple investment.

Figure 24: Training and financing

Indicator	2010	2011	2012	2013	2014	Total
Applications for Training	40	240	99	323	648	**1350**
People trained	20	215	101	260	498	**1094**
Women	*3*	*63*	*15*	*71*	*146*	**298**
Men	*17*	*152*	*86*	*189*	*351*	**795**
Applications for Financing	10	89	148	184	309	**740**
Finance grants contracted	0	73	69	171	191	**504**

Source: ODIMM

This process helps to develop connections domestic entrepreneurs and diaspora community, helping to repatriate funds. Also, by ensuring those emigrants are financially invested, this can help build collaboration, leading to repatriation of knowledge, experience and skills in ways that will help the businesses to thrive. The international connection can also push businesses to develop organizational cultures that reflect international standards of practice and have opportunities to take advantage of international resources, while remaining rooted in Moldova.

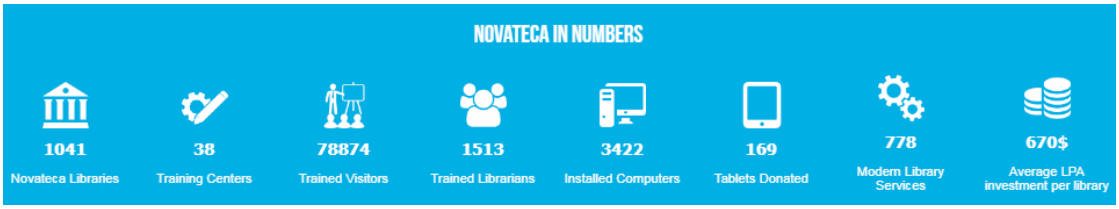
E-Government Centre

The efforts of the E-Government Centre since 2010 have represented significant steps toward public service transformation in Moldova. They have primarily engaged in digitizing and reforming public services. The goal was to reduce ambiguity and duplication and increase transparency and regularity, developing a more effective and efficient set of processes. In parallel with reforming and digitizing procedures, they have worked on developing infrastructure and shared services, and engaging in training programmes, both for civil servants who will need to develop and manage services, which included embedding 67 CIOs and 19 full departments in public agencies and for the general public who will be using the services. The centralized services have included efforts at cloud storage for public data, reducing duplication of services and other efficiency reducing issues, and plans to develop a one stop shop for businesses. The key drawback to this programme is that it began somewhat external to the government agenda, being largely World Bank funded, and many stakeholders saw it as not having full buy in from all parts of the public sector. The more cohesive a strategy can become with public service transformation as a focus, the better this kind of programme can function.

Novateca Libraries

The overall need for soft infrastructure in Moldova is starting to be resolved by groups like Tekwill and Generator Hub. There is a particular need for soft infrastructure outside of Chisinau, where most of the current programmes are centred. Novateca has been working with libraries throughout the country in order to develop both hard and soft infrastructure resources throughout the country. Training centres, are accompanied by computers and tablets, as shown in Figure 26.

Figure 25: Novateca hard and soft infrastructure resources



Source: Novateca

Currently, there are efforts to incorporate additional ecosystem supporting activities to leverage the infrastructure being developed. This includes business services, training in business skills and the organization of hackathons by libraries in order to create small entrepreneurial communities throughout the country. This strategic direction can be amplified, helping some strategic locations to become small hub systems in order to develop local ecosystems throughout the country.

Agricultural Information Centre

The Agricultural Information Centre incorporates a number of public sector functions oriented toward modernization and innovation in the agricultural sector. It merged the animal registry, the centre for information and computing for cereals and the "Agroindsistem", along with new functions focused on providing information systems to support the work of the agricultural sector in Moldova, and reforming the administration of public services to agricultural firms in the country. It is responsible for centralizing, developing and maintaining information systems for the agricultural sector and implementing e-agriculture and parts of e-governance strategies. These services form the framework to support the incorporation of e-agriculture and m-agriculture and other digital services into the agricultural sector.

Along with this framework, the centre is responsible for further transformation and modernization, both in public services and the agricultural sector. It is responsible for guiding and fostering research and innovation in the agricultural sector, helping academics, entrepreneurs and private firms to develop new technologies and business models to support agriculture. This, as part of the e-agriculture strategies, represents a clear area where a government strategy successfully incorporated the role of and impact on the private sector in its development and implementation.

Aleco Russo State University of Balti

Aleco Russo State University of Balti is the second largest university in the country, and hosts several programmes and projects which have been noted by stakeholders as good practice supports for the ecosystem. The Innovation Incubator Nord is part of a system of incubators overseen by the Agency of Innovation and Technology Transfer, and is focused on providing resources to innovators and entrepreneurs. These resources include legal assistance, hard and soft infrastructure and the networking benefits of a technology cluster, which was folded into the structure of the incubator. These services are supplemented by a limited number of events aimed at developing networks and communities to support the ecosystem. The Euraxess Centre and Erasmus+ programmes are based in part at Aleco Russo and build on the innovation efforts by incentivizing international researchers and students to come into the university and collaboration with the Moldova ecosystem.

6 Priority objectives

6.1 Overview

In innovation policy, identifying high visibility political support and connecting them with their policy underpinnings is a critical exercise to ensure both political support and sustainable progress. In this spirit, the following set of priority objectives represent key political or strategic goals found during the research process. In this section of the report, the political background and sources of support are given, recommendations are made, and the benefits are explained.

6.2 Modernize and digitize public services

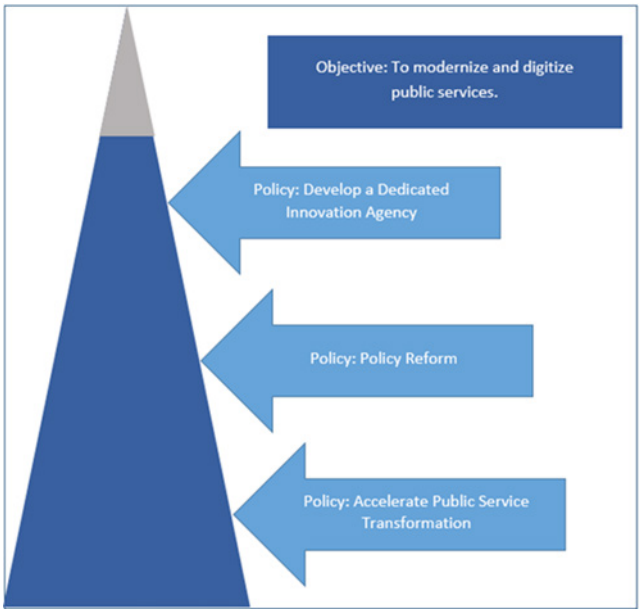
6.2.1 Background

Issues with the public services, related to transparency, bureaucratic barriers, duplications, complexity and ambiguous or irregular enforcement were broadly reported as issues in the ecosystem. Multiple reports and strategies have recognized these issues as critical barriers to doing business in Moldova, especially for start-ups and small businesses. There are existing efforts to reform and modernize these services in a number of areas, which were often recognized as positive changes in the ecosystem, but which at this time remain somewhat uncoordinated and presently do no focus on collaboration with other stakeholders. Specific focus is needed on what role entrepreneurship and private sector initiatives can play in transforming public services, and on what role that transformation plays in supporting the efforts of the innovation ecosystem.

6.2.2 Related recommendations

Prioritizing efforts to *Accelerate Public Service Transformation* will bring renewed focus, funding and methods to the process of developing the kinds of changes needed, especially in terms of streamlining and digitization. In particular, the recommendation as frame includes improved pathways to leverage private sector innovation toward transformation. Though changes in procedure and process are valuable, for many issues, underlying *Policy Reform* will be needed for many public services, in order to resolve some issues that are embedded in the core legislation. Finally, the development of an *innovation agency* will help to guide these processes, providing a strategy, support, coordination and possibly resources.

Figure 26: Modernize and digitize public services



Source: ITU

6.2.3 Benefit

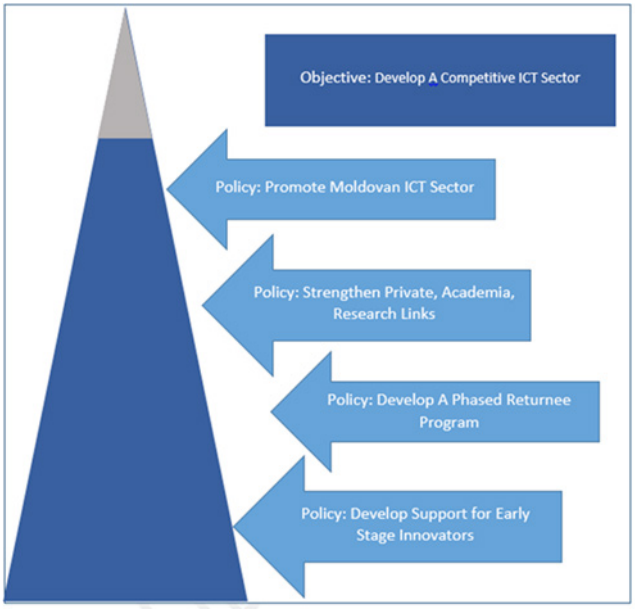
Modernized and digitized public services will help to broadly improve the situation for businesses working in Moldova. Since the issues of excessive bureaucracy and problems of transparency are barriers that can drive innovators abroad, away from entrepreneurship, or into the grey economy, these changes will help increase the number of entrepreneurs active within the country. They will also be an initial step toward building up a better business culture and developing trust between ecosystem stakeholders. Beyond this, bringing private sector and entrepreneurial initiative into the process of public sector transformation can lead to a much more rapid process, along with the development of new and innovative ICT products based on public sector data for consumers and the development of new businesses to create and provide them.

