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GUIDE ON INTELLECTUAL PROPERTY (IP) COMMERCIALIZATION

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1. This document contains a Guide on Intellectual Property (IP) Commercialization, prepared in the context of the *Project on Innovation and Technology Transfer Support Structure for National Institutions* (CDIP/3/INF/2). The guide has been prepared by Mr. Gary N. Keller, Chief Executive Officer (CEO), Xomix Ltd, Chicago, United States of America.

2. The CDIP is invited to take note of the information contained in this document.

[1] The views expressed in the guide are those of the author, and not necessarily those of the WIPO Secretariat or its Member States

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The Guide is the outcome of two years of research, conversations with, and active contributions and support by individuals, governmental and non-governmental institutions, organizations and companies. The Commercialization of Intellectual Property (IP) is its focus with an emphasis on the translation of academic inventions to commercial products and startup companies. The Guide is envisioned as primary resource for developing and emerging countries.

We wish to thank all who supported this compilation of knowledge and resources for the development of new infrastructure and as a means of further dissemination of the resources available by WIPO to support knowledge transfer, technological change, and economic impact.

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1 Executive Summary

Innovation and intellectual property are economic drivers of the contemporary world economy. These sectors are strong engines for economic growth and spreading prosperity not in a few countries, but around the world. The World Intellectual Property Organization (WIPO) Committee on Development and Intellectual Property (CDIP) works to make innovation more collaborative across geographical boundaries. This guide serves to meet one of the key recommendations related to Technical Assistance and Capacity Building made by the CDIP. During the inaugural meeting of LES Arab Countries (AC), in Riyadh, Saudi Arabia in April 24-26, 2012 the development of the Guide for Intellectual Property (IP) Commercialization was initiated and was subsequently prepared under the general direction of Ali Jazairy, Senior Counsellor, PCT International Cooperation Division, Patents and Technology Sector, World Intellectual Property Organization (WIPO).

The Commercialization of Intellectual Property (IP) is the focus of this Guide with an emphasis on the translation of academic inventions to commercial products and startup companies. Universities are one of the primary and rising sources of new knowledge and technologies and play a role in technological innovation, technology transfer and commercialization of intellectual property rights (IPR) arising from research and development activities. The Guide is envisioned as primary resource for developing and emerging countries in moving from discovery to commercialization of ideas and technologies.

Commercialization of intellectual property (IP Commercialization) is making money out of one's ideas. As such, an idea has no value until one makes it into a tangible object and its utility has been proven such that others would pay to use, see, read, recognize, or listen (to) that product. We define the commercialization of intellectual property as a continuum of activities and actions that provide for the protection, management, evaluation, development and value-creation of ideas, inventions, and innovations to implement them in practice. Prototypes and implemented processes lead to the development of products and services by entrepreneurs, startups, existing companies as well as governments resulting in economic and societal benefits.

The transformation of technologies from research results originating in academic institutions has been the source of inventions, products, and companies for as long as there has been university research and entrepreneurs. Commercialization of technologies into products and companies that take these products to market based on intellectual property rights requires a continuum of activities to further refine, prove, and improve these inventions. This compendium of information and case studies is designed to help guide the development off research findings and guide the appropriate pathway to a license, startup or spinoff company.

Beyond the issues that pertain to any one dimension of a technology and its associated intellectual property rights, the infrastructure to support the development of a critical mass of companies is essential in order to accelerate the rate of commercialization. The guide defines the terms, process, and methodologies for the commercialization of university inventions, research results and know-how and the collaborative development and funding processes to make them successful.

The guide was prepared in conjunction with a core team of advisors, key contributors, reviewers and editors. We wish to thank all who supported this compilation of knowledge and resources for the development of new infrastructure and as a means of further dissemination of the

resources available by WIPO to support knowledge transfer, technological change, and economic impact.

2 Preface

Technological possibilities are an uncharted sea. We may survey a geographical region and appraise... that the best plots are first taken into cultivation, after them the next best …And those that are still in the lap of the gods may be more or less productive than any that have thus far come within our range of observation.... There is no reason to expect slackening of the rate of output through exhaustion of technological possibilities.

Joseph A. Schumpeter[10]

Intellectual Property and the Global Economy

Innovation and intellectual property are economic drivers of the contemporary world economy. These sectors are strong engines for economic growth and spreading prosperity not in a few countries, but around the world. The World Intellectual Property Organization[11] (WIPO) Committee on Development and Intellectual Property (CDIP) works to make innovation more collaborative across geographical boundaries. The CDIP highlights economic enablers like IT infrastructure, including the Internet, social networking, simulation, visualization and eScience technologies.[12] WIPO is also advocating global policy and expertise necessary to nurture local innovation capacity. WIPO strives to spread advancement capacity beyond national borders and first world countries, to include developing and emerging countries. Through WIPO's assistance, Member States are cultivating innovation ecosystems by enhancing human resources with innovation commercialization skills.[13]

WIPO's capacity building initiatives focus on supporting the development of collaborative networks for innovation. Today, one lives and operates in a global economy that is linked by technology and which fosters the creation of value from intellectual property as intangible assets. Since 1980, global trade has grown 2.5 times faster than global GDP. World exports are now at $12.5 trillion, nearly 20 percent of world GDP.[14] The largest contributors to new economic growth are small and medium-sized enterprises (SMEs). These companies represent

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[10] Schumpeter, Joseph A. *Capitalism, Socialism and Democracy*, (Psychology Press, New York, 2012), pp. 118.

[11] World Intellectual Property Organization, WIPO, Retrieved March 5, 2014 from http://www.wipo.int/portal/en/index.html.

[12] World Intellectual Property Organization (WIPO), "Committee on Development and Intellectual Property (CDIP)," Ninth Session, Geneva, April 23, 2012.

[13] Jazairy, Ali. "Impact of Collaborative Innovation on IP and Future Trends in IP," *Les Nouvelles – Journal of the Licensing Executives Society,* Vol. XXXXVII (3), pp.224- 229, September 2012.

[14] Atkinson, Robert and Andes, Scott *The 2008 State New Economy Index,Benchmarking Economic Transformation in the States*, (The Information Technology and Innovation Foundation, Washington, D.C. 2008).

over 90% of businesses in most countries worldwide. These enterprises are considered the drivers of innovation and the major contributors to the growth of the global economy through employment creation and exports, and function as a powerful force for wealth creation.[15]

Connecting SME Growth Engines to IP

International financial transactions based on intellectual property are growing. The WIPO Director General, Mr. Francis Gurry, states that "the role of intellectual property (IP) has fundamentally changed. The increased focus on knowledge, the rise of new innovating countries and the desire to protect inventions abroad has prompted a growing demand for IP protection." Figure 1 below depicts the growth in cross-border licensing trade in the world economy represented by the increase in international royalty and licensing payment and receipts.[16]

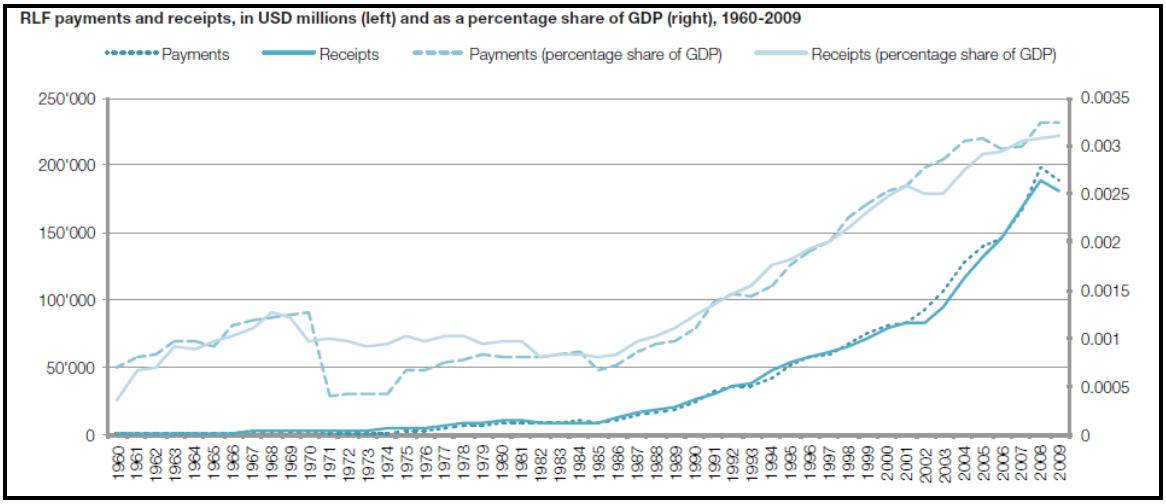

FIGURE 1: RLF PAYMENTS AND RECEIPTS 1960-2009

Source: WIPO Intellectual Property Handbook: Policy, Law and Use

[15] World Intellectual Property Organization (WIPO), "Small and Medium-Sized Enterprises, About the SMEs Section Program on SMEs," Retrieved March 5, 2014 from http://www.wipo.int/sme/en/about_sme.html.

[16] World Intellectual Property Organization (WIPO), *Intellectual Property Handbook: Policy, Law and Use*, Second Edition Reprinted 2008, p.9. Retrieved March 5, 2014 from http://www.wipo.int/export/sites/www/freepublications/en/intproperty/944/wipo_pub_944_2011.pdf.

Intellectual Property Affects Corporate Value

Intellectual property rights have grown as a key indicator of corporate value. Driven by the shift in the importance of intellectual property in the valuation of products, services, and business, there is greater demand for both invention and protection. Intangible assets account today for nearly 80% of the corporate value reflected in market capitalization on the S&P® 500 as opposed to less than 20% in 1975 as depicted in Figure 2 below.

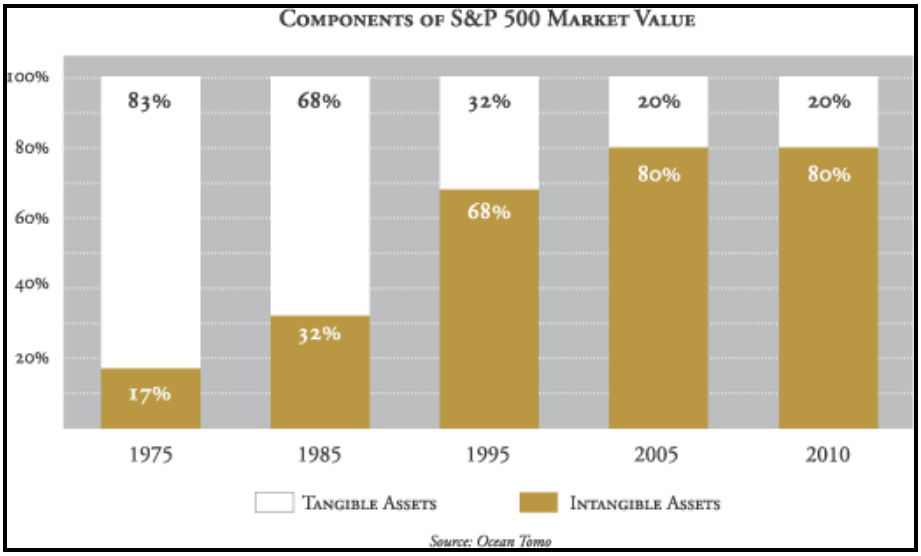

FIGURE 2: COMPONENTS OF S & P 500 MARKET VALUE

Source: Ocean Tomo[17]

National Intellectual Property Landscapes are Changing

The role of intellectual property as an economic driver is consistently tracked in the United States and closely monitored abroad to determine progress relative to industry and demographics. Efforts to accelerate commercialization of intellectual property rights (IPR) into new businesses and develop the "innovation" economy in the Unites States are supported by the investment of resources in talent, pre-growth, capital, and innovation through the Startup Act 3.0[18]. In recent years we have seen the emergence of intellectual property as a cornerstone for economic growth in a number of countries as indicated by the increase in applications for protection of IPRs. Fresh approaches to meet the challenges have become

[17] Components of S & P 500 Market Value, Ocean Tomo, Retrieved from http://www.oceantomo.com/productsandservices/investments/intangible-market-value on March, 16, 2014.

[18] Startup Act 2.0, Retrieved March 5, 2014 from http://www.moran.senate.gov/public/index.cfm/news-releases?ContentRecord_id=1f919cb7-f74f-4416-b462-e660cdeeaa8b

correspondingly global, with concerted action at the national, regional and international levels to enable developing countries to participate in and benefit from technological advances. [19]

Intellectual property policy and laws are changing within many countries to enable and incentivize both filing and protection of IPRs and commercialization through licensing or new business development. Key governance changes include those concerning the ownership and management of intellectual property by academic institutions, establishment of technology transfer offices, research parks, commercialization initiatives, investment tax incentives, and funding sources.

The Organisation for Economic Co-operation and Development (OECD)[20] conducts extensive studies on startup rates and provides statistics on outcomes between 2006 and 2011 as Figure 3 depicts for selected countries.[21]

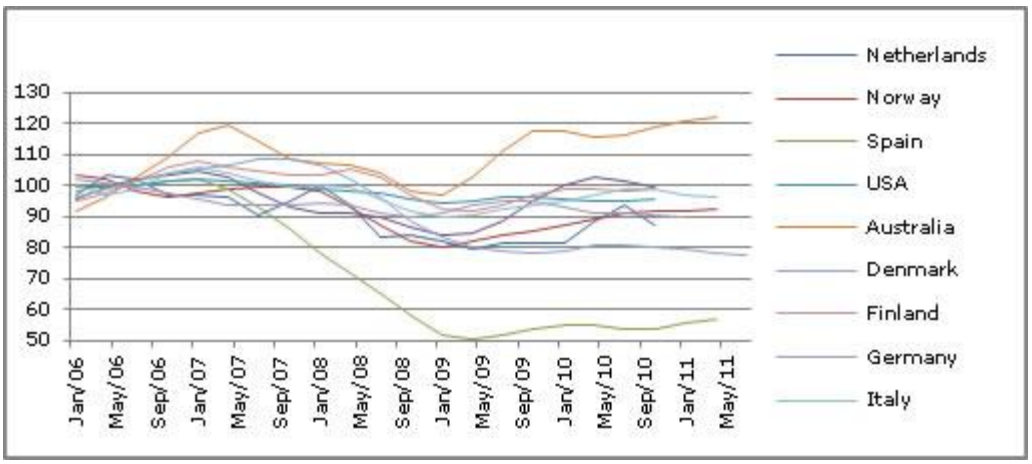

FIGURE 3: NUMBER OF NEW ENTERPRISES, TREND CYCLE, 2006-2011

Source: OECD Timely Indicators of Entrepreneurship

[19] World Intellectual Property Organization (WIPO), *2011 World Intellectual Property Report, The Changing Face of Innovation, 2011*, Economic and Statistic Series, (WIPO, Geneva, Switzerland).

[20] The Organisation for Economic Co-operation and Development (OECD), OECD, "Start-up rates begin to show signs of slowdown in most OECD countries in 2011", Retrieved March 5, 2014 fromhttp://www.oecd.org/std/start-pratesbegintoshowsignsofslowdowninmostoecdcountriesin2011.htm.

[21] *ibid*. Source: OECD Timely Indicators of Entrepreneurship

Intellectual Property Spawns from University Research

The WIPO University Initiative[22], introduced in 2002 addresses critical issues and assists universities in the establishment of IP awareness, including comprehensive IP policies, IP and technology management infrastructure for universities; development of human capital skilled in IP and technology management; promotion of effective use of IP, in particular, patents, utility models and trademarks; and creation of national, regional, and global university IP groups so that universities can enjoy the full benefit of the IP system. To effectively accomplish the commercialization of intellectual property rights by academic institutions, including universities, there needs to be a culture of innovation as well as the resources and support to achieve the increase in value, and minimize the risk for investors and other stakeholders.

Universities are one of the primary and rising sources of new knowledge and technologies and play a role in technological innovation, technology transfer and commercialization of intellectual property rights (IPR) arising from research and development activities. One indicator is the increased patents which universities and Pubic Research Organizations (PROs) filed nationally and internationally under the Patent Cooperation Treaty (PCT). Between 1980 and 2010 as shown in Figure 4, the compound annual growth rate was about 13 percent for all PCT applications, 35 percent for university applications and about 29 percent for PRO applications.[23]

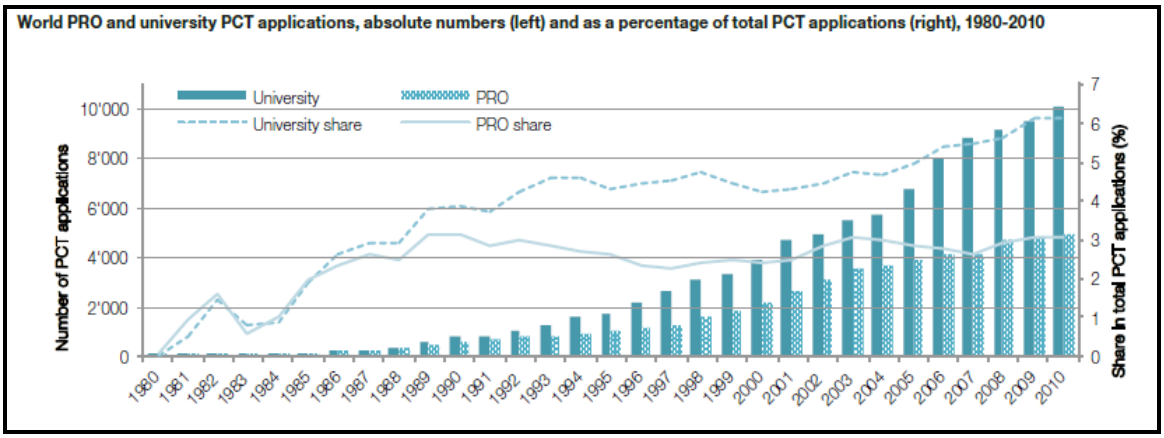

FIGURE 4: WORLD PRO AND UNIVERSITY PCT APPLICATIONS, 1960-2010

Source: WIPO Intellectual Property Handbook: Policy, Law and Use

University licensing agreements continue to make a significant impact on the innovation economy. A report prepared for the Biotechnology Industry Organization [24](BIO) estimates that

[22] World Intellectual Property Organization (WIPO), " WIPO Intellectual Property Handbook: Policy, Law and Use ", p. 148 (WIPO, Geneva, Switzerland).

[23] *ibid.*

[24] Biotechnology Industry Organization, http://www.bio.org/.

between 1996 and 2007, university licensing agreements based on product sales contributed between $47 and $187 billion to the U.S. GDP.[25]

Intellectual Property is Being Commercialized by Universities Globally

According to WIPO, almost a third of R&D in developed countries is undertaken in the public sector which includes universities. In developing countries this trend is even more marked with the majority of new technology development being carried out in public universities and R&D institutions. As a result, the management of intellectual property rights and technology throughout the research and commercialization phases has become extremely important for universities as illustrated in Figure 5. [26]

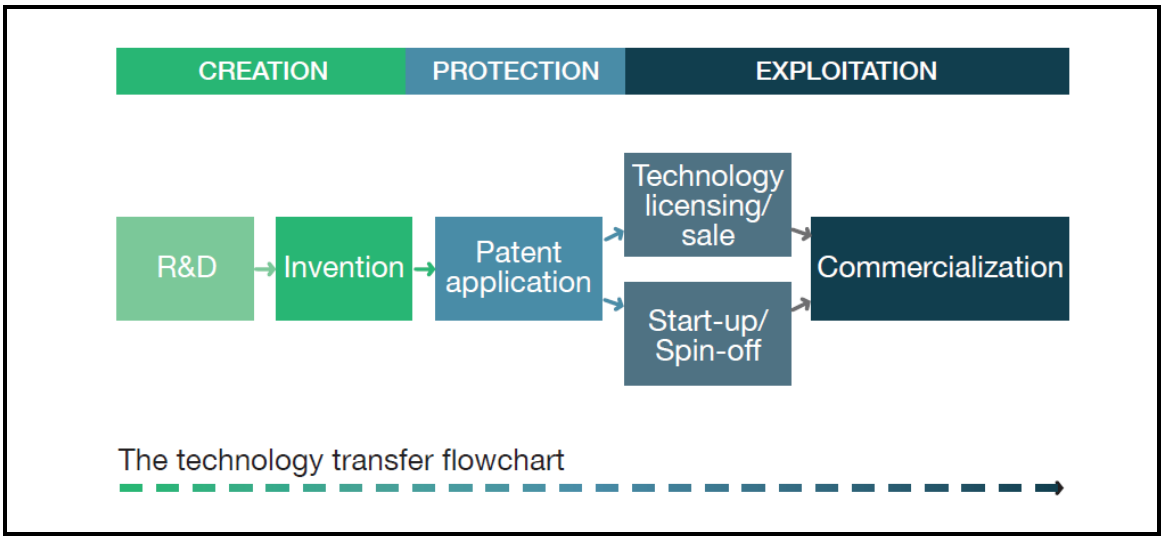

FIGURE 5: WIPO UNIVERSITY INITIATIVE PROGRAM

Source: WIPO University Initiative Program[27]

Beyond the issues that pertain to any one dimension of a technology and its associated intellectual property rights, the infrastructure to support the development of a critical mass of companies is essential in order to accelerate the rate of commercialization. One proven means of accomplishing this is through the development of networks across institutions, organizations, regions, and countries.

[25] Biotechnology Industry Organization, "Originating in University Research, 1996-2007, Final Report to the Biotechnology Industry Organization (BIO), September 3, 2009," Retrieved March 5, 2014 from http://www.bio.org/articles/economic-impact-licensed-commercialized-inventions-originating-university-research-1996-200.

[26] World Intellectual Property Organization (WIPO). , "Universities Play a Vital Role for the Economic Technological and Cultural Progress of Society," University Initiative Program (WIPO, Geneva, Switzerland).

[27] WIPO University Initiative Program, Retrieved March 16, 2014 from http://www.wipo.int/export/sites/www/freepublications/en/general/1033/wipo_pub_1033.pdf.

New Funding Mechanisms are Being Created for Technology Commercialization

Key to enabling the potential of technology to create value and impact through commercialization is access to capital continuously through the development process to market profitability, merger, acquisition, or other forms of exit including initial public offering (IPO). The options for funding resources available by geographic location, by technology area, or by stage of development are increasing. The early stages of development funding can be most challenging as the application has not been proven and the risk is substantially higher.

The most challenging issues facing early stage companies are securing initial capital and follow up funding through the "Valley of Death" or the Startup Financing Cycle (Figure 6) depicted below. With changes in the global economy early stage funding sources are being diverted to later stage investments. New research and funding mechanisms and acceleration models have emerged to fill this funding gap.

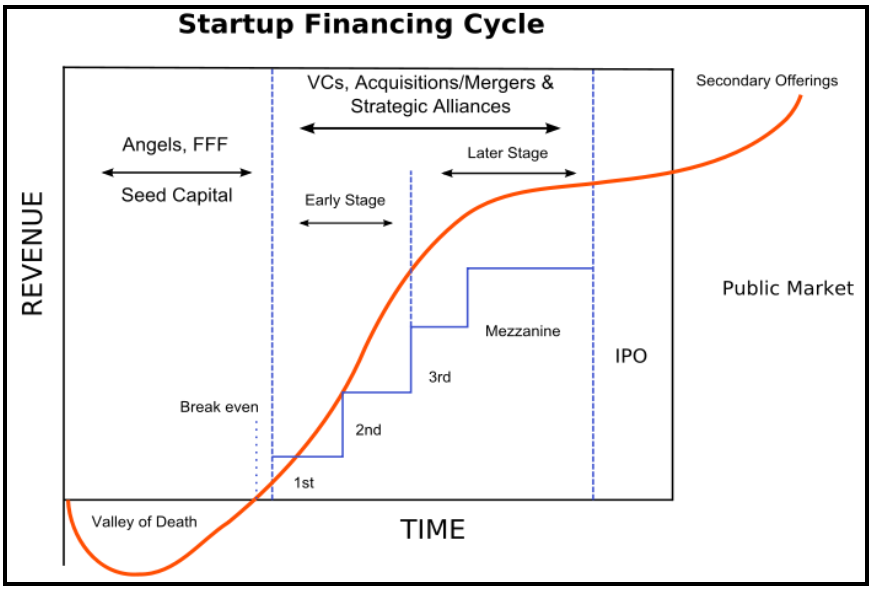

FIGURE 6: STARTUP FINANCING CYCLE

Source: Kompere[28]

The Guide on Intellectual Property Commercialization provides an overview of the key issues and resources that enable commercialization of intellectual property to focus on academic research. The guide defines the terms, process, and methodologies for the commercialization of university inventions, research results and know-how and the collaborative development and funding processes to make them successful.

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[28] Startup Financing Cycle Source: Kompere, retrieved from http://upload.wikimedia.org/wikipedia/commons/8/8e/Startup_financing_cycle.svg on March 16, 2014). Permission is granted to copy, distribute and/or modify this document under the terms of the GNU Free Documentation License, Version 1.2 or any later version published by the Free Software Foundation; with no Invariant Sections, no Front-Cover Texts, and no Back-Cover Texts.

2.1 Objectives

- Present an overview on the commercialization process effectively used in universities
- Supply an overview of commercialization programs and acceleration models
- Provide references to commercialization programs and resources
- Establish a useful orientation for emerging countries developing commercialization systems
- Indicate the key considerations in the commercialization process
- Outline the content for WIPO workshops on this topic

3 Overview on Commercialization

3.1 Defining University Commercialization

Commercialization of intellectual property (IP Commercialization) is making money out of one's ideas. As such, an idea has no value until one makes it into a tangible object and its utility has been proven such that others would pay to use, see, read, recognize, or listen (to) that product. We define the commercialization of intellectual property as a continuum of activities and actions that provide for the protection, management, evaluation, development and value-creation of ideas, inventions, and innovations to implement them in practice. Prototypes and implemented processes lead to the development of products and services by entrepreneurs, startups, existing companies as well as governments resulting in economic, cultural and societal benefits.

The transformation of technologies from research results originating in academic institutions has been the source of inventions, products, and companies for as long as there has been university research and entrepreneurs. Commercialization of technologies into products and companies to take those products to market based on intellectual property rights requires a continuum of activities to further refine, prove, and improve these inventions. Research findings and help guide the appropriate pathway to a license, startup or spinoff company.

3.2 Scope of Activities

The commercialization of research results and related intellectual property rights by research universities involves a compilation of activities including education, research and development, entrepreneurship and innovation, and the development of experience and expertise.

Education

Academic research institutions' main mandate is focused on providing education and transferring knowledge and experience. They also undertake the search for knowledge and the discovery of new solutions and methods that could serve as the foundation for patentable inventions. Translating these inventions into devices and processes to impact the quality of life and health requires action and resources that extends academic research into applied development.

Many universities have created commercialization programs or extended joint programs to incorporate education in business and research. The Boston University School of Management Institute for Technology Entrepreneurship & Commercialization (ITEC)[29] has established academic programs, collaborative projects, events, and services, to build management skills for translating ideas into marketable products and services. Another example is the USC Graduate Certificate in Technology Commercialization[30] designed to let students experience the entire

[29] Boston University School of Management Institute for Technology Entrepreneurship & Commercialization, Retrieved March 5, 2014 from http://www.bu.edu/itec/.

[30] University of Southern California, Master's Degree Programs, Graduate Certificate in Technology Commercialization, Retrieved March 5, 2014 from http://www.usc.edu/dept/publications/cat2010/schools/business/masters/technology.html.

spectrum of the commercialization process – invention, product development, technical and market feasibility analysis, intellectual property acquisition, business planning and venture funding. Online and on site educational programs such as the Master of Science in Technology Commercialization, McCombs School of Business-Graduate at The University of Texas at Austin[31] are available as well.

Research and Development

The recent shift in the focus of academic research and funding is to center research on solutions and applications on technologies that can be used globally for the benefit of the general public. This effort requires increased funding for interdisciplinary research, translational research centers, and industry collaborations.

In the United States, a major outcomes oriented research effort is the National Institutes of Health (NIH) National Center for Advancing Translational Sciences (NCATS)[32] which was officially established in the fiscal year 2012. The Center strives to develop means to reduce, remove or bypass costly and time-consuming bottlenecks in the translational research pipeline in an effort to speed the delivery of new drugs, diagnostics and medical devices to patients. To enable this effort the Strategic Alliances branch within the Office of Policy, Communications and Strategic Alliances[33] provides services including negotiating standard forms and model agreements between NCATS and outside parties, including universities, pharmaceutical companies and biotechnology companies. NCATS supports a number of grant programs and in-kind service delivery and provides intramural and extramural grant funding to support research projects, core facilities, and scientific resources and tools, state-of-the-science conferences and events. Many of the innovative projects under NCATS benefit from the flexible spending authority provided via the Cures Acceleration Network[34], a source of large grant funding.

Entrepreneurship and Innovation

For years, many academic research institutions and government laboratories in the United States discouraged industry relations and pursuit of developing products and spinning-off companies resulting from research inventions. Now, however, many international institutions encourage and reward these pursuits in tandem with entrepreneurial activities. This shift is also characterized by new educational programs and centers for Entrepreneurship and Innovation within leading academic institutions. Universities often provide hands on experience for business development or startup projects through the university's office of technology transfer as well as internships with early stage companies.

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[31] The University of Texas at Austin, Master of Science in Technology Commercialization (MSTC) Program, Retrieved March 5, 2014 from http://www.mccombs.utexas.edu/MSTC.aspx.

[32] U.S. Department of Health and Human Services, National Institutes of Health (NIH), "National Center for Advancing Translational Science (NCATS)," Retrieved March 5, 2014 from http://www.ncats.nih.gov/about/budget/authorization.html.

[33] *ibid*.

[34] U.S. Department of Health and Human Services, National Institutes of Health (NIH), National Center for Advancing Translational Science (NCATS), "Cures Acceleration Network," Retrieved March 5, 2014 from http://www.ncats.nih.gov/funding-and-notices/can/can.html.

One example is the National University of Singapore Enterprise Group[35] (NUS Enterprise) including the NUS Industry Liaison Office (NUS ILO) and the NUS Entrepreneurship Centre (NEC). NEC promotes and supports entrepreneurial startups by NUS investigators and their collaborators and conducts research on policy and technology venturing. NEC's activities are organized into four key areas: Experiential Education, Entrepreneurship Development, NUS Enterprise Incubator and Entrepreneurship & Innovation Research.

The Kaufmann Foundation[36] and the Coleman Foundation[37] provide programming, education, research and policy and grant funding in the United States.

Develop Experience and Expertise

"One must learn by doing the thing, for though you think you know it, you have no certainty until you try." This statement by Sophocles points to the benefit of experience and the development and refinement of skills over time. Yeda Research and Development Company Ltd[38] established in 1959 is the commercial arm of the Weizmann Institute of Science (WIS) in Israel is one of the first and world's finest university Technology Transfer office. These types of early efforts to establish technology transfer have contributed to making Israel a global leader in technology commercialization and founder of some of the earliest established firms coming from technology transfer programs.

In the 1960s and 1970s Eastern European countries and the Soviet Union established special technology development and transfer companies whose mandate was to commercialize research results issued from government research organizations and to facilitate licensing-in of advanced technology from abroad. Considerable expertise in licensing and technology commercialization and transfer was developed; however, these structures, vanished with the collapse of the socialist system in Eastern Europe and the Soviet Union.

Sweeping legislation in the United Sates in 1980 changed the climate for collaboration between universities, small businesses, and federal R&D laboratories and non-profits entities forever. The Bayh–Dole Act[39] in 1980 gave these groups ownership rights to the intellectual property obtained in relation to their inventions and other intellectual property rights that resulted from R&D activities developed under federal (government) funding. The Bayh-Dole Act permits a university, small business, or non-profit institution to elect to pursue ownership of an invention in preference to the government. This led to many universities and federal laboratories establishing technology licensing, technology transfer or technology management offices (TLO/TTO/TMO) and increased commercialization of academic research inventions.

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[35] NUS Entrepreneurship Centre (NEC), Retrieved March 5, 2014 from http://r2m.nus.edu.sg/cos/o.x?c=/r2m/pagetree&func=view&rid=5696.

[36] The Kaufmann Foundation, Retrieved March 5, 2014 from http://www.kauffman.org.

[37] The Coleman Foundation, Retrieved March 5, 2014 from http://www.colemanfoundation.org.

[38] Yeda Research and Development Company Ltd., Retrieved March 5, 2014 from http://www.yedarnd.com/About-Yeda.aspx.

[39] Wikipedia, The Bayh Dole Act, Retrieved March 5, 2014 from http://en.wikipedia.org/wiki/Bayh%E2%80%93Dole_Act.

The Federal Laboratory Consortium for Technology Transfer[40] (FLC) is the national network of federal laboratories formally chartered by the Federal Technology Transfer Act of 1986 to promote and strengthen technology transfer nationwide. Today approximately 300 federal laboratories and centers and their parent departments and agencies are FLC members.[41] The U.S. National Institutes of Standards and Technology (NIST) reports that for 2010 the 11 federal laboratories included had more than 18,000 active collaborative relationships with private entities and other government agencies disclosed more than 4,700 inventions, submitted 1,830 patent applications and received 1,143 patents.

We are witnessing a new era for collaboration between technology transfer and commercialization offices or services in all parts of the world. A report constructed for the Biotechnology Industry Organization (BIO) on the economic impact of licensed commercialized inventions originating in university research between 1996 and 2007 captures the purpose and global expansion of the process. "Knowledge and technology transfer focus on application of existing knowledge to solve problems and improvement of products and processes, functions that initially (in the U.S.) were central to land grant universities but are now recognized as highly important for all research universities, public and private. The creation of technological innovations at the university frequently leads to patenting, licensing, and the formation of start-up companies by faculty and students."[42] Based on research by Cohen in 2000, between 1980 and 1999 university spin-offs in the United States created $33.5 billion in economic value at an average of $10 million per startup.[43] More recently a study of *Entrepreneurial Impact: Role of MIT* by the Kaufmann Center determined that 25,800 currently active companies founded by MIT alumni employ about 3.3 million people and generate annual worldwide sales of $2 trillion, producing the equivalent of the eleventh-largest economy in the world.[44]

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[40] U.S. Federal Laboratories the Federal Laboratory Consortium for Technology Transfer (FLC), Retrieved March 5, 2014 from http://www.federallabs.org/.

[41] *ibid.*

[42] Roessner, David, Bond, Jennifer, Okubo, Sumiye , and Planting, Mark , "The Economic Impact of Licensed Commercialized Inventions Originating in University Research, 1996-2007, Final Report to Biotechnology Industry Organization, September 3, 2009."

[43] Cohen, W., "Taking care of business," ASEE Prism Online, January, 1-5, 2000, (*ASEE Prism*, 9(1), 18–21). Retrieved March 5, 2014 from http://www.prism-magazine.org/jan00/html/coverstory.cfm.

[44] Edward B Roberts and Charles Eesley, "Entrepreneurial Impact: Role of MIT," MIT Sloan School of Management, Executive Summary, 2009, Retrieved March 5, 2014 from http://www.kauffman.org/what-we-do/research/2009/08/entrepreneurial-impact-the-role-of-mit.

3.2.1 Process

To optimize the success of technology commercialization universities need to have a defined process and resources. Many academic research universities have well defined processes to support and guide the process of commercialization of IPRs. In emerging countries often these systems may be less developed or are in various stages of creation and evolution by experienced professionals.

These systems include the establishment of technology transfer offices and associated policies for both invention support and creation of startups and spinoff companies, programs to sustain company development, incubators and accelerators, research parks, and participation in organizations and networks focused on commercialization.

Many countries are now actively engaged in the development of technology transfer and commercialization within their universities and national R&D laboratories. There has been a concerted effort throughout Latin America and Asia to build the knowledge sector and encourage entrepreneurship and innovation.

Technology Transfer in Latin America

Governments of Chile and Mexico have enacted a variety of efforts to improve technology transfer capabilities in their universities and research centers. Some of these innovation efforts intend to increase the number of startups while others intend to enhance the ability of moving research results into the marketplace. Both countries have recently funded and initiated major initiatives aimed at enhancing the capacity of institutions to increase knowledge transfer to industry.

In September 2011 Mexico's FINNOVA (Sectoral Innovation Fund), operating under the Secretary of the Economy (CONACYT), launched an initiative to encourage the creation and strengthening of "Knowledge Transfer Offices" in universities and research centers. These entities will provide knowledge transfer services for research discoveries from their institutions, including consulting, licensing, new business support (startups), and outreach to investors. A total of thirty (30) institutions were approved for the program, including universities, major research institutes, and public research institutions with a long history of industry collaboration. Examples are National Autonomous University of Mexico (UNAM), the Tecnológico de Monterrey, the National Polytechnic Institute, CIATEQ (Advanced Technology Center) and CIQA (Research Center in Applied Chemistry).

In Chile, CORFO's (Promotion Corporation of Chile Production) Innova had similar goals in its efforts launched in 2011. Its "Strengthening Transfer and Licensing Offices" program will build capacity in technology transfer and commercialization in universities and research centers throughout the country. This includes training of tech transfer professionals, the creation and use of intellectual property policies, conflict of interest management, faculty education, startups, and best practices in licensing, benchmarking, strategic and operational planning.

CORFO's effort is notable for being the first in the region to engage most of Chile's universities at one time and provide centralized and comprehensive perspectives for all participating institutions. In two separate competitions CORFO funded 14 single universities, three collaborative projects that engage 6 universities, and one nationwide research institute. CORFO and these universities are collaborating with AUTM (Association of University Technology Managers) for professional development and securing senior experts to provide consultancy services to meet the institution's objectives.

In Brazil, FORTEC (the Brazilian Forum of Innovation and Technology Transfer Managers) was created in 2006 and has been a leader in bringing Brazil's technology transfer entities together to discuss challenges, solutions, and provide for networking and professional development. In 2012, FORTEC advanced its efforts by becoming a non-profit association in order to advance the technology transfer agenda in Brazil and provide for a formal and legitimate representative body to promote a culture of innovation, intellectual property, and technology transfer.

Source: David L. Gulley, Ph.D. University of Illinois at Chicago (retired) and Senior Expert and Team Leader for CORFO-AUTM TTO Project.

FIGURE 7: CASE STUDY - TECHNOLOGY TRANSFER IN LATIN AMERICA

It is important to understand where the university is in the process of establishing the infrastructure to support intellectual property commercialization. The commitment of international education institutions is to build the parts missing in the commercialization pipeline to increase the probability of success, enhance value, and establish a critical mass of companies, experienced entrepreneurs, and seasoned investors.

3.2.2 Purpose and Objectives

The university should have a clear definition of commercialization and alignment of the stakeholders regarding their commitment to technology transfer and other university objectives. The creation of intellectual property rights, protections, and subsequent development of such IPRs into services, products, and companies serves a myriad of objectives for research institutions. The importance of these objectives varies from institution to institution. For the most efficient alignment of stakeholders it is important to clarify the priority and value of these efforts and national, local, or institutional policy or the availability of resources.

Service to Faculty, Students, and Institution

Intellectual Property Right (IPR) protection is a service to ensure the rights of the university, its innovators, inventors, research sponsors and the public. It helps protect against and prevent infringement, improper exploitation and the abuse of IP belonging to the university and others associated with it. It is considered a best practice within academic institutions and often is a consideration in the ability to recruit top researchers.

Development of Culture of Innovation

Protection is part of the process to ensure that research results and inventions will be pursued by faculty and students and that what is discovered will have the capacity to gain value and attract resources for further development. A culture of research development optimizes the environment for innovation and incentivizes research and for the creation of new knowledge.

Attraction of Resources and Relationships

Intellectual property protection and licensing and partnering to support commercialization create access to new resources such as equipment, specialized laboratories, accelerators, incubators, as research parks. These endeavors build a network of relationships for the institution that may lead to new business relationships, expanded alumni relations, and sponsored research.

Creation of Value

Intellectual property protection lays the foundation for increased revenue through licensing, sponsored research, and expanded programming to yield significant revenue for institutions. According to Kelvin King, a patent attorney with Sutherland Asbill and Brennan LLP, intellectual property is recognized as the most important asset of many of the world's largest and most powerful companies and lays the foundation for the market dominance and continuing profitability of these corporations. Intellectual property is often the key target for mergers and acquisitions and knowledgeable companies are increasingly using licensing routes to transfer these assets to low tax jurisdictions.[45]

Economic Impact

Intellectual property protection and commercialization create economic impact through the revenue generated for the institution and the inventors, the encouragement of expanded research and development, investment into new companies, and the creation of high paying jobs and additional technology companies. Academic Institutions have a primary objective of educating students through instruction and hands on training in research and through internships and so have economic impact by expanding employment.
R&D activities are part of the education process. Unlike government and private R&D entities, the main objective of universities is not to produce and commercialize research results, but to educate and transfer knowledge. For this reason, setting up and implementing a well-designed IP Policy, coordinated with the principal mandate of universities, to transfer IP out of the University for commercialization is very important to have greatest impact.

[45] Kelvin King, "The Value of Intellectual Property, Intangible Assets and Goodwill," Retrieved March 5, 2014 from http://www.wipo.int/sme/en/documents/value_ip_intangible_assets_fulltext.html.

4 Impact of Commercialization

The benefits of technology are both direct and indirect. From the perspective of technology commercialization, intellectual property may provide financial, cultural, economic and social impact to key stakeholders. This may be in the form of financial remuneration, jobs, infrastructure development, improvements in the quality of life and condition of health, induced spending, and a sense of pride in accomplishment based on innovation and pioneering leadership. The benefits of commercialization are shared throughout the ecosystem ranging from the universities and research institutions where these discoveries are made to the industry and development partners, the supporting organizations, the legislators, and, of course, the people whose lives are changed by these improvements.

Everywhere in the world small and emerging business is the driver of jobs and revenue. As a reference, according to the U.S. Small Business Administration "Small businesses are an important engine of innovation, wealth and job creation in the United States. They generate about 70% of new jobs, employ 40% of high-tech workers (scientists, engineers and computer programmers), account for half of private non-farm gross domestic product, generate 30% of exports by value, and produce 13 times more patents per employee than large patenting firms -- and their patents are twice as likely as those of large firms to be among the 1% most cited."[46]

Entrepreneurs and new firms develop new industries, create jobs, and spur economic growth. Through the Small Business Jobs Act an additional $44 billion in loans was provided through the Small Business Administration (SBA) and Treasury, as well as $12 billion in tax relief to small businesses. Through its Startup America initiative, the U.S. administration will to continue to improve access to capital for startups and accelerate commercialization of new technology.[47]

4.1 Financial

The financial impact of commercialization of intellectual property rights can be realized through licensing revenue and the associated attraction of resources and funding for additional research and development. In the United States over 400 university startups are created each year based on federally funded R&D. These included Google, Netscape, Genentech, Lycos, Sun Microsystems, Silicon Graphics, and Cisco Systems as referenced by the National Center for Entrepreneurial Tech Transfer (NCET2).[48] The organization also reports that 8 percent of all university startups go public, in comparison to a "going public rate" of only 0.07 percent for other U.S. enterprises - a 114x difference.[49]

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[46] US Small Business Administration, Headd, Brian, "An analysis of small business and jobs," Small Business Research Summary, No. 359, (SBA, Washington, D.C., March 2010); Kobe, Kathryn, "The small business share of GDP, 1998-2004," prepared for the Small Business Administration Office of Advocacy, (SBA, Washington, D.C, April 2007).

[47] U.S. Department of Commerce, National Economic Council, "The Competitiveness and Innovative Capacity of the United States," (Department of Commerce, Washington, D.C, January 2012).

[48] National Center for Entrepreneurial Tech Transfer (NCET2), Retrieved March 6, 2014 from http://www.ncet2.org/.

[49] National Center for Entrepreneurship in Technology Transfer (NCET2), Retrieved March 6, 2014 from http://ncet2.org/index.php?option=com_content&view=article&id=226&Itemid=119.

According to a 2009 report published by the Organisation for Economic Co-operation and Development (OECD)[50], international receipts for intellectual property increased from $10 billion in 1985 to $110 billion in 2004.[51] OECD has a mission to promote policies that will improve the economic and social well-being of people around the world and it acknowledges protection of IP rights for a well-functioning technology licensing market.

As well, a report by the Biotechnology Industry Organization based on the annual "The U.S. Hospital and Research Institute (HRI) AUTM Surveys" between 1996 and 2010 reports licensing income received with totals of $5.47B, approximately 29% of the $18.58B reported by university respondents. The running royalties reported by the survey respondents over the 15 year period total $2.27B, approximately 21% of the $13.1B reported by university respondents. Furthermore the report states that nonprofits, as well as universities, are performing a larger share of total U.S. R&D. The report also states that U.S. R&D performed by universities and colleges from 1953 through 2009 grew from 5.3% to 13.6% of total U.S. R&D.[52]

Commercialization of intellectual property rights can add significant value through the establishment of a startup. An academic institution can transfer through a license the value of early understanding of a new therapeutic to a biotech company that is designed to take on high risk clinical development programs that require modest levels of investment. The same product may be transferred again once proof of concept has been established and further development depends on large-scale clinical trial processes, commercial skills, and access to higher levels of investment. At that point, a large pharmaