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Good Practices Guide on Clusters and Technology Transfers– Cyprus

Limassol Chamber of Commerce
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"Handbook with Good-Practices for Clustering and Technology Transfer"

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By

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Contents

Summary

Clustering represents a highly advanced form of business cooperation, aiming to maximize the potential of various sectors where regions appear to present a comparative advantage using entrepreneurial and research innovation, and quite often Technology Transfer. According to its national policy documents (S3CY, NPSEE) and international studies and reports (GEM report, RIO) Cyprus presents some significant advantages in certain economic sectors such as Tourism, Energy, Marine Transport and others. Business networking still relies in more traditional association forms, expanding in all sectors with relatively limited horizontal links, with clusters having a very limited and occasional role.

The reasons for this delay in business networking development and to the low innovation incorporation, including the lack of large-scale technology and knowledge transfer, lay both in systemic lags in the business ecosystem and in the up to date lack of capacity in implementing innovation policies. Two identified major shortcomings in the second category are the delay in creating a clear supporting framework for clustering and in the gap existing between public funded R&D and its market transfer via patents ect. To support the reverse of the abovementioned image the study identified technology transfer practices applicable in the case of Cyprus, the means to implement them and the advantages and challenges faced by the actors involved. A common ground for the identified practices was the flow of information for potential benefactors and beneficiaries, the use of existing and creation of new networks and the use of holistic rather than pure sectoral approaches.

According to the study's final findings, it is clear that clustering and technology transfer should be viewed as multiplier tools, rather than as solutions for all innovation and entrepreneurship relating problems. In recent years, some of the policy issues has been resolved, allowing for the application of the recorded best practices, still clustering and technology transfer require a fertile environment to bear fruit and maximize their potential benefits.

Introduction

Clustering is one of the potential forms of business ecosystem cooperation. As a form of organization, it appears to have many similarities to more traditional forms of cooperation such as business networks, sector associations and others. It can be claimed that clusters are in effect a potential evolution of the traditional organizational forms, with broader participation and goal setting and quite often with a scope that goes beyondmarket-related organizational benefits.The table below presents the main differences between business clusters and business networks, that support the above-said opinion.

Business Clusters	BusinessNetworks / Associations
Equal Standing of Participants	HierarchicalStructure
Locality	Nogeographicallimitation
Larger Participation ImprovesPerformance	Stable Participation
AdaptiveRelationshipsbetweenPartners	PredefinedRelationships
Newentity	Part of NormalActivities
Includes businesses, stakeholders and service providers	Includes only one type of participants
BusinesseshaveCompetitiveProducts	Cooperative, ComplementaryProducts
Provision of Specialized Services in a specific area	Lowering of specializedproduction
Can includeBusinessNetworks	CannotincludeClusters
Broader Goals, that extend beyond the specific goals of each partner	Focus on the goals of participating partners

The core of Cluster Theory has been thoroughly described by Porteras "…**geographic concentrations of interconnected companies and institutions in a particular field**. Clusters encompass an array of linked industries and other entities important to competition. They include, for example, suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. Clusters also often extend downstream

to channels and customers and laterally to manufacturers of complementary products and to companies in industries related by skills, technologies, or common inputs. Finally, many clusters include governmental and other institutions—such as universities, standards-setting agencies, think tanks, vocational training providers, and trade associations—that provide specialized training, education, information, research, and technical support." (Porter 1990).

In other words, Clustering, in general, refers to the interaction of businesses of a similar type and serves the healthy competition, networking and collaboration between them.

1. Cyprus Business Context

Clusters and business clusters, in particular are interconnected groupings of businesses and related organizations, that are producing similar or related products or services. However, they differ from other business networks by also including within their structures supported other supporting entities and organizations such as chambers of commerce, technology institutes, research institutes, industry associations, financial institutions, universities, etc. Clusters were already long in existence before the concept was defined by Michael Porter and the label of 'cluster' applied. Since then, however, policymakers have begun to formulate top-down approaches to encourage the further development of existing and potential clusters.

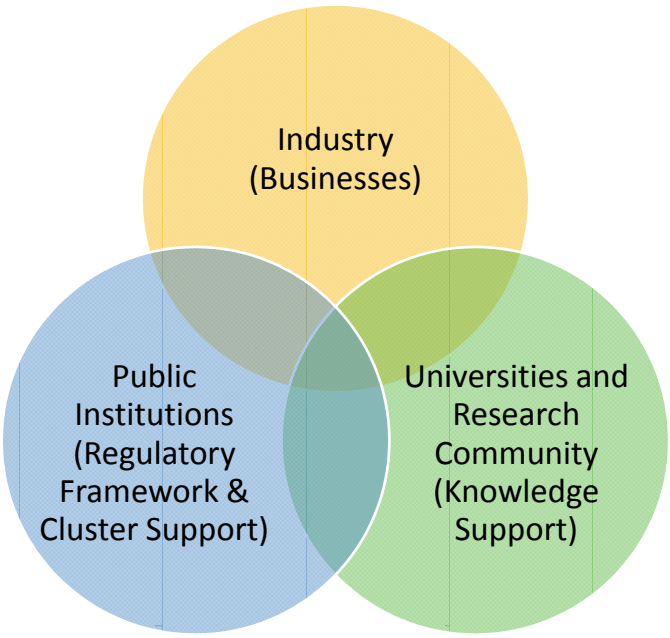

Figure 1 Clustering in the triple helix concept

The uptake of Cluster Creation initiatives can contribute effectively in tackling challenges relating to market turbulence, external competition and overcome size-related limitations, especially in economies with high and very high SMEs ratio. Especially in the case of Cyprus, according to EUROSTAT and CYSTAT statistics, the economy is dominated by small, family-run enterprises with limited export orientation. The country's economy is dominated by the

service sector, mainly tourism, transport, and finance. As SMEs mainly provide low-added value support services are unlikely to invest in R&I, and tend to concentrate on low-value-added products and services rather than taking risks on new products or export markets.

Cyprus does not have a specialized legal framework for the creation and operation of clusters. As a result, cluster references need to be tracked down in the respective policy documents of the Cypriot government regarding business innovation and the new needs of the entrepreneurial ecosystem. While these documents do not create legal obligations to respected in the formation of a cluster, it is clear that they provide the State's approach on the subject, and, as public authorities tend to be major stakeholders in clustering, will have to be taken into serious account. The two most important documents presenting the official view on clustering in Cyprus are the "National Policy Statement for the Entrepreneurial Ecosystem" (NPSEE), adopted by the Cypriot Government in December 2015 and the "Smart Specialization Strategy for Cyprus" (S3CY) adopted in March 2015.

The priority areas identified through S3Cy and reflected in NPSEE are:

1. Tourism,
2. Energy
3. Structured Environment/Construction Industry,
4. Transport/Marine,
5. Agriculture/Food Industry and
6. Health.

Information and Communication Technologies, Environment and Key Enabling Technologies have been identified as key cross-cutting priorities.

Admittedly Cyprus' small size does not allow for the creation of large-scale economies. That leads to the need for the incorporation of all possible market multipliers including clusters and technology networks, as part of the country's development and innovation strategy. As mentioned before, the lack of a specialized legal framework for the creation and operation of clusters means that there are no specific legal requirements that refer to the type, size, purpose or any other. In any case, up to date clustering activity in Cyprus has been sporadic

and of limited value for the formation of a clear picture of potential requirements based on practice. One of the reasons that have prevented the creation of clusters in Cyprus so far,is assumed to be the lack of a culture of cooperative spirit between competitors. In addition, Innovation and the research stakeholders need to be approached and introduced into market operations, an approach that appears to be missing from in the current business ecosystem.

Data has shown that Cypriot businesses tend to be rather introvert and have little or no vertical and cross-sectoral synergies both within the same manufacturing sector or across sectors. Clusters are proposed as a solution to reduce this problem. The issue of limited extroversion and interconnection also includes the inadequate interconnection of businesses with universities and research centres. While the capacity of these actors is generally acknowledged, the conditions for bridging the gap and the substantial development of partnerships have not been shaped.

Responding to these needs, S3CY has identified specific opportunities for clustering sectors that include high tech applications, but also more conventional products and services. As these tend to operate in isolation, major benefits can be produced by successful vertical (sectoral) clustering incorporating for example parallel activities in private and public sector but also horizontal clustering (by linking the sectors that can benefit from each other). As far as the agricultural sector is concerned, other clusters could be built on the partnership between the primary, secondary, manufacturing and service sectors. A common interlink age would be in this case the tourism – agriculture pairing for promotion of local product via the use in an important and profitable export service such as tourism. Other commonly mentioned fields are manufacturing, transports and the highly publicized energy sector. Finally, a technology park could support the idea of a business cluster and the first one that could be created to be for information and communication technologies. Unfortunately, up to date, relevant attempts remain fruitless[1].

[1]Observing the cluster typology, one can identify some variation depending on the cluster's scope. A common and easily identified distinction lies with the horizontal or vertical cluster character. In the case of same sector businesses (and supporting stakeholders) with similar products, the resulting clusters can be described as

2. Clustering as a business organization form in Cyprus

2.1 Current State of the Art of Clustering

Regional economies and their individual clusters tend to develop slowly in an evolutionary, path-dependent process. Some of the factors that drive this process are inherited or a result of the external environment, however, they do not single-handedly not determine the evolutionary path of a regional economy or cluster formation. It is true though, that clustering represents an advanced form of business units' organization that requires several elements in order to operate effectively and reach their full potential. As will be described in later sections, this is not the case in Cyprus, where a number of these elements are deficient or completely missing. As a result. Clusters have a long road to cross before becoming the mainstream tools for local or sectoral organization. This rule remains firmly into the area of more traditional organizational structures such as associations, chambers or similar others.

However, this does not mean that clustering is completely absent in the case of Cyprus. Despite the lack of a specific framework on the operation of clusters (despite the fact that this has been a declared target since 2015 in the relevant research and entrepreneurship policy documents), including an official registration record, some efforts have been made towards that direction.

An examination of clusters formations in Cyprus shows that their majority tends to be rather small-sized and short-lived, with few notable exceptions. This mostly due to the fact that most of the clusters have been created as outputs of research or other co-funded programs (an example was the Green Cluster, whose ambition was to involve activities on The identification of opportunities and market needs in the green sector in Cyprus; Sector-specific and solution-oriented networking events; A host of online tools, the Green Cluster e-platform, to share knowledge and information; A web-database of green best practices,

horizontal, while in the case of clusters that involve more than one levels of their sector's supply chain, clusters tend to operate vertically. In the case of Cyprus and in the field of product export promotion, both such types of synergies are necessary depending on the business sector.

and more), without being able to remain sustainable on the long term. These types of cluster appear to have operated (mostly on a pilot form) on many economic sectors, but their shot life means that they have been marginally impactful. Their most important contributions could be that they provided experience for Cypriot businesses and other institutions of cluster formation and operation that can be more useful in the future.

A second more important category of clusters in Cyprus is linked to large scale international initiatives and clusters. In this case there is often a national scale cluster such as in the case of the Cypriot cluster as part of Smart Cities Mediterranean Cluster (focusing on Business Services, Environmental Services, Blue Growth Industries, Creative Industries, Creative services, Socio-economic models, economic aspects, Coastal & maritime tourism and the Development of regional cultural & creative industries) and the case of Cypriot Municipalities Cluster in the EU SMILEGOV Project. This category can be more important in the long term, mostly due to the better sustainability of the international clusters and the national impact of the Cypriot section of these. However, since these cluster and large scale initiatives also tend to focus on broader issues with an indirect economic impact on a smaller scale.

The final category of clustering in Cyprus refers to the only up to date national scale cluster ambition for a particular sector, the creation of the Cypriot Maritime Cluster. Given the importance of maritime transport for Cyprus and the Cypriot economy and the import share of relevant services exported compared to the national total, it is imperative that this effort is crowned with success. Given that the term cluster is being used rather freely, to state the total of shipping and supporting services under the auspices without the existence of a specific institutional form or process, there is a lot of space to be covered. However, it is crucial that the key export sectors of Cypriot economy such as maritime transport, tourism and other services to begin to move towards a holistic cluster approach.

3.2 Other Forms of Business Organizations

As clustering has not yet penetrated into the business ecosystem, the benefits of organized activity within regions or sectors in Cyprus arise from the participation of businesses in other forms of collective approaches. The most notable of these is the sectoral associations

that exist for all major economic activities in Cyprus. There are broken down to the following sectors and particular membership:

- Industry
  - Association of Metallurgical Industries of Cyprus
  - Pancyprian Association of Furniture and Woodworkers
  - Pancyprian Association of Printing Employers
  - Association of Mosaic & Marble Industry
  - Cyprus Federation of Pharmaceutical and Chemical Industries
  - Pancyprian Association of Glass Industries
- Energy & Environment
  - Association of Renewable Energy Companies of Cyprus
  - Pancyprian Association of Energy Saving Companies
  - Large Electricity Consumers Association
  - Pancyprian Biogas Producers Association
  - Wind Energy Association of Cyprus
  - Cyprus Biofuel Producers Association
  - Cyprus Solar Industry Association
  - Participation of the Competitive Electricity Market Participants
  - Association of Hazardous Waste Management Companies
- Construction
  - Federation of Cyprus Construction Contractors' Associations
  - Pancyprian Association of Land & Building Developers
  - Association of Civil Engineers and Electrical Contractors of Cyprus
  - Association of Civil Engineers / Construction Engineers in Cyprus
  - Federation of Associations of Electric Contractors of Cyprus
- Services
  - Cyprus Shipping Agents Association
  - Association of Cyprus Insurance Companies
  - Association of Telecommunications Companies
  - Cyprus Information Technology Association

- Association of Newspaper Publishers & Magazines of Cyprus
- Association of Engineering, Electrical, Mechanical and Energy Consultants
- Cyprus Association of Business Advisors
- Cyprus Internet Publishers Organization
- Association of Drinking Water Equipment Owners
- Cypriot Citrus Cutting Association
- Cyprus Naval Chamber
- Association of Professional Photographers in Cyprus
- Pancyprian Association of Chemical Engineers
- Cyprus Business Market Surveys & Surveys Association
- Cyprus Tourist Enterprises Association
- Pancyprian Association of Tourist Bus Owners
- Pancyprian Refrigeration Association

- Education
  - Pancyprian Association of Private Schools of Tertiary Education
  - Association of Private Preschool Education of Cyprus
  - Cyprus Association of Educational Counselors
- Health
  - Pancyprian Pharmaceutical Association
  - Pancyprian Association of Private Nurses
  - Pancyprian Dental Association
  - Pancyprian Medical Association
  - Association of Clinical Laboratory Managers, Biomedical and Clinical Laboratory Scientists
  - Association of Medical and Scientific Equipment Representatives of Cyprus
  - Pancyprian Dental Association
  - Association of Paraplegics
  - Pancyprian Association of Multiple Sclerosis Patients
- Trade
  - Pancyprian Employee. Association of Citrus and Grape Extractors - Exporters

- Association of Motor Vehicle Importers
- Cyprus Motorcycle Importers Association

- Others
  - Cyprus Federation of Women Entrepreneurs-Professionals
  - Cyprus Quality Association
  - Cyprus CSR CYPRUS Network

In addition to business associations, another active organization form in Cyprus that can perform activities similar to those undertaken by clusters, are the various Chambers of Commerce. In Cyprus, there are 5 Chambers, 4 of which cover local needs in district level. These are the Chambers of Commerce and Industry (CCI) in Nicosia, Limassol, Famagusta, Larnaca and Paphos, with geographical coverage of their respective districts, whereas Nicosia CCI also covers the districts of Kyrenia and Morphou. The fifth chamber is the Cyprus Chamber of Commerceand Industry, a private corporate body functioning under special law and is financially independent, free of any influence by the state. The Chamber is funded by its members' subscription fees and through income generated from a number of services it provides.The CCCI is the Federation of the local Chambers of Commerce and Industry (CCIs) and was initially founded during English rule in 1927. In 1963, a new structure which remains in operation to datewas adopted, and the federation took its current name.

As CCCI is effectively the union of Cypriot businesses, it represents and promotes their interests towardsnational authorities, while, through its participation in tripartite bodies and committees, it conveys and promotes the views of the business community.The membership of the CCCI is estimated to exceed 8,000 enterprises from the whole spectrum of business activity. Affiliated to it are more than 140 Professional Associations from the trade, industry and services sectors.

The advantages provided by the participation of various businesses in the organizational forms described above include among others:

- The promotion of the interests of their business community,

- The strengthening of private initiativesvia promotingthe liberal character of Cyprus' economic system
- Participating in decision making on the economic developments
- Contributing to continuous and balanced growth nationwide
- Taking advantage of collective schemes and remaining informed on issues relating to EU and national funding.

Clusters are critical engines in the economic structure of national and regional economies and can identify fundamental challenges in the national or regional business environment. However, these roles can up to a point be played by other forms of economic networks as previously described. Where clusters really make a difference is in providing new roles for government, companies, and other institutions in economic development. However, cluster initiatives alone are less effective, if they are not part of an overarching approach to improve competitiveness on the national and/or regional level and without an overall strategy to improve a country's or region's competitiveness, that will include both cluster approaches and Cross-cluster issues affecting the whole economy.

That said, while the absence of an extensive clustering activity in Cyprus is a detriment for the promotion of innovation and the metamorphosis of the character of the economy, it is clear that the existence of the abovementioned institutions that tend to pursue similar objectives to business clusters, can at least provide a core for the eventual introduction of clusters under a sustained and coordinated policy that will address the issues presented in the following sections. This policy, though it will have to originate from central authorities, should not drive the economic development through decisions and incentives, but rather set the framework for a collaborative process involving government at multiple levels, companies, teaching and research institutions, and institutions for collaboration.

3. Tools for Clustering and Technology Transfer in Cyprus

3.1 Cluster Policy in Cyprus: Strengths and Limitations.

As mentioned previously, clustering has been introduced relatively recently (2015) in Cyprus' policies as part of the innovation activities for Smart Growth. According to the National Policy Statement for the Entrepreneurial Ecosystem Action Plan of 2015, a Plan was to be created to promote the creation of Business Clusters, in order to develop strategic co-operation and to achieve economies of scale for businesses in Cyprus. The Ministry of Energy, Commerce and Industry was set as the competent authority while the Directorate General for European Programmes, Coordination and Development was identified as an institutional stakeholder. The initial projections were for the Cluster Plan to be launched in 2017, According to the latest progress report (2017), the estimated period of implementation was 2018-2019, with a total budget of 30.000.000 euros. However, there have been no developments regarding the issue as late as March 2019. It is expected that when implemented the Programme will contribute in promoting cluster forces to address common challenges and opportunities, in networking, exchange of expertise and exploitation of a common infrastructure and in achieving critical mass and activating the entire value chain of implementing sectors.

According to the latest Global Entrepreneurship Monitor analysis regarding the period 2017-18 (using 2018 data) in the nine measured Entrepreneurial Framework Conditions (EFCs) (financing, government policies, taxes and bureaucracy, government programs, school-level entrepreneurship education and training, post-school entrepreneurship education and training, R&D transfer, access to commercial and professional infrastructure internal market dynamics and market openness, and social and cultural norms), Cyprus presents a mixed picture regarding Innovation and Entrepreneurship as shown in the figure below, with the best rating referring to physical infrastructure, followed by the categories relating to market and regulations. In overall, the lower ratings are predictably the ones relating to entrepreneurial education especially in early stages and the ones relating to supporting innovation such as Government Entrepreneurship programmes, R&D Transfer and financing. As these categories have long been described as the Cyprus economy's major drawbacks

regarding innovation, prompting the recent changes described above, improvement need time and a steady organized approach so it is only reasonable that any progress has yet to be represented in indexes.

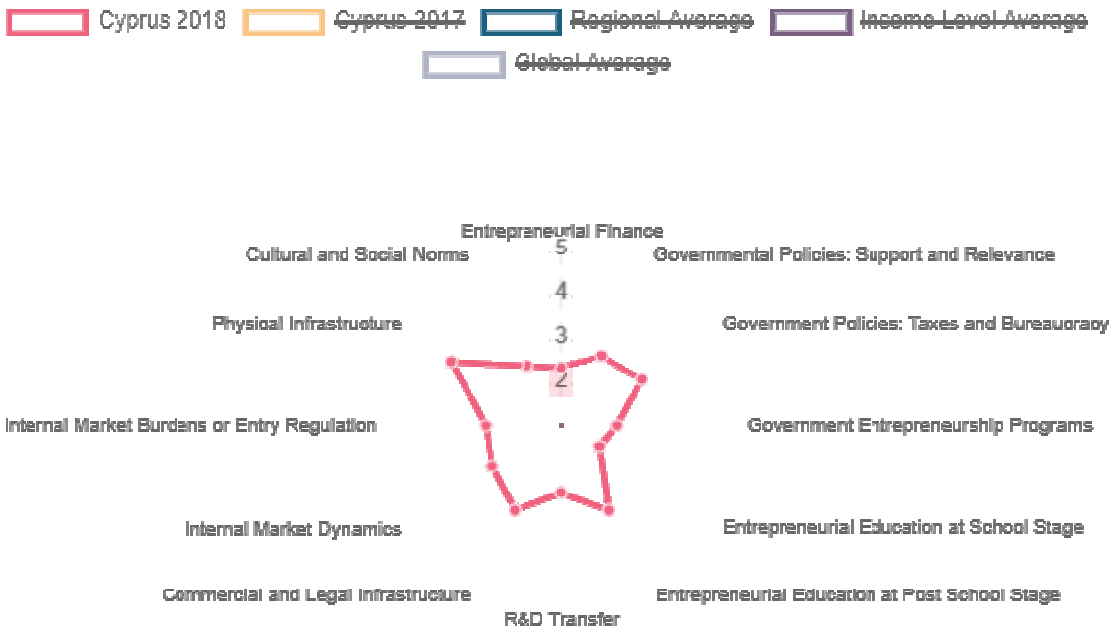

Figure 2 Cyprus Entrepreneurial Framework Conditions 2018 (GEM 2018)

In the period between the publication and endorsement of the new generation of innovation relating policy texts of 2015 and to date, a series of actions have taken place to modernize the legal system that surrounds the establishment and operation of businesses in Cyprus. One of the main activities was to simplify the legal procedures required to register a company, simplify and facilitate the procedure to submit VAT and income tax documents. Linked to this, a more attractive tax income framework was introduced to provide tax incentives to individuals to invest in innovative and start-up companies. Another activity was the development of the SME Test to assess the impact of legislative measures taken per type of business in order to avoid imposing additional burdens especially to micro

businesses and SMEs. The new revised framework for Impact Assessments was approved by the Council of Ministers to be implemented as of January 1st 2017.

Since two of the major lagging aspects of the Cypriot Business Environment are e-government and e-commerce, relevant Cypriot ministries initiated an effort to create a digital platform in order to provide information for funding Schemes related to companies (e.g., available funding, procedures to submit applications, related legal issues), so that they can easily spot available funding opportunities. At the same time, measures were taken to harmonize the Cypriot legal framework with the EU legislation on e-commerce, aiming to create a reliable system for businesses to carry out e-commerce activities and to protect consumers' rights.

3.2 IPR Policy

Another important amendment of the Cypriot Law was the one of the income tax law of the intellectual property regime (the IP box regime) (exploitation and/or sale of intangible assets) by the Cypriot Parliament, an improvement that is recorded in numerous international reports since. The amendment targeted the alignment of the Cypriot IP regime according to the relevant recommendations of the Organization for Economic Co-operation and Development (OECD) and applicable EU rules. Finally, a notable initiative was the "Startup Visa program/scheme" aimed to attract entrepreneurs from third countries to create and register a startup in Cyprus.

A major recorded obstacle for innovation in the Cypriot legal framework is the exclusion of public universities from creating spin-off companies, constraining the commercial uptake of university research, despite the relatively positive R&D profile of Cyprus universities research. To address this legal obstacle and align the law of public universities with best practices applied in advanced economies of Europe, North America and Asia, the three public universities of Cyprus worked in collaboration with government stakeholders and came up with a "framework" of proposed amendments to the law governing the public universities in order to allow them to establish private legal entities with private inventors, investors and entrepreneurs. In parallel, the Research Promotion Foundation of Cyprus as the main instrument of the innovation application in the Cypriot entrepreneurial ecosystem,

developed an initial business plan to establish and operate a Technology Transfer Office to develop know-how and support services for the academic and research institutions, in order to support them in exploiting their research results and in securing their intellectual property rights.

In addition to the systemic shortcomings of the business ecosystem in Cyprus, there is a further element that needs to be referred into as a potential challenge for clustering, and this is the apparent lack of entrepreneurship education. This is reflected particularly reflected in the GEM and EFC indicators relating to the social parameters of entrepreneurship. This is both the cause and result of a traditionally structured and fragmented economy based on very small sized businesses, which in many cases are family run in isolation to other economic players other than those absolutely required (suppliers, customers, sources of finance). As it is easily understood, a business environment of this type tends to focus on reduced risk taking and risk intolerance, which when combined with an apparent lack of collaborative culture, lead to a relative stagnation in innovative schemes. Finally, a significant challenge for the development of cluster-based economic activities is the often-lacking available information for businesses regarding novel approaches in services and products, leading to a low degree of implemented innovation for many businesses.

3.3 Recent Cluster and TT policy developments

The Directorate General for European Programmes, Coordination and Development has prepared an overarching R&I policy document (ERA National Roadmap for Cyprus) with policy suggestions to address the challenges identified. The Roadmap has been approved by the Council of Ministers on 19th of July 2017, and includes a list of suggestions for the R&I involved public authorities, as follows:

- To Explore the possibility of the establishment of an Assessment Mechanism for organizations receiving institutional funding, based on core principles of international peer review.
- Establishment of a Monitoring and Evaluation mechanism for the implementation of national R&I policy.

- Take political decision on the upgrade of the R&I Governance structure based on the recommendations of the relevant studies conducted.
- Support Policymaking by setting up of Scientific Advisory Committee on R&I issues.
- Use of indicators in the monitoring mechanism for the implementation of the national Smart Specialization Strategy.
- Evaluation of the national Framework Programmes through the systematic Monitoring and set-up of an Evaluation Mechanism which will include Annual Monitoring Reports, an Interim Evaluation (by external experts) in 2018 and an Ex-Post Evaluation in 2023.

In addition, the Research Promotion Foundation underwent substantial reform in July 2017 to meet the vision of establishing more efficient R&I implementation mechanisms in Cyprus.

3.4Funding Mechanisms and Programmes

Despite its importance, the funding subsystem is the weakest link in the RTDI system chain in Cyprus. The sub-system includes entities that support financially the development of RTDI actions and mainly innovative business activities. Essentially, the subsystem is dominated by the hegemonic role played by the state (resources from the state budget and the EUTT), mainly through the Research Promotion Foundation and the Ministry of Energy, Industry and Tourism. The subsystem is significantly affected by the virtually non-existent private-sector intervention capacity, with few initiatives are associated with venture capital and risk capital.

The RESTART 2016-2020 Programmes are the current multiannual development framework of Programs for Research, Technological Development and Innovation Support in Cyprus, co-funded by national and European funds and implemented in conjunction with other national initiatives and programs.The vision of the RESTART 2016-2020 Programs aim for the emergence of the Research, Technological Development and Innovation (RTDI) sector as a key factor in the economic development of Cyprus, contributing to addressing the key economic and social challenges and developing the conditions for achieving sustainable development, in line with the principles outlined in the Europe 2020 strategic framework for smart, sustainable and inclusive growth. They focus on individual goals as well as the Priority

Areas that emerged through the S3Cy Smart Strategies Strategy. The Action Plan of the S3Cy, comprises of competitive calls for proposals which require or encourage collaboration (Integrated Projects, Excellence Hubs, New Strategic Infrastructures Units - Young Scientists, DIDAKTOR-postdoctoral researchers, Research in Enterprises, Research in Start-Ups), whereas other calls refer to a single beneficiary and/or come in the form of a small lump sum (Innovation Vouchers, Industrial Property, Encouragement, Complementary Funding). In total, more than 700 proposals have been submitted for funding from the RPF.

At the same time, the Programmes are part of the Operational Program "Competitiveness and Sustainable Development 2014-2020", for the development strategy of Cyprus for the utilization of ERDF resources under Priority Axis 1 "Enhancing the Competitiveness of the Economy".

Through the interventions under the Investment Priority 1b the following objectives are pursued:

- To promote holistic and integrated solutions that will enhance the competitiveness of the individual sectors of the Priority Areas that emerged from S3Cy. This objective is supported by the "Integrated Projects" Program, which involves the implementation of interdisciplinary long-term cooperation projects with the ultimate objective of providing integrated interventions to the dominant challenges presented by the Priority Areas and integrated solutions with an impact on the economic development and the reform of the individual production sectors.
- Strengthening SMEs, including new businesses, to develop innovative products and services, either individually or in collaboration with a research organization or other SMEs active in the field of research and innovation, and to encourage business collaboration with research organizations. This is supported by the "Enterprise Research ", " Startup Businesses Research " and "EUREKA Cyprus", which involve the involvement of enterprises, including start-ups, in research and development activities and the development of new or substantial improvement existing products / services / production methods of high added value, individually or in collaboration with other research organizations and enterprises from Cyprus

- Creating a research and innovation culture both in business and in the wider society. This endeavour supports the "Social Innovation" Program, which involves the implementation of innovative ideas, products, services, technologies, models and strategies to address societal challenges and to cultivate a culture of social innovation, which means innovation with a social dimension.
- Ensure intellectual property rights and promote the commercial exploitation of research results. These endeavours support the Industrial Property Program to support patenting (patents, industrial projects) of significant research and innovation results with the ultimate goal of maximizing the benefits of exploiting research, development and innovation results.

The most relevant funding programmes are presented in table 4 below:

Pillar	Section	Programme
Pillar I Smart Growth	Research and InnovationPartnerships	HolisticProjects
Pillar I Smart Growth	Participation of Businesses	Enterprise Research
Pillar I Smart Growth	Participation of Businesses	Startup Businesses Research
Pillar I Smart Growth	Participation of Businesses	Expansion of Industrial Application Technology /Know-how
Pillar I Smart Growth	Extroversion – OpenHorizons	TransnationalPartnerships
Pillar I Smart Growth	Extroversion – OpenHorizons	International Collaboration - DualTargeting
Pillar I Smart Growth	Extroversion – OpenHorizons	EUREKA Cyprus

Pillar II Sustainable RTDI System	New Researchers, New Ideas, New Opportunities	Social Innovation
Pillar III Transformation of RTDI System	Support Mechanisms	InnovationVouchers
Pillar III Transformation of RTDI System	Support Mechanisms	Industrial Property
Pillar III Transformation of RTDI System	Support Mechanisms	Participation in International Networking Activities
Pillar III Transformation of RTDI System	Support Mechanisms	Encouragement of Project Coordination in the Horizon 2020 Programme
Pillar III Transformation of RTDI System	AlternativeFundingForms	Commercial Exploitation of Research Results
Pillar III Transformation of RTDI System	AlternativeFundingForms	Commercial Exploitation of Research Results by Businesses

Table1RESTART 2016-2020 RelevantProgrammes

The total budget of the RESTART 2016-2020 Programs amounts to € 99,140,000, while an amount of € 45,000,000 is foreseen to be covered by the European Regional Development Fund.

In addition to RESTART 2016-2020 Programmes, the Ministry of Energy, Commerce and Industry is promoting the Scheme for Development New Innovative Products and Services, short titled "Entrepreneurial Innovation". This initiative aims to support and strengthen existing and newly established firms investing in research and innovation to develop competitive innovative products and services that they plan to market and / or innovative processes and processes in the production of their products.It also aims to support and promote collaborations between businesses and businesses with research organizations. This objective is to be achieved by the use of incentives in the form of financial aid.Particular

emphasis is placed on the development of products and services that can be protected by patents or industrial designs. The project is co-funded by the Republic of Cyprus and the European Regional Development Fund of the EU with an estimated cost of about € 18 million for the 2014-2020 Programming Period. Up to date, 224 proposals were submitted in the various Calls, of which 84 were approved for funding with a total budget of €10m.

In addition to the two funding frameworks mentioned above, an additional number of funding tools is available in Cyprus. These include the following:

- JEREMIE Initiative (funded by the European Investment Fund) - http://www.eif.europa.eu/what_we_do/resources/jeremie/index.htm
- EaSI Guarantee Financial Instrument(funded by the European Investment Fund) - https://www.eif.org/what_we_do/microfinance/progress/index.htm
- CyprusEntrepreneurship Fund – CYPEF (Funded by the Bank of Cyprus and European Investment Fund) - https://www.eif.org/what_we_do/resources/cypef/index.htm
- Cyprus Business Angels Network (CYBAN) - https://www.cyban.com.cy/en/homehttps://www.cyban.com.cy/en/home

Further assistance is provided by The European Business Support Centre in Cyprus is part of the European network "Enterprise Europe Network" and serves as the focal point for the provision of information and advisory services in order to support the development of competitiveness and innovation of Cypriot businesses.

The aim of the European Business Support Centre in Cyprus is to provide business support services and play an important role in:

- ensuring the access of small and medium-sized enterprises (SMEs) to information relating to the operation of the internal market and available opportunities
- providing feedback from SMEs for policy development and impact assessment,
- providing support to enterprises for cross-border cooperation,
- disseminating information and raising awareness of innovation-related policies, legislation and support programmes,
- promoting the exploitation of results from research programmes,
- providing brokering services for technology and knowledge transfer and,

- building partnerships between innovation actors.

In order to carry out its mission, EBSC offers a range of services including mediation for business agreements, participation in joint projects, technology transfer, innovation and knowledge, dissemination and exploitation of research results and support for issues related to national and European legislation and programs.

4. Technology Transfer in Cyprus: Advantages and Challenges

4.1 Identifying Good Practices for Technology Transfer

The more important practices that foster Technology Transfer in countries of similar profile to Cyprus (Mediterranean Region) are:

a. Dissemination of Technology Offers and Technology Requests.
b. Inventory of Technology Offers and Technology Requests.
c. Matching between Technology Offers and Technology Requests.
d. Follow-up of the results of the Technology Transfers.
e. Fostering meetings between Universities/Research Centres and Companies
f. Programmes to help finance and promote Technology Transfer projects.
g. Giving advice in IPR and contractual issues
h. Technology Transfer Fairs

The main target groups of the best practices can be different categories of business network and cluster members, such as:

- Universities/Research Centers
- Companies
- Other organizations (other than Universities, RTOs, companies) as potential end users of transferred technology and or knowhow

These practices and their implementation tools are described in the following sections.

4.1.1 Dissemination of Technology Offers and Technology Requests

To disseminate, in terms of the field of innovation, means to broadcast technology offers and requests to the technical public. Different Mediterranean regions develop this action by the various ways

In particular, the Innovation Observatory allows the diffusion of specialised information on the issues and experiences related to research and development, innovation and technology transfer. The programme offers support for the development of the Regional Technology Transfer Network and for the exploitation of research results.

The production of reports for each technology sector responds to the information need about competences, opportunities and relevant research results available in the regional system on one side and about the enterprise's innovation needs in relation to production, services and processes to the other side. The first level of interaction between technology demand and the offer is achieved also by the organization of public events where the study results are presented to the stakeholders interested.

The tools used include:

- Paper edition distributed during public events and eventually on request
- Online contents available on the relevant websites.
- Newsletter for targeted mailing lists.
- Other Enterprise Europe Network information tools.
- Monthly newsletters, collaboration with third-party technical magazines and Technological bulletins.

4.1.2 Inventory of Technology Offers and Technology Requests

Each region develops appropriate accountancy and characterization of all the innovative resources, in terms of innovative companies, innovation projects and technology offers/requests.

Tools used include:

- Technology Audits.

- Company visits.
- E-Networking information tools (First Class).
- Development of Specialized Databases, Software and Management Tools

4.1.3 Matching between Technology Offers and Technology Requests

Analysis of the technology transfer opportunities of each region.

Tools used include:

- Automatic Matching Tool
- Partnering events; Organized match making seminars and outside the region where technology offers and requests are presented to potential partners; Brokerage events at European scale focused on selected themes and aimed at achieving a link between potential partners and producing a TO/TR catalogue;
- Company Missions as guided meetings between entrepreneurs of different countries.
- Access to a TO/TR database through the appropriate e- network platforms and regional offices.

4.1.4 Fostering meetings between Universities/Research Centers and Companies

Facilitating meetings betweenresearch institutions and companies, through official channels and using and relationship network within the region.

Tools used include:

- Innovation Festival: a regional event with exhibitions, conferences and workshops, that aims at showing to the public and regional, national and foreign stakeholders the activities of the Regional Innovation System, the technological clusters, the new high-tech companies, patents and results of regional research.
- National Road Show: calendar of public events to present to national stakeholders updated report of the regional innovation system.
- Innovation Club: organization of meeting introduced by guest speakers with the goal of creating a chance to meet and compare experiences of regional women and men working in industries, universities, research centres and public authorities.

- Regional Technology Transfer Network intermediary services.
- One-on-one semi-structured interviews
- Internal Database for recording and filtering potential partners
- Working-group roundtable meetings between potential partners
- Organization of meetings of researchers with companies on demand.

4.1.5 Programmes to help finance and promote Technology Transfer projects

To achieve a better collaboration of the companies and research groups in the innovation activity, each Region develops a method to promote innovative projects.

Tools used include:

- Exchanging best practices with other regions
- Maintaining relationships with venture capitalists and other investors.
- Monitoring the finance opportunities available in the market as well as in the public sector (FP7, national and other regional support programs).
- Vouchers which partially cover costs of international extension procedures for patents owned by universities and services for the establishment and growth of academic spin-off.
- Organization of the regional business plan competitions dedicated to innovative business ideas spinning out of scientific research
- Spreadsheet templates designed to provide project information that facilitates the automated creation of databases with all project information.
- Spreadsheet templates designed to provide an easier and more homogeneous evaluation of projects quality.

4.1.6 Giving advice in IPR and contractual issues

Each region provides support to its research groups and companies on issues of both intellectual (IP) and industrial property rights protection.

Tools used include:

- Front offices services.

- Open workshops within PROs on intellectual property issues, with the goal of improving awareness among researchers on the importance of disclosing and protecting the results of their research efforts and derive some value (both economic and relational) from their work. • One on one first level consultancy services by relevant agencies.
- development and publishing of Good Practices Guides.
- Dedicated web-space on Official Websites with latest news and documents concerning IPR
- Local networks of collaborating professionals.

4.1.7 Technology Transfer Events

A TT Event consists of the celebration of bilateral meetings between entities based on their technology profiles. Technology Transfer events are among the activities that can facilitate TT with the greater success as they bring together parties with a real interest in collaboration, are thematic and focused events which multiply probabilities of reaching agreements, and result more efficient in face to face talks between interested parties. There are different available types of events, that include:

- Regional Innovation Fairs: Periodic events where the regional research results and excellences are displayed and offered to the national market. It is difficult to obtain higher involvement in the industry.
- Venture Contests: Assessment procedure from a panel of experts in the financial field. The chance to receive funding from investors at the end of the contest remains low.
- Organization of TT events and assistance for the participation of local entities in TT events abroad
- Organization of thematic Brokerage Events
- Organization of incoming company missions
- Organization of outgoing company missions
- Co-organizing of Brokerage events abroad

4.2 Technology Transfer Benefits

Technology Transfer is the process of transferring scientific findings from one organization to another for the purpose of further development and commercialization and in some cases the transformation of scientific findings into real benefit for the market, the economy and the society. Thus, the benefits that arise from technology transfer activities can be identified in more than one sectors. These can include both financial benefits and positive societal impact.

The financial benefits of successful technology transfer are usually easily trackable. For example, individual businesses, business associations, clusters or other organizational forms can benefit directly from renewed business creation, with national returns arising from direct and indirect economic effects; financial returns generated from licensing of technology and the development of new products and services; and benefits to for-profit and non-profit organizations through the efficiency improvement in the production of goods and the provision of services.

Societal impacts are not always equally obvious. The most easily measurable is the direct contribution to the employment market, via the creation and the preservation of employment opportunities. Other impacts are more subtle or indirectly such as the implementation and utilization of new technologies and research outcomes for various purposes. In this case, benefits can include the offer to the public of a wider choice of reliable goods, the maximization of product efficiency together with the lowering of cost for consumers and in some cases the overall improvement of quality of life. Last but not least, an often-understated benefit of technology transfer is the infusion of society with new ideas, ideally leading to a more open and innovative culture.

Focusing on the case of Cyprus, the opportunities provided for the transfer of new technologies and know-how are numerous and can include:

- Quality Research Outputs,
- High Educational Level of Human Resources /a Growing academic community,

- Newly Established & Emerging Centers ofScientific Excellence / Strategic Collaborations with institutions abroad,
- New Programming Period for R&I 2016-2020,
- Mobilization of private high-risk capital (i.e.CyBAN / Financial Institutions),
- The cultural shift of the younger generations to engage in entrepreneurial activity / Increasing private initiative to support start-up community,
- The gradual shift in policy-making towards the support of entrepreneurship,
- Stabilizing national financial conditions,
- Emerging regional strategic collaborations, and a
- A regulatory framework, attractive to foreigninvestment.

As such, these can lead to significant benefits, for companies, research centres and clusters can reliably expect at least a number of the following positive outcomes:

- Achievement of a critical mass of high-level technology/knowledge output
- Utilization of economies of scale
- Building on synergies and avoid overlapping activities
- Building -up sustainable expertise and supporting tools.
- Customized functions based on regional conditions
- Benefits from cost sharing
- Promotion networking and collaboration among research organizations.
- Better monitoring quality of services and benefit produced.

4.3 Technology Transfer Challenges

In addition to the systemic shortcomings of the business ecosystem in Cyprus, there are further elements that need to be mentioned as potential challenges for innovation activities such as clustering and technology transfer. The most important of these is the apparent lack of entrepreneurship education. This is reflected particularly various innovation measuring indicators relating to the social parameters of entrepreneurship. A further significant challenge for the development of cluster-based economic activities is the often-lacking available information for businesses regarding novel approaches in services and products, leading to a low degree of implemented innovation for many businesses.

Furthermore, as technology transfer can be a complex process, requiring relevant skills and experience in needs assessment, that can lead to negative results that include malfunctioning or nonfunctioning products or services. Some common reasons for technology transfer failures, that can be traced include inaccurate market Assessments, lack of competent specialists within transfer teams, cost overruns, technology underperformance and fast obsolescence, the choosing of non-suitable technology for the local environment and the lack of support for new technologies after the transfer.

Such potential failings can occur in all business environments, however, the business environment of Cyprus can be even more vulnerable, due to its structure and due to the fact that it is based on very small sized businesses, which are in many cases family run in isolation to other economic players other than those absolutely required (suppliers, customers, sources of finance). As it is easily understood, a business environment of this type tends to focus on reduced risk taking and risk intolerance, which when combined with an apparent lack of collaborative culture, lead to a relative stagnation in innovative schemes or to their inadequate preparation.

The above-mentioned challenges, together with the structural issues of the Cypriot economy and the Technology Transfer Landscape in Cyprus are summarized below:

- Low National R&D Investment / Recent History in Research / Limited R&D Activity in the business sector;
- The small critical mass of researchers;
- Low performance in relation to the production, patenting and exploitation of research results;
- Lack of an integrated National Research and Innovation Strategy and sustained policy commitment;
- Lack of important innovation support structures (i.e. Incubators, technology parks);
- Absence of internal institutional management policies for Intellectual Property Rights (IPR) issues in mostof the research organizations;
- The national regulatory framework for public universities that tends to operate asa barrier to spin-off creation;

- TTOs absent from the Cyprus R&I landscape. Limited technology transfer activities are supported at an adhoc basis by Liaison Offices, IP Committees or Research Support departments operating within researchorganizations;
- Limited availability of Seed / Start-up Capital (VCs & BA);
- Small Internal Market.

Conclusions

Clusters are a tool for the further development of existing regional or entrepreneurial strengths. They are not suitable as a short-term solution for structural weaknesses, that admittedly exist in Cyprus regarding various aspects of the entrepreneurial ecosystem. When beginning scratch, it's best to understand the critical success factor that is needed and to make formation decisions only in locations where these criteria have been met. There are two specific dimensions to the general criteria framework:

- External dimension– macro considerations: i.e. economic/ market regional conditions and economic criteria. An adequate number of supplementary and active businesses with at least a European level of competitiveness is a prerequisite for successful cluster development.
- Internal dimension – micro considerations: organizational and operational aspects
    - There should be a clear focus on core competencies which are identifiable in practice. Clusters must have a common identity.
    - Clusters need appropriate, lean and professional control and management structures.
    - Existence of appropriate stimulating support programmes, partnerships and innovative service models (such as the "one stop shop" model), but they cannot "build" clusters.

A clear analysis of these two dimensions together with the adoption of relevant good practices and a systematic approach in addressing structural deficiencies of the local economy via horizontal holistic business and market policies will eventually lead to the more extensive adoption of clustering as a networking and economic approach.

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