6.3 Develop a competitive ICT sector

6.3.1 Background

The Moldova ICT sector has a number of key advantages in developing its ICT sector. It has relatively low labour costs, good infrastructure, the basis for good skills development and strong integration into the regional markets. However, a range of factors hold the sector back. These have included brain drain, limited awareness and support, and the need to better leverage the academic sector for research and human capital. These issues result in a vicious circle of problems, where small domestic market leads to a barrier to entry for domestic firms, leading to fewer firms incorporating in country or focusing on domestic consumers, leading to skilled talent migrating, and few quality ICT products for domestic consumption, which reduces domestic interest in ICT products developed. All of these negative synergies deal with perceptions of the national ICT sector, which needs to be dealt with overall. These issues need to be addressed in a way focused on developing the sector, both as a component of the national economy, and as part of international networks.

Figure 27: Develop a competitive ICT sector



Source: ITU

6.3.2 Related recommendations

Many of the recommendations are interrelated, and will need to happen more or less simultaneously. Working to *Strengthen Private Sector, Academia and Research Links* will provide some strong inputs and supports to the ICT sector. To ensure those inputs can be used effectively, there is a *Develop Support for Early Stage Innovators* providing both investment and soft infrastructure to support entrepreneurs. By *Developing a Phased Anti-Brain Drain Programme* the diaspora network can be tapped into over time, and in ways that are supported by the other components of this process. Finally, there is a need to *Promote Moldovan ICT Sector*, promoting interest in and the development of businesses domestically, and positioning Moldova ICT firms in the regional and global market.

6.3.3 Benefit

The development of a competitive ICT sector could have a number of major implications for innovation in Moldova. First, there is the economic benefit, a robust ICT sector is key in a modern economy. Second, by developing the sector in a cross cutting fashion, other sectors of the economy benefit

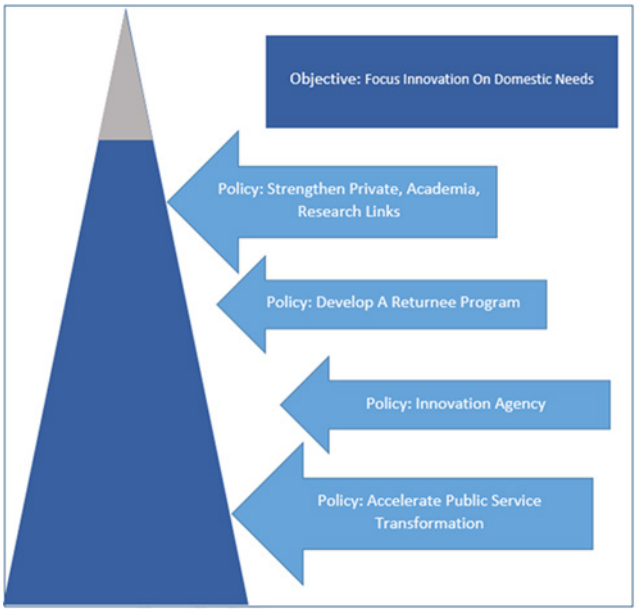
from the work of innovators in the ICT sector. Third, it will provide a growth engine that may be able to provide a way to incentivize potential migrants to remain, and the diaspora network to return.

6.4 Focus innovation on domestic needs

6.4.1 Background

A barrier to gaining the full benefit of the Moldova innovation ecosystem is that innovators are focusing on a range of problems that do not help foster overall development. Many are using Moldova strictly as a base from which to sell products and services to the EU or CIS market, doing little or no business in the country. Others are developing projects that have no substantial, lasting impact, or which are mismatched from market needs. This, in part, leads to the slow adoption of ICT products and services in the country, which is part of a vicious cycle, since it drives more relevant projects into international markets, further reducing the perceived value of ICTs.

Figure 28: Focus innovation on domestic needs



Source: ITU

6.4.2 Related recommendations

Accelerating Public Service Transformation represents two parallel tracks. By providing opportunities for smaller ICT firms to work on public tenders, the process will give entry points into more high impact areas of innovation, and through open data sandboxes, open up opportunities to experiment with technology for domestic consumption. *Strengthened Private Sector, Academia, Research Links* will help to tie together the local academia and private sector, leveraging training and research in country, rather than abroad. A *Returnee Programme* will help foster local entrepreneurs in terms of business culture, skills and investment over time, giving them opportunities in country which wouldn't be available right now. Finally, the *Innovation Agency* can use its convening power to push communities toward certain key sectors or projects, guiding part of the process through strategy and guided collaboration.

6.4.3 Benefit

By applying ICT to issues of high salience within the domestic market, it will help to build the sector, while using that growth not just for economic, but for broader social benefit. It will aid both access to opportunity and quality of life in the country, possibly helping with the brain drain issue as well as developing businesses themselves. It will also encourage businesses that are rooted in the comparative advantages that exist in Moldova, rather than businesses which are more easily mobile, and therefore more likely to leave the country.

7 Recommendations

7.1 Develop a dedicated innovation agency

At present, a large number of government ministries, agencies and programmes lay claim to portions of the Moldova ICT centric innovation ecosystem. MIEPO, AITT, MICT, ASM, E-Government Centre, ODIMM, and others have responsibilities in these areas, along with local and municipal governments. This range of actors is also seen in terms of strategic planning, with multiple government strategies covering specific components of governance related to the work of the ecosystem. Beyond these, a number of programmes coming from civil society, the private sector, and academia have roles to play, including projects such as Tekwill, Novateca, university laboratories and Generator Hub. These actors and strategies are not generally working against one another, but in many cases are not focused on synergy or collaboration. In particular, the strategic thinking in most of the government strategies is focused more on internal reform of programmes and policies, rather than presenting a cohesive vision for the ecosystem, in particular one with space for the private sector.

Given the number of actors, no coordinating office or other official body represents an issue. A dedicated innovation agency, whether in the form of an independent entity, or office in one of the current stakeholders, would have the potential to coordinate between the actors and strategies. In How Innovation Agencies Work[56], four main models for innovation agencies are presented. The structure would be a mix of the roles of the "Industry Builder" and "System Optimizer" models. Its goals, for now, would be more akin to the industry builder, developing a specific sector or sectors of the economy, but rather than the in-house projects emphasized by that model in the report, it would be reliant more on the coordinating function of the system optimizer, focused on sitting between key actors.

Specifically, the agency would be expected to form connective tissue between the different ministries, levels of government, and between the different stakeholder groups, especially the public and private sectors. It would serve as an honest broker in terms of harmonizing efforts, connecting actors and identifying potential synergies. Ideally, it would be an independent entity with a PPP structure. This would insulate it, to some degree, from political instability, strengthen its sustainability and resilience, and allow it to be seen more readily as a neutral actor.

By existing between the different stakeholders, it would also be ideally placed to carry forward the processes underpinning this report, bringing together multi-stakeholder consultations and workshops to improve trust and communication in the ecosystem. In this role, it can also serve as a key component of the strategic planning process, helping to ensure that the voices of key stakeholders are heard during the development of new strategies and that the strategies provide a complete vision for national development, with roles and visions for all stakeholders.

Policy Implication	Challenge	Recommendations
Develop an innovation agency.	Actors lack a central honest broker. Private sector not well incorporated into existing strategies.	The agency should coordinate stakeholders and projects between ministries, levels of government and sectors. The agency and its programmes should be developed along a PPP structure.
Consultative function in the ecosystem.	Current strategies are siloed. Strategies focus on government reform. Need for sectoral strategy.	Refocused strategies on domestic priorities and strengths. Focus on supporting innovation and developing digital transformation roadmap. Regular consultations with stakeholders to ensure ecosystem representation.

[56] NESTA, 2016.

Policy Implication	Challenge	Recommendations
Estonian entrepreneurship.	In recent years, Estonia has used a powerful set of policies to position itself as a regional and global ICT leader. These have included: direct support to entrepreneurs and support networks, investment in ICTs to digitize and transform public services, immigration laws which have made the country accessible and attractive to entrepreneurs and tech workers, tax codes and regulations which lighten burdens and encourage risks, education and community building efforts to encourage entrepreneurs, and a range of other actions, covering most areas relevant to innovation. http://kasvustrateegia.mkm.ee/index_eng.html	
System optimizer innovation agency model.	Innovation agencies fulfil critical role in the ecosystem. In a study of various innovation agencies worldwide, NESTA has developed a model for a new type of innovation agencies that will help orchestrate interventions for the ecosystem. • orchestrate a combination of supply side and demand side; • undertake direct and indirect actions to support ecosystem; • foster partnerships; • coordinate across public service and political support; • developing domestic and international experts would be required to help; • help navigate changing ICT telecommunication. www.nesta.org.uk/sites/default/files/how_innovation_agencies_work.pdf	

7.2 Accelerate public service transformation

Issues of inefficiency in the delivery of public services, ranging from tax compliance, to licensing and permits, to regulatory compliance, registration and dissolution of companies, to inspections and more, represent one of the major barriers to success as an innovator in Moldova. Processes remain opaque, needlessly duplicative and bureaucratic, systems are outdated and inefficient and procedures are ambiguous in ways that allow for arbitrary or biased decisions on the part of civil servants.

Many stakeholders have made note of this issue, including those who cite it as a reason companies operate in the grey economy without formally registering or integrating, and those who cite it as a reason companies and innovators travel overseas, rather than struggle to maintain their businesses in Moldova.

In response to this, there are efforts, in particular from the E-Government Centre, to reform and transform the public service. They have engaged in training, digitized services, and promoted their work both within the government and in the broader community.

By redoubling efforts in this space, there is potential to have a dramatic impact throughout the lifecycle of innovation in Moldova. First, increased investment in this area, coupled with a review of current policy on PPPs and tenders will strengthen the work of these kinds of programmes. In particular, there should be an effort to create the space for SMEs and start-ups to compete in this space, since these firms are more in need of the support from public procurement, more likely to be local or regional, and more likely to be directly involved in innovation. Second, by incorporating structures like open data sandboxes and programmes like hackathons and competitions, the process can step away from its current linear structure, and allow for greater innovation, intrapreneurship and entrepreneurship in the public sector.

Policy or Project	***Champions***
Develop a Dedicated Innovation Agency	MITC

Challenge	***Value Proposition***	***Recommended Action***
No coordinated strategy that incorporates all stakeholders. Need for collaboration between different public sector actors. Need for collaboration between public sector and other stakeholders.	Strengthen coordination between agencies and ministries. Incorporate the views of other stakeholders into the public sector innovation strategy development. Create a platform to develop collaborative projects and programmes in implementing innovation strategies.	Create an agency with the funding and mandate to develop programmes and policies to support the ecosystem. Shared resources for projects via MOUs and PPPs. Develop the agency as a platform and honest broker to discuss issues and developing inclusive innovation strategies. Regular ecosystem review processes and revision of strategies and projects. Advocacy to ministries and other public sector actors on behalf of stakeholders.

Knowledge Base	***Good Practices***	***Problem Owners and Beneficiaries***	***Key Resources and Support***	***Risks and Constraints***
NESTA report: Making Innovation Policy Work. EBA and ATIC priorities. Chemonics ecosystem mapping.	E-Government Centre efforts. Moldova 2020. Tekwill, Chemonics, Novateca, other ecosystem development efforts.	Public sector seeking private sector buy-in. Stakeholders seeking roles in ecosystem strategies. Outside, especially international actors seeking a focal point or honest broker.	Space for meetings. Mandate from government. Development of network or integration of existing networks. Inclusive engagement in strategy and project development. Regular staff (~5) and office space.	Need for wide stakeholder buy-in. Maintenance of legitimacy and trust critical. Success relies on private sector buy in and potentially international sponsorship.

Mission Achievement Criteria	***Mission Budget***
Ongoing, stable agency. Role as implementing agency for comprehensive innovation strategy. Organic development of innovation ecosystem and private ICT sector. Successful establishment of flagship PPP projects.	USD 150 000/year for four years. Additional funding required on a per-project basis, with objectives to gather joint funding via PPPs and international development funding.

Source: ITU

Policy Implication	Challenge	Recommendations
Strengthen existing public service transformation efforts.	Duplication, inefficiency and bureaucracy. Opportunity for public tenders to support innovation in ICTs. Process of public service transformation should be accelerated.	Increase investment in public service transformation. Revise frameworks around PPPs and tenders to increase competition, allow for better support of IT related projects, and incentivize work with SMEs and start-ups.
Develop programmes for innovation in public service	Current transformation processes are working linearly Not enough engagement of private sector and entrepreneurs in many efforts	Develop labs and open data sandboxes to provide opportunities and support for entrepreneurs looking to apply public data to innovative projects. Work with universities, hubs and others on hackathons and competitions, both to spark movement on digitization and develop creative ideas
Estonia e-Governance policy	Estonia has spent years developing a leading suite e-governance services, including single window services for a number of areas of government services, and a centralized service for identification and public records, reducing duplication of services and bureaucratic burden on citizens. https://www.eesti.ee/en/	
Electronic Government Authority, Thailand	The Thai Electronic Government Authority coordinates a wide range of components within the process of public service transformation in Thailand. Building on strategic documents, it incorporates and coordinates the work of the Bureau of Budget, Office of the Public Sector Development Commission, Electronic Transfers Development Agency, other government agencies, and international and domestic agencies. It focuses on developing infrastructure and frameworks for e-government services, and on coordinating the various efforts to transform public services. https://www.ega.or.th/en/profile/902/	
Kenya Revenue Authority open innovation, Kenya	The Kenya Revenue Authority (KRA) is charged with collecting revenue and administering policies. With its flagship project iTax, KRA helped transform the tax base and service delivery to citizens. KRA is extending their innovation leadership in public service transformation by linking via MoU with various universities, related networks locally and globally with aim towards adopting best international standards. KRA has also developed an open annual competition which serves as a platform to stimulate domestic innovation. KRA vision is clear and has specific activities that support a full bridge for an open innovation platform with key stakeholders of the ecosystem. www.kra.go.ke/	

7.3 Develop a phased diaspora engagement programme

Brain drain was consistently noted as a major problem in the Moldova ecosystem. It represents a substantial net loss of talent from the ecosystem, along with issues facing start-ups incorporating abroad. The economy has a significant reliance on remittances from the diaspora for support, representing a risk in terms of sustainability and growth. The migrants do not see strong arguments to return, given the political, social and economic situation in the country, as situation likely to grow worse as they integrate into their host cultures. However, the diaspora networks can also be a resource in terms of bringing investment, human capital and improved business culture into the country, if leveraged properly.

There are existing efforts in this space. These include the Pare 1+1 initiative, intended to repatriate innovators and investment from the diaspora community, and the strategic focus to address this issue

Policy or Project	***Champions***
Open Data Sandboxes	E-Government Centre Universities

Challenge	***Value Proposition***	***Recommended Action***
Current public sector transformation process is centralized. Entrepreneurial initiative will accelerate the process and drive it in novel directions.	A centralized set of resources for organic public sector transformation. Open APIs and data to foster further entrepreneurship. Market driven development of innovative uses for public sector data and efficiencies in public service.	Development and ongoing implementation of open APIs and data standards. Public procurement policies revised to prioritize SMEs and open infrastructure Development of labs focused on applications of public sector data in partnership with key ministries and/or universities. Competitions and hackathons targeted to developing key solutions, potentially including smart city initiatives especially in Chisinau and Balti.

Knowledge Base	***Good Practices***	***Problem Owners and Beneficiaries***	***Key Resources and Support***	***Risks and Constraints***
E-Government Centre research on service adoption. Government reform strategies and outside agenda setting documents. International open data standards	E-Government Centre Public service reform efforts Kenya Revenue Authority US Digital Service Estonian e-governance policy	Public sector agencies and ministries, including local and municipal leadership. Potential entrepreneurs seeking opportunities. Universities seeking resources and projects for researchers.	Open data and API requirements in PPP and procurement. Development of labs and competitions. Support and training for public sector in innovation methods and processes.	Data privacy concerns represent a barrier. Low adoption rates may limit value of projects. Resistance and inertia from legacy actors within public sector slow adoption.

Mission Achievement Criteria	***Mission Budget***
Architecture development. Establishment of lab programmes. Successful implementation of three hackathons and two longer running competitions. Organic growth of entrepreneurial projects.	USD 500 000 first year, establishment of lab programmes and partnerships. USD 300 000/year for lab maintenance and operating costs for competitions and other incentive programmes. USD 100 000/year for civil service capacity building and upkeep.

Source: ITU

seen in some documents. One issue with trying to tap into financial resources from the diaspora network is time. In many cases, these are relatively recent migrants who have not had enough time to establish themselves in their host communities. However, they often do have strong skills and some resources, if they can be inspired to work together with the Moldovan ecosystem. A critical component is improving local conditions in ways that will reduce concerns over barriers to success and quality of life.

A programme to connect the diaspora with the innovation ecosystem should proceed in a phased process. Initially, the focus should be mostly on promotion, creating opportunities for migrants, especially IT and business professionals to see the kinds of projects being developed in Moldova, their potential and the support they need. Then, there is a possibility to reach out to the diaspora for crowdfunding, mentorship or skill sharing programmes. These activities can be significant in terms of support for entrepreneurs, but are relatively low opportunity cost for the migrants. Finally, projects should be pursued focusing more on developing investment, repatriation of migrants to help with skill training and mentorship and efforts to develop international diaspora networks to help Moldova innovators integrate into international markets.

Policy Implication	Challenge	Recommendations
Phased diaspora engagement programme.	Brain-drain reduces talent pool. Entrepreneurs likely to incorporate abroad. Diaspora community represents a pool of money and talent. Weak business culture.	Phase 1: Communication and sensitization of diaspora community regarding Moldova innovation. Phase 2: Development of crowdfunding, skill sharing and mentorship to provide accessible opportunities for engagement. Phase 3: Repatriation of funds for larger investment, and of individuals to found start-ups, and engage in training and mentorship to support entrepreneurship. Engagement of Moldova innovators into international networks through diaspora community.
Start-Up Chile, Chile	Start-Up Chile is an accelerator programme run by the Chile Government, which serves two key functions in developing the Chile ecosystem. First, it attracts various start-ups and international talent to Chile by providing incentives (space, funding, support) for companies to launch in or relocate to Chile. Second, it requires the founders of those start-ups to participate in social programmes to educate young entrepreneurs and foster entrepreneurs in Chile. http://startupchile.org/about/	
Enterprise Ireland and Global Irish, Ireland	Ireland's Global Irish platform centralizes key resources for the diaspora community. The goal of Global Irish is to help the diaspora maintain connections to Ireland through information and support, and one of the key components of that support is to connect potential entrepreneurs looking to settle or resettle in Ireland with resources including seed funding and investment support, and training and guidance for early stage innovative start-ups. https://www.dfa.ie/global-irish/ https://www.enterprise-ireland.com/en/	

7.4 Promote a cross-cutting ICT sector for Moldova

The Moldova ICT sector has a wide range of different directions and needs a clear focus in terms of strategic direction. Despite a position in several large international trade networks, strong potential for human capital, and good infrastructure, businesses are much more likely to incorporate abroad, employ Moldovan staff outside the country and work with neighbours, rather than engage directly in Moldova with the ICT sector, or to engage with the sector in terms of lower skills and lower value processes that do not contribute to sustainable growth of the economy.

Policy or Project	***Champions***
Phased Diaspora Engagement Programme	MIEPO ODIMM

Challenge	***Value Proposition***	***Recommended Action***
Brain drain is limiting domestic talent pools. Moldovan start-ups incorporate internationally. Issues with experience, success stories and business culture in ecosystem. Diaspora community represents and underutilized resource.	Leveraging diaspora network skills, experience and resources. Provide support to potential entrepreneurs, both domestically and in diaspora community. Support to ICT sector and innovation ecosystem.	Phase 1- Outreach to diaspora networks to connect them with domestic entrepreneurs and sensitize them to developments in the sector. Phase 2- Development of platforms, programmes and incentives for crowdfunding, skill sharing (from abroad) and mentorship (within country) by emigrants. Phase 3- Expansion of efforts to repatriate funds and entrepreneurs based on domestic developments, integration of domestic entrepreneurs into international networks.

Knowledge Base	***Good Practices***	***Problem Owners and Beneficiaries***	***Key Resources and Support***	***Risks and Constraints***
Pare 1+1 outcome reporting MIEPO Reports on international views of ICT sector Domestic university networks with Erasmus Plus students Consulate and embassy networks	Pare 1+1 Global Irish programme Start-up Chile programme	Diaspora networks interested in domestic development. Universities and training programmes seeking mentors and trainers Domestic entrepreneurs seeking support	Development of legal regimes for crowdfunding Development of platforms for skill-sharing Collaboration with universities and soft infrastructure to host returnee mentors	Success reliant on overall development of ecosystem and sector Potential declining engagement of diaspora network as families emigrate

Mission Achievement Criteria	***Mission Budget***
Initial outreach to 100 000 diaspora members. Platforms provide support to projects in line with exponential growth of Pare 1+1 programme. Mentorship and support at five universities by repatriated mentors.	USD 1 500 000/4 years outreach campaign. USD 500 000/year development and maintenance of skill sharing and crowdfunding platforms. USD 500 000/year incentives for returnee as mentors, entrepreneurs and investors.

Source: ITU

A strategic vision for the domestic ICT market, orienting efforts toward a few key cross cutting sectors and supported with the development of clusters and other resources can help build an identity and brand for the country. This process will also help to develop a specific comparative advantage for Moldovan ICT firms that will be a unique selling point for them in working with international partners. In addition, there should be a focus on B2B services and other means of collaboration among the private sector, to develop a network that supports the development of new firms.

In parallel with these efforts, a programme to promote the sector internationally should be developed, building interest in investment and collaboration from international actors. As this process matures, linkages to the EU, CIS, US and other international ecosystems can be leveraged in terms of linkages, tech transfer and twinning activities. With a domestic sector focused on specific advantages only available in Moldova, these can be undertaken on a more equal footing, limiting the risk of relocation by companies.

Policy Implication	Challenge	Recommendations
Foster development of key ICT centric sectors.	Little trust and awareness. Weak domestic networks and communities. Foster champions and success stories.	Domestic clusters in ICT and other key sectors, based on FEZs and tech parks. Focus on B2B services and key cross-cutting sectors.
Promote Moldova ICT activities internationally.	Poor domestic business and entrepreneurship culture. Lack of confidence in national economy and ecosystem among international partners.	Develop a promotion and outreach programme for Moldovan ICTs. Foster linkages and twinning activities with international success stories.
Corallia, Greece	Corallia is an initiative that manages a series of ICT centric innovation clusters in Greece. They focus on bringing together innovative ICT firms and key resources in a number of verticals. These connect with a series of 'innohubs' designed to provide incubation and support services, including outreach services to young innovators. www.corallia.org/en/about-corallia.html	
Startup America	Startup America is a high profile initiative to promote high growth entrepreneurship that will seed economic growth primarily in the United States of America. According to the White House factsheet: "Startup America is an initiative to celebrate, inspire, and accelerate high-growth entrepreneurship throughout the nation. This coordinated public/private effort brings together an alliance of the country's most innovative entrepreneurs, corporations, universities, foundations, and other leaders, working in concert with a wide range of federal agencies to dramatically increase the prevalence and success of America's entrepreneurs". www.startupamericapartnership.org/	

7.5 Improve connections between private sector, human capital, and research

Skill mismatch and problems with the quality and qualifications of professionals, both in terms of technical skills and soft skills such as administration, communication and management, were seen as limiting factor for Moldova ICT firms. Whether connected to curricula, skills among teachers and trainers, availability of programmes or brain drain, human capital is a concern. Research activities in the country suffer in a similar way, with concerns generally over funding, but also over commercialization and application of research activities. Research is productive, but many expressed frustrations over the allocation process and the priorities that process sets.

Policy or Project	***Champions***
Promotion of Cross Cutting ICT Sectors	MIEPO ATIC

Challenge	***Value Proposition***	***Recommended Action***
There are issues with the business culture in Moldova in terms of trust, transparency, and doing business to international standards. International and domestic stakeholders lack confidence in the sector in Moldova. The innovation ecosystem needs more focus and collaboration.	Raised awareness of the potential of the Moldova ICT sector. Increased entrepreneurial interest and potential. Higher international investment and business engagement.	Survey and define key cross cutting ICT sectors (aerospace, agri-business, material science and public services had been discussed). Develop ICT centric innovation strategies with a focus on supporting and promoting key sectors. Promote sectors internationally through events, partnerships and networks. Promote sectors domestically through success stories, events, twinning with global leaders and supporting projects.

Knowledge Base	***Good Practices***	***Problem Owners and Beneficiaries***	***Key Resources and Support***	***Risks and Constraints***
MIEPO sectoral analysis Stakeholder awareness of successful or high potential sectors. Investment tracking by Ministry of Finance.	Existing MIEPO promotion efforts. Rwanda Development Board	International investors and MNCs looking for possibilities in Moldova. Potential domestic innovators seeking opportunities.	Private sector success stories and efforts to promote. Connect with international outreach networks. Domestic events and support activities. Coordination with other recommendations to support sector.	Barriers to entry currently limit success. Limited success stories for promotion. Weak national reputation to start. Need for other recommended actions for promotion to succeed.

Mission Achievement Criteria	***Mission Budget***
Development of cross cutting ICT sector strategy. International outreach and branding strategy and efforts. Internal promotion and support strategies. Support programmes for key sectors established. Uptick in investments and business starts in key sectors.	USD 300 000 strategy and branding exercise. USD 500 000/year for external engagement with networks and events. USD 300 000/year for internal promotion and development. PPP funding for projects to support ecosystem and sector.

Source: ITU

In connection with existing reforms of the education sector and research institutions, improved linkages between the two groups and between each and the private sector should be considered as priorities. Bringing the private sector into the research process can unlock additional sources of funding and support, and not only help drive research priorities in commercially viable directions, but potentially provide a built in market for the results, once delivered. Connecting research and human capital, through laboratory programmes, experiential learning and research oriented curricula can provide greater experience in project management for early graduates, along with some degree of hands on experience and unique backgrounds and skills that will help them compete. Finally, connecting the private sector to skill training, through curricula development, partnerships and internship or externship programmes will create graduates with more appropriate skills who will require less retraining. All three can be merged effectively, for example through coursework focused on researching novel solutions for private sector firms.

Policy Implication	Challenge	Recommendations
Research – Private Sector Linkages.	Resources are overly focused on pure research. Limited applied or commercialized research.	Focus research on commercially viable, collaborative projects. Develop partnerships with private sector in terms of developing, funding and implementing research activities.
Research – University Linkages.	Barriers to access research funds and resources by universities.	Embed research activities in teaching institutions through laboratory- and course-work. Develop more opportunities for students to engage in research processes.
Private sector – University Linkages.	Skill mismatch. Limited quality and need to retrain graduates before hiring.	Work with private sector on IT training curricula. Develop internship and other means of hands on learning and research in ICT.
True Innovation, Thailand	True Corporation is a telecom operator in Thailand. They have recently established a series of projects under the umbrella of True Innovation. This includes incubation, investment and competitions with a specific focus on working together with universities in order to develop resources for young people with an interest in ICT innovation. http://ecommerceiq.asia/true-corp-digital-park/	
FINEP, Brazil	The Financiadora de Estudios e Projetos is a Brazilian institution, organized as a public company owned by the government. It serves a coordinating role in the ecosystem, including providing economic support to research projects, developing partnerships between private and academic entities and directly providing seed funding or investment to innovative entrepreneurial efforts. www.finep.gov.br/	
Start-Up Nation Central, Israel	Start-Up Nation Central is a new initiative in the Israeli innovation ecosystem designed to connect Israeli start-ups with problems in a number of key verticals, such as financial and technology services, agriculture and healthcare. It then matches those projects with resources from around the world, including MNCs, investment and governments interested in seeing those solutions developed. www.startupnationcentral.org/	

Policy or Project	***Champions***
Private Sector-Research-University Nexus	ASM ATIC

Challenge	***Value Proposition***	***Recommended Action***
Research is not being applied and commercialized. Skill training is mismatched and graduates need hands on experience. Universities need access to research funds and resources. Need for more overall funding and support for research.	More relevant skills and research based on private sector inputs. More unified and open research process. Increased support to research and innovation in the private sector.	Revised IT curriculum, including private sector inputs and a focus on hands on experience. Development of private sector supported labs for research. Projects to match private sector support for research with public funding, redirecting priorities and increasing resources. Incorporation of internships and research opportunities into IT curricula.

Knowledge Base	***Good Practices***	***Problem Owners and Beneficiaries***	***Key Resources and Support***	***Risks and Constraints***
USAID Skills Gap Analysis. Existing curricula and research agendas.	Campus Biotech, Geneva Switzerland. MIT Media Lab. Israeli Shared Research Funding.	Private sector in need of more relevant skills and R&D support. Universities seeking research funding and strengthened training. Researchers seeking more applied research and increased funding. Innovators looking to spin off research.	Legal reform of process for research funding allocation. Revised framework for curriculum development. Buy in from private sector, universities and research institutions.	Resistance from existing actors to reform in process. Stakeholder not taking responsibility for engagement in process. Limited interest from private sector.

Mission Achievement Criteria	***Mission Budget***
Revised curricula for next academic year. Development of internships for 30 per cent of IT students within two years. Research engagement for 15 per cent of IT students within two years. Twelve jointly funded research projects within two years.	USD 300 000 for curriculum consultation and development. USD 1 000 000 for development of labs and internship programmes, shared with private sector. USD 100 000 / year for maintenance of projects. Ongoing increase and reallocation of existing research funding.

Source: ITU

7.6 Develop early stage support for innovation

Insufficient finance and soft infrastructure can limit the growth of companies many of which relocate abroad in order to seek out better opportunities, and the lack of support services in the country lead to them having little interest in returning. In particular, there is a strong need for seed funding and early stage support, essential for start-ups to begin operations.

There are some efforts to develop this kind of resource, but they need to be fostered, accelerated and coordinated to have their full impact. A full continuum of ICT support services, including co-working, training, incubation, acceleration, tech parks, administrative support and other activities are needed, and in particular there is a need at least for entry points to those services outside of the major cities, especially outside of Chisinau. These include programmes such as hackathons and competitions, which will push entrepreneurs toward specific and important sectors and issues, and help to develop entrepreneurial skills and communities in the ecosystem. Mechanisms for seed funding need to be developed, and legal regimes structured in such a way to promote them and provide frameworks for their implementation. Finally, there is a need to coordinate these efforts, either through the proposed Innovation Agency or other structures, which can serve to find synergies between programmes, locate key needs or gaps in the system, and help to broker needs and programmes in effective ways. This last element is important not just in terms of a coordinating function domestically, but internationally as well, bridging gaps between funding and support opportunities and Moldovan start-ups in need of assistance in development.

Policy Implication	Challenge	Recommendations
Develop Soft Infrastructure and Support.	Entrepreneurs incorporate abroad. Undersupply of soft infrastructure. Shortage of appropriate financing. Weak business and entrepreneurship culture.	Develop a full continuum of ICT support services, ensuring access in rural areas. Use hackathons, competitions, etc. to focus innovation on key issues and sectors.
Develop Mechanisms for Seed Funding.	Entrepreneurs incorporate abroad. Shortage of appropriate financing.	Create mechanisms for seed funding: Crowd funding, grants, prizes, private seed, etc. Update fiscal and legal frameworks to allow, foster, and facilitate the development of seed funding and other early stage investment.
Coordinate Efforts.	Many actors are operating in different directions. Entrepreneurs incorporate abroad. Lack of trust in and awareness of the ecosystem.	Aid entrepreneurs in accessing international support and finance. Coordinate efforts between programmes. Brokering and matching services for start-ups and support.
Hungary	Hungary has launched a start-up support programme for its ecosystem after wide consultations in the country following the Budapest Runaway manifesto. A subsequent project, funded by EU, the INPUT programme aims to develop success stories for start-ups. The programme has three pillars: education, mentoring and market access. Hungary's programme is a good example of government intervention to guide an innovation ecosystem with a facilitative approach to help resolve its challenges without creating market distortion. In fact the programme seeks to increase the community supporting the start-ups via its innovative approach to building sustainable support networks, competitiveness, and talents growth. www.inputprogram.com/	

Policy or Project		***Champions***		
Early Stage Innovation and Entrepreneurship Resources		New innovation agency		
Challenge	***Value Proposition***		***Recommended Action***	
Need for more evenly distributed soft infrastructure. Shortage of investment, especially early stage. Need for increased coordination, strengthened business culture and increased trust.	Full coordination of resources to support innovation ecosystem. Improved development of soft infrastructure outside of major cities. Increased investment and improved business culture.		Analysis of full spectrum ecosystem needs. Identification of key gaps and needs, both thematic and geographic. Incentivization and coordination of resources to meet critical needs. Development of a PPP seed investment fund for key sectors.	
Knowledge Base	***Good Practices***	***Problem Owners & Beneficiaries***	***Key Resources & Support***	***Risks & Constraints***
Novateca Libraries Chemonics ecosystem mapping MITC sectoral analyses	Novateca Libraries Tekwill Generator Hub Hungary Input Programme Rwanda innovation fund	Entrepreneurs seeking additional support. Support networks interested in coordination. Rural communities needing ecosystem support.	Private sector and international donor development of projects. Support from existing soft infrastructure. Strategies to coordinate efforts across the country.	Transportation infrastructure limits rural impact. Low confidence from international partners. Low internal trust and coordination.
Mission Achievement Criteria		***Mission Budget***		
Draft of strategy to develop soft infrastructure. Development of new soft infrastructure resources, especially outside of Chisinau. Development of innovation fund in partnership with international donors.		USD 1 000 000: Development of board, good practice guidelines, local needs analysis and key networks USD 4 000 000 over four years: Incentives and resources to develop early hub network, including hardware, training, and incorporation of international networks Matching funds (USD 5 000 000 over three years) to come from private sector, this should provide the majority of funding to develop USD 10 000 000 investment fund, primarily supplied by outside partners, implemented by private sector alliances such as banking associations.		

Source: ITU

7.7 Undertake specific reforms of key policies

In looking at the policy and regulatory needs of the Moldova ICT-centric innovation ecosystem, certain specific issues were noted. In many cases, these have been explored in more depth by the EBA, ATIC and others. Similarly, many of these specific issues are under review or in the process of being resolved based on the various reform strategies elaborated by ministries and agencies, however, suggestions for resolving issues known to be under review are still provided.

The funding and implementation for this set of policy reforms could be incorporated into the financing and programme requirements for the innovation agency, or included as recommendations to reach of the respective ministries. The correct process will depend on a number of subtle factors related to ongoing government reforms and the order of implementation for the respective recommendations of this report, and may shift over the process of reform implementation. Due to this issue, a project canvas is not provided.

Specific areas of needed policy revision are outlined below, including international good practices, which may be used as a basis for policy experimentation.

Policy	Challenges Addressed	Example
Single Window Streamlined Public Services	Bureaucracy, lack of transparency and duplication create barriers to doing business and raise the costs of compliance. Frameworks with too much space for flexible application allow for arbitrary decisions. Opaque and complex public services diminish views of the business culture in Moldova.	Estonia has spent years developing a leading single window service. They provide a single identification for business owners and a centralized, simplified, online system for various public services. Available through: https://www.eesti.ee/en/
Financial Regulation	Current financial regulations make it difficult for banks and other institutions to provide capital to SMEs and start-ups. They need more legal definitions for angel investment, venture capital and other key instruments to support an innovation ecosystem. Insufficient protections and oversight reduce investor and client confidence in the financial system.	The Financial Management Authority of New Zealand provides legal frameworks for individual investors and financial institutions, along with guidance, fraud protection and a single window for regulatory compliance. Available through: https://fma.govt.nz/
Crowdfunding	There are few high net worth individuals within Moldova. The diaspora community represents an underused resource. Crowdfunding is an emerging method of financing start-ups.	The US SEC recently established guidelines for equity crowdfunding, opening it up as a means of financing and allowing investment by a wider population. Available through: https://www.sec.gov/info/smallbus/secg/rccomplianceguide-051316.htm
Incentivizing Investment	Individuals and institutions lack incentives to invest in innovation in Moldova. Barriers to entry and concerns about the investment climate must be overcome.	Israel has developed a range of incentives for investment, notably matching funds to be provided by the government, collaboration opportunities, tax benefits and incentives to develop human capital. Available here: www.financeisrael.mof.gov.il/FinanceIsrael/Docs/En/publications/InvestorsBooklet.pdf

Policy	Challenges Addressed	Example
ICT Sector Recognition and Support	ICT firms are not recognised as part of a strategic sector and nor is the need for fully supportive legal frameworks. Strategies and incentives are needed to drive innovation in the ICT sector. Key legal components and reforms are needed to develop the ICT sector.	The Korean ICT sector has been recognized as a key component of the economy and the focus of comprehensive strategies and the recipient of significant government support, and this has resulted in explosive growth since 2003. The incentives have included e-government development, financial incentives, research support and regional supports. Available here: http://english.msip.go.kr/english/main/main.do www.kisdi.re.kr/kisdi/jsp/fp/eng/main.jsp
Research Support and Programmes	Current allocation of research funding is overly focused on pure research. Universities and private firms feel excluded from research programmes. Joint research between the public sector, private sector and universities is under supported.	The Financiadora de Estudios e Projetos is a Brazilian institution, organized as a public company owned by the government. It serves a coordinating role in the ecosystem, including providing economic support to research projects, developing partnerships between private and academic entities and directly providing seed funding or investment to innovative entrepreneurial efforts. Available here: www.finep.gov.br/
More innovation friendly public procurement requirements	Public procurement is a major component of the demand for ICTs in Moldova. SMEs and start-ups often feel disadvantaged by various requirements under the current procurement system.	The Swedish Competition Authority awards public bids using traditional metrics, but incorporating advantages for innovative projects, sustainability and young and/or small businesses. Available here: www.konkurrensverket.se/en/publicprocurement/

Conclusion

Moldova is in the process of developing a robust ICT centric innovation ecosystem. There are clear strengths to build on. The country has done excellent work in preserving primary education and research activities and has very strong communications infrastructure. There are also positive signs to be seen in the way the country is moving. There are widespread efforts at policy reform and steps toward the development of soft infrastructure resources. But there are persistent problems as well, transparency and bureaucracy present barriers to start-ups, trust gaps prevent collaboration and the development of strong communities among stakeholders, brain drain dramatically reduces the supply of skilled labour and draws potential innovators abroad, research and academia are not focused on areas that will support the ecosystem and capital is broadly difficult to access.

With careful effort and focused strategic thinking, the strengths can be built upon and the challenges overcome in the process of developing the innovation ecosystem. The recommendations in this report, a focused innovation agency, public service transformation, diaspora engagement, promotion and focus of the ICT sector, connections between academia, research and the private sector, early stage innovation support and targeted policy reforms, come together to provide a direction for ongoing projects, programmes and strategies. Moreover, the process of this report, with its intensive stakeholder engagement and bottom up needs analysis, represents a process which can be repeated and built upon to develop those same projects, programmes and strategies.

The key to the success of this kind of endeavour will be the intensive, sustained and active engagement of all of the stakeholders in the ICT centric innovation ecosystem. All of the efforts to strengthen the ecosystem will rely on collaboration of stakeholders in the development of a continuum of resources to support innovators over the entrepreneurial lifecycle and to develop an ecosystem that will build an innovative future for Moldova.

Glossary

Moldovan organizations, reports and agencies

AGEPI *State Agency for Intellectual Property*

AITT *Agency for Innovation and Technology Transfer*

ASM *Academy of Sciences Moldova*

CIA *Agriculture Information Centre* A public sector agency that incorporates a number of public sector functions oriented toward modernization and innovation in the agricultural sector.

E-Government Centre

MIEPO *Moldova Investment and Export Promotion Organization*

Ministry of Economy

Ministry of Education

Ministry of Finance

Ministry of Labour, Social Protection and Family

Ministry of Regional Development and Construction

MTIC *Ministry of Information Technology and Communication*

NBM *National Bank of Moldova*

ODIMM *Organization for Small and Medium Enterprises Sector Development*

Pare 1+1 A programme by ODIMM (see above) providing investment matching, incentives and training, focused on repatriating funds and entrepreneurs.

Moldovan businesses, programmes and stakeholders

Academy of Economic Studies of Moldova

Aleco Russo State University of Balti

ATIC *Association of ICT Companies* An association of private sector companies in the ICT sector, intended to promote the development of the sector.

Chamber of Industry and Commerce of Moldova

Chemonics The implementation agency for USAID (See below) entrepreneurship programmes in Moldova.

Deeplace A web development firm based in Chisinau.

Dreamups A Chisinau innovation hub focused on co-working, events, acceleration and networking.

EBA *European Business Association*: An association of private sector businesses, created to advocate for business and to promote alignment to European standards in legislative frameworks and business culture.

Generator Hub A Chisinau based co-working space with event space and community building activities.

IDSI *Information Society Development Institute* A research institute focused on research and applications for information society development.

iHub A Chisinau innovation hub with regular events, competitions, co-working, mentorship and support, and connections to an international network providing investment and network access.

Infoinvent An annual international exhibition based in Moldova, focusing on IP, innovation and creativity.

Intexnauca An engineering, consulting and technology firm based in Moldova.

MoldCell A mobile network operator in Moldova.

Moldova Banking Association (ABM)

Novateca Libraries Programme A project supported by USAID and the Bill and Melinda Gates Foundation focused on providing ICT training and hardware for libraries in order to develop community services.

Positron Bohemia A web and mobile development start-up based in Chisinau.

Spooky House Studios A game development agency based in Chisinau.

Startnet Academy Plus An ICT training centre in Chisinau focused on providing open curricula in current IT themes.

STEP IT Academy Part of an international association of IT training centres, with a branch in Chisinau. It is an authorized training centre for a Microsoft, Cisco and Autodesk.

Tekwill: A training, research, event and co-working space focused on entrepreneurship and innovation, developed from a collaboration between the AITC, USAID, UTM and SIDA (See above and Below).

UTM *Technical University of Moldova*: A Chisinau based technical university and the sole technical university accredited by the state in Moldova.

International organizations, programmes and agencies

Basel III An international regulatory framework for banks and financial institutions.

BDT *Telecommunication Development Bureau:* The secretariat of the ITU Development Sector (ITU-D).

Bill and Melinda Gates Foundation An private development foundation, based in the United States.

CEFTA *Central European Free Trade Agreement*

CIS *Commonwealth of Independent States*

EBRD *European Bank for Reconstruction and Development*

EC *European Commission*: An institution of the European Union (See below) that functions as the executive government of the bloc.

EEN *Enterprise European Network* The EC programme designed to provide support to private sector firms operating within the EU and its neighbouring region.

EIB *European Investment Bank*

Erasmus+ *European Region Action Scheme for the Mobility of University* Students: An EU programme providing opportunities for exchange and travel among European universities for students, lecturers, staff, volunteers, young people and those involved in sport.

EU *European Union*

EU Neighbourhood Programme: An EU (See above) programme focused on relations with nearby states who are not members of the EU itself.

GEI *Global Entrepreneurship Index*: An annual report by the Global Entrepreneurship and Development Institute on the quality of entrepreneurship ecosystems at a national, regional and local level.

GII *Global Innovation Index*: An annual report analysing global innovation along 82 indicators in 7 pillars: Institutions, Human capital and research, Infrastructure, Market sophistication, Business sophistication, Knowledge and technology outputs, and Creative outputs.

GIZ *Deutsche Gesellschaft für Internationale Zusammenarbeit*: The German International Development Agency

Grameen: A Nobel Prize Winning institution which established the concept of micro-credit community lending.

HDI *Human Development Index*: A composite statistic by the UNDP of life expectancy, education, and income per capita indicators, used to rank countries into four tiers of human development.

IDI *ICT Development Index*: An annual ITU report detailing the development of ICTs in all Member States based on 11 indicators in the areas of use, access and skills.

IMF *International Monetary Fund*

ITC *International Trade Centre*

ITU *International Telecommunication Union*

ITU-D *ITU Development Sector*

MDG *Millennium Development Goals*: A series of 8 global goals established in 2000, which the UN system and member states committed to achieving by 2015.

OECD *Organization for Economic Cooperation and Development*

Rockstart A global network focused on connecting established entrepreneurs with those starting out, providing resource sharing, mentorship and other forms of support, along with innovation hubs focused on acceleration, skill training and co-working.

SDG *Sustainable Development Goals*: A series of 17 global goals with development targets defined by the UN, intended to be reached by 2030.

Seedstars: A global start-up competition focused on working in developing and emerging markets.

SIDA *Swedish International Development Cooperation Agency*

Startup Grind: An international network of events to educate and mentor entrepreneurs through monthly business events and speaking series in cities across the globe, supported by Google.

Startup Live: A programme intended to connect local innovation ecosystems and entrepreneurs on an international level through multi-day workshops, pitching opportunities, and other support services.

Startup Weekend: A global series of multi-day events where teams develop, prototype and pitch new business ideas over the course of a weekend.

UN *United Nations*

UNCTAD *United Nations Conference on Trade and Development*

UNIDO *United Nations Industrial Development Organization*

UNDP *United Nations Development Programme*

USAID *United States Agency for International Development*

WEF *World Economic Forum*

Western NIS Enterprise Fund A USD 150 000 000 investment fund working in Moldova and Ukraine, originally funded by USAID and primarily supported by United States of America investors, focused on developing and reforming economic policies, the business community and leadership.

WSIS *World Summit on the Information Society*: An annual multi-stakeholder event, organized by ITU and other UN organizations, for the purpose of discussing major issues in ICTs and development.

World Bank

WTDC *World Telecommunication Development Conference*: An ITU conference focused on the development of telecommunications and providing guidance to ITU-D.

WTO *World Trade Organization*

Terms

Accelerator: A start-up service working with a start-up or entrepreneur for a fixed period of time and providing intensive mentorship and development services.

Angel Investment: Early stage investment intended to provide a one-time boost to initially launch and develop a start-up. Often provided by entrepreneurs, friends or families and connected with mentorship.

B2B *Business to Business*: Services or products from private sector companies intended to be used by other private sector companies.

B2C *Business to Consumer*: Services or products from private sector companies intended to be used by members of the general public.

B2G *Business to Government*: Services or products from private sector companies intended to be used by the public sector.

Big Data: An emerging field of ICTs focused on the analysis and application of large scale data sets often being developed by online services, public information and IoT.

BPO *Business Process Outsourcing*: The contracting of an outside firm to manage certain business processes and administrative tasks for another firm, often in another country. BPO is generally split into back office (internal) and front office (customer facing) services.

Brain Drain: The process of immigration by highly trained or qualified individuals, generally from communities with lower incomes or quality of life to those with higher, and the accompanying loss of human capital in the country from which people emigrate.

CIO *Chief Information (Innovation) Officer*: The head of development for technology or innovation in an organization or firm.

Collaborative Regulation: Regulation created by collaboration among all the various government agencies involved in overseeing the digital economy.

Co-working Spaces: Offices split into various work stations and spaces for rent by clients. These often incorporate skills training, community building or other soft infrastructure functions.

Crowdfunding: Financing a new venture, product or project by collecting small amounts of money from large numbers of investors, often in exchange for perks such as early access to the product.

E-Governance: The application of ICT to the delivery of government services, government communications and backend services and activities within the government.

Entrepreneurial Support: Programmes such as incubators, accelerators, labs, and other services which provide entrepreneurs with resources such as training, mentorship and business services.

Equity/Equity Finance: Investments or other services provided in exchange for partial ownership or a share of company profits going forward.

Equity Crowdfunding: A crowdfunding campaign which provides contributors profit sharing or company ownership rather than traditional perks.

Exit: A step in a business where the founder sells their investment in the company, often through sale or an IPO, limiting losses from a failing company or making profit from a successful on.

FDI *Foreign Direct Investment*: Investment in the form of a controlling ownership in a business enterprise in one country by an entity based in another country.

FEZ *Free Economic Zone* A geographic area defined by a government, wherein economic activities, generally within a specific sector of the economy, have specific advantages regarding taxation, import export and business support.

Fintech *Financial and technology services*: The application of ICTs to make financial services more efficient.

GDP *Gross Domestic Product*: The monetary value of all the finished goods and services produced within a country's borders in a specific time period.

Grey Economy: Economic activities which are not regulated, monitored or reported to authorities.

Hard Infrastructure: Physical infrastructure to support businesses such as mobile and fixed connectivity, power, water, roads, physical plants, equipment and other elements.

ICT *Information and Communication Technology*: An umbrella term covering wireless and wired communication, the hardware and software related to them and their applications.

ICT Centric Innovation Ecosystem: A description of an innovation ecosystem recognizing that ICTs are often at the centre of innovation, and have a cross cutting role in many other sectors of the economy.

ICT4D *Information and Communication Technology for Development*: The use of ICTs for the purpose of economic and social development, humanitarian response or promotion of human rights.

Incubator: A start-up service providing business services and trainings, early stage support and mentorship and often office space and communities for start-ups and entrepreneurs.

Innovation: The implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.

Innovation Ecosystem: The major stakeholders and processes supporting innovation and the establishment of new businesses in a particular area, and their associations and connections.

Investment Rounds: A series of investments made in a business intended to develop a business, each round focuses on a different stage of development, developing business models, expanding and scaling.

ISID *Inclusive and Sustainable Industrial Development*: Development in which all parts of society benefit from industrial progress, which provides the means for tackling critical social and humanitarian needs.

IP/IPR *Intellectual Property/Intellectual Property Rights*: The rights of persons over their creations. They usually give the creator an exclusive right over the use of his/her creation for a certain period of time.

IPO *Initial Public Offering*: the first time that the stock of a private company is offered to the public. This often raises significant amounts of capital, but shifts the company to a publicly traded firm.

IoT *Internet of things*: An emerging field of ICTs focused on communication between connected devices and the potential technical applications that can emerge from it.

MNC *Multinational Corporation*: A corporation which operates across national borders.

MOU *Memorandum of Understanding*: A generally non-binding agreement between parties establishing a relationship or partnership based on mutual interest.

Open Innovation: A variation on traditional research

Peer-to-Peer Lending: The process by which individuals lend their own money to other individuals or businesses directly generally through a mediating entity.

PPP *Public Private Partnership*: A public sector project or business venture executed through a collaboration between a government entity and a private business.

Remittance: Funds sent by an expatriate to his or her country of origin.

Risk Finance/Risk Capital: High risk, high reward investments, often made to early stage start-ups or SMEs, and covering a range of specific services, angel, seed funding, venture and others.

Seed Funding: Small amounts of investment, often in the form of grants or angel investment, used to initially launch or develop a company.

SI *Systems of Innovation*: An understanding of innovation as a process representing the flow of information and collaboration between various actors.

Skill Poaching: Larger, more established institutions and firms seeking to hire staff already employed by smaller institutions or firms by offering better income or benefits.

SME *Small or medium enterprise*: A private firm which is beyond the stage of being a start-up, but which is still young, with limited staffing and/or income. The exact definition in terms of upper and lower bounds on age and scale varies between institutions.

Soft Infrastructure: Programmes and resources in an innovation ecosystem which provide mentorship, skills, experience and other knowledge resources to support innovative businesses.

STEM *Science, technology, engineering and mathematics*

STI *Science Technology and Innovation*

SWOT Analysis *Strengths, Weaknesses, Opportunities and Threats Analysis*: A way of analysing the position of an organization or project based on positive and negative features, looking at the current and future scenarios.

Tech Park/IT Park A strategically planned space designed to provide office space, connection to universities and other resources for firms in the ICT sector, often accompanied by tax breaks or other benefits from the public sector.

User Centred Design: A design process focused on the experience of the end user, concentrating on empathy with users and use cases.

Venture Capital: High risk investment in an early stage business which have proven growth potential, intended to help the business develop and expand.

Valley of Death: The period early in the development of a business where the amount invested in developing the business outweighs its current revenue. Businesses need continuous investment and other supports and often fail during this time.

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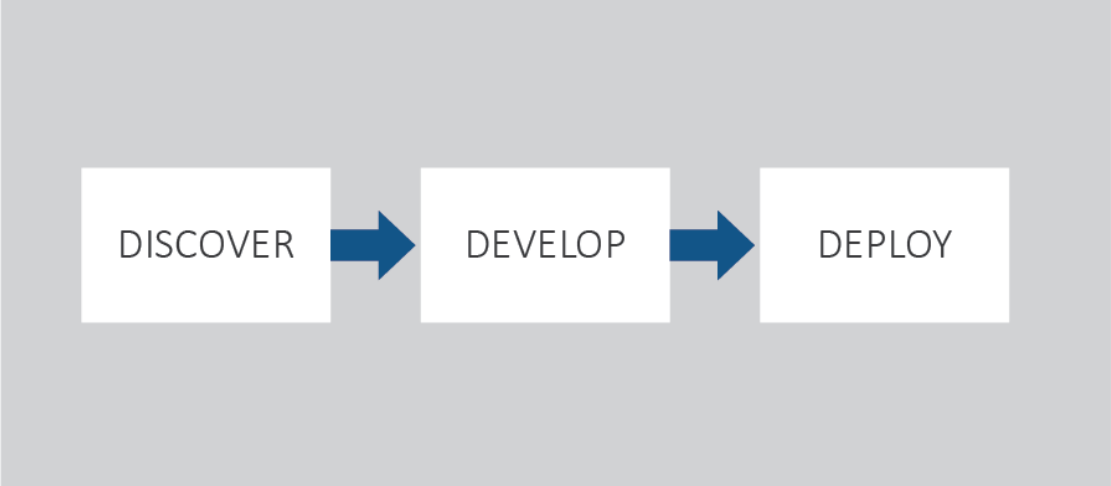
Appendix A: Systems of innovation primer

Another fallacy associated with the linear approach is that commercial research and development (R&D) is seen as applied science, and "basic scientific research does not always lead to the design of innovations". Figure A.1 below illustrates this type of innovation process within the economic space of industries and markets.

Figure A1: Linear model of innovation



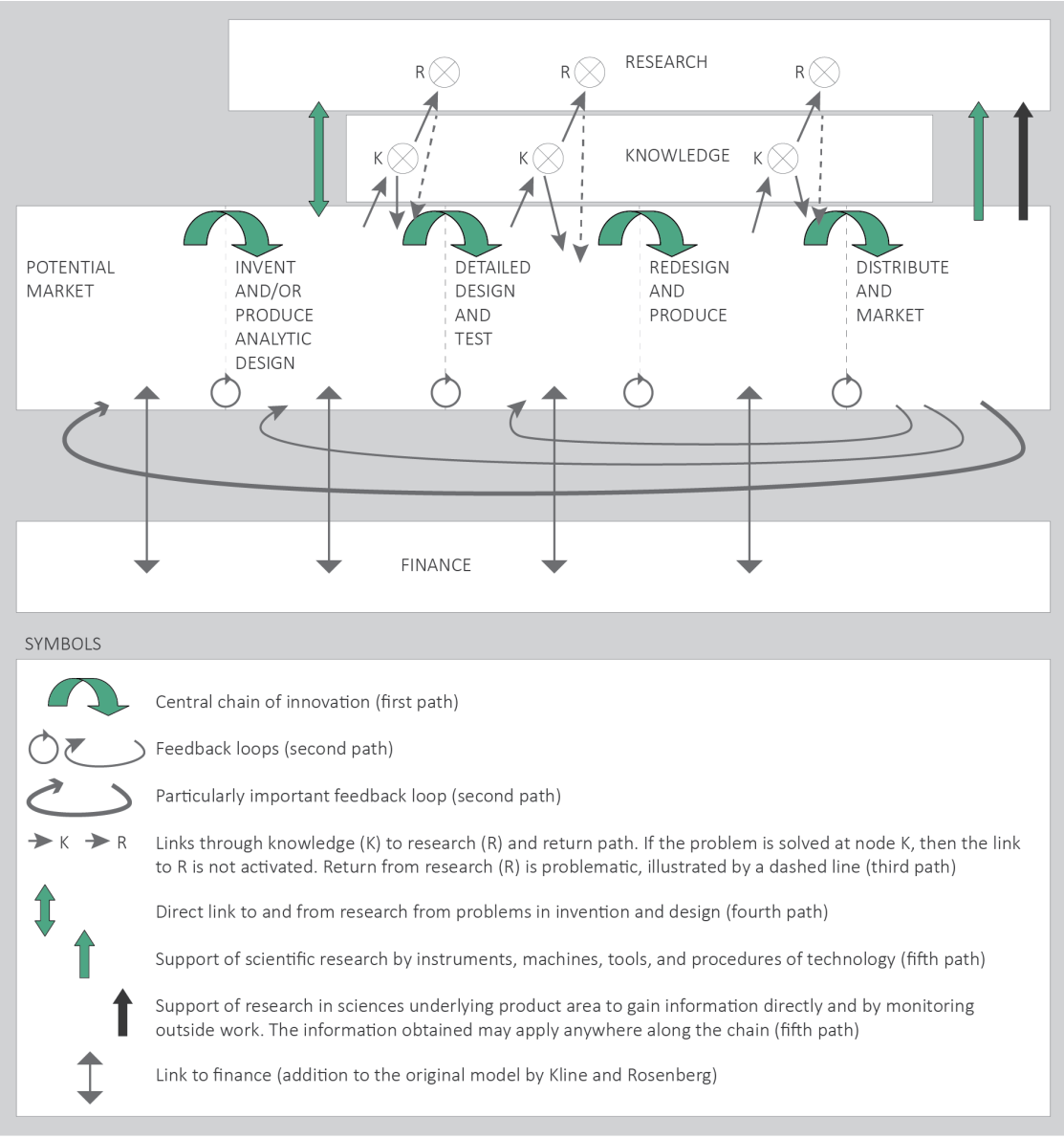
Source: Adapted from Padmore, Schuetze and Gibson, 1997

This view is arguably simplistic and unrealistic. However, its earlier legitimacy is due particularly to its consistency with neo-classical economic theories and 'market failure' explanations for the need for direct and indirect public support of industrial R&D (Arrow, 1962).

Lessons from the post Fordist era brought criticisms to the 'orthodox' linear model of innovation (Fisher, 1999) and lead to the evolution of a more 'heterodox' (Balzat, 2002) approach, with empirical evidence indicating firstly that there is no directionality associated with the innovation process (Nelson & Winter, 1982); and secondly that innovation may occur independently of scientific interaction (Mytelka and Farinelli, 2000). Rather different rates and intensities of feedback exist between upstream (technology related) and downstream (market related) phases of the innovation process (Fisher, 1999). Such considerations support an alternative iterative or 'chain linked' model of innovation characterized by a design initiated chain (motivated by competition) supported by multiple feedback loops, and supplemented by lateral transfer of ideas from one area of the chain to another (Padmore, Schuetze and Gibson, 1997). This conceptualization marks the beginnings of the theory and empirics of the systemic approach to innovation with a greater influence of demand side dynamics and policies (Edquist & Hommen, 1999).

Kline and Rosenberg (1986) earlier influenced the development of the chain linked model by visualising that "all the links in such a chain draw on the existing corpus of knowledge or could be used to create new knowledge through research" (Padmore, Schuetze and Gibson, 1997, pg.607). They advanced the model through an additional dimension indicating different depths of the level of innovation based inquiry i.e. shallow or deep.

Figure A2: Chain linked model



Source: Adapted from Padmore, Schuetze and Gibson, (1997)

The chain link model of innovation, by recognizing: the multidimensional nature of innovation; numerous feedback links among the stages of product development; as well as external sources of knowledge incident on innovation has been an important advancement in innovation theory.

Appendix B: Chisinau Stakeholder Outcome Document (Manifesto)

Multi-stakeholder Consultation within the Framework of the Development of a National Digital Strategy

12 May 2017

Chisinau, Moldova

Chisinau MANIFESTO

Based on the discussion with various stakeholders surrounding Inclusive Digital Ecosystem in Chisinau, 56 participants identified a set of challenges and recommendations, which may serve as a base for planning and implementing future activities fostering national ICT centric innovation ecosystem in Moldova. The set of challenges and recommendations developed by the community gathered at this meeting are all equally important albeit non-binding; important gaps were discussed and must be addressed. These challenges and recommendations are for the purpose of consideration and are to be used as an input to the national review to be carried out by ITU.

Recognizing the critical role of ICTs across all sectors of the economy and the particular contribution of ICT centric innovation and entrepreneurship to socio-economic development, stakeholders representing the public & private sectors, entrepreneurs, academia, financial and support groups shared the goals that they see for Moldova in the next 3-5 years, for each of the following pillars.

Vision

- A vision and strategy for the ecosystem needs to be elaborated with the aim to develop an efficient and sustainable digital innovation ecosystem.
- The vision must include a focus modern education, and business culture.
- Appropriate systems of regulation, policies and structures of public administration must be developed to support such a vision.

Policy

- Public policy regimes need to be strengthened to better foster innovation in the ICT sector.
- Steps should be taken to ensure the continuity of policy over time between different administrations.
- Policies and regulations should be developed in a coordinated fashion between different ministries and agencies, based on national strategies and roadmaps.
- Government services should be modernized and online services should be developed.
- Policies to foster and develop financial mechanisms to support innovation, (such as venture funds, innovation funds, angel investment, or crowdfunding) should be created.

Capital and Resources

- A proper legal framework for investment in innovation and research needs to be developed.
- Financing for innovation and research activities needs to be streamlined and expanded.
- Legal frameworks should be strengthened to protect investors and minimize their risk exposure.
- A full range of funding mechanisms for start-ups, including both existing and emerging models should be encouraged and developed, with a special focus on building on good practices, both domestically and internationally.

Talent and Champions

- Measures to reduce the impact of brain drain on the country are urgently needed.
- The compensation for teachers and professors need to be improved to encourage high level experts to join academia, and to foster advanced study among students.
- Training programmes in business and technical skills should be developed.
- Cooperation between academia and the private sector, including internships and hands-on education, needs to be strengthened to improve matching for skills and research activities.

Infrastructure and Programmes

- The cost of Internet access, hardware and software need to be reduced to increase availability and access, especially for poorer citizens.
- The current legislation regarding soft infrastructure such as IT parks and hubs should be fully developed and implemented to realize the innovation potential of the ecosystem.
- A platform or mechanism is needed to connect consumers and producers in the ICT sector and should be developed.
- Cloud access needs to be further expanded and costs reduced to encourage usage.

Market and Networks

- Moldova should be promoted as a destination for innovation, including all necessary financial tools and supports in order to ensure interest in the country.
- Home grown IT solutions should be promoted, and in particular awareness raising needs to be undertaken among Moldovan consumers about domestic IT solutions.
- Informal networking activities should be developed through joint events, workshops, and other activities to gather and encourage collaboration between different stakeholder groups.
- Creative education should be developed in order to build innovative skills among young people.
- A unique platform should be established to facilitate the exchange of information and best practices between stakeholders.
- Specific professional training should be developed in order to enhance the capacity of firms and innovators to engage in import and export activities, including business management and marketing skills.

Communities and Culture

- Steps should be taken in order to develop a more predictable business and investment environment, improving trust among the private sector and civil society, which will lead to increased innovation activities.
- Communities and events should be created in order to share entrepreneurial and innovation culture and interest, especially among young people. This should include online platforms to share culture, success stories and good practices.
- Education activities should be developed in order to encourage innovation within academia, with a goal of creating a culture of lifelong learning, development of innovation and business skills, and spread of innovation culture and interest.

Appendix C: Institutions surveyed

Academy of Economic Studies of Moldova	AITT	AGEPI	Agriculture Information Center
Alecu Russo Balti State University	ASM	Chamber of Industry and Commerce of Moldova	Chemonics
City of Balti	Deeplace	e-Government Centre	European Business Association
Generator Hub	Intexnauca	MIEPO	Ministry of Economy
Ministry of Education	Ministry of Finance	Ministry of ICT	Ministry of Labour, Social Protection and Family
Ministry of Regional Development and Construction	MoldCell	Moldova Banking Association (ABM)	Moldovan National Bank
ODIMM	Positron Bohemia	Spooky House Studios	Tekwill/Association of ICT Companies
UNDP	UTM Technical University of Moldova	Western NIS Enterprise Fund	

All presented as being based on stakeholder opinion is based on the above, with N=31.

Workshops were also held, informing qualitative discussions, with a larger participant pool.

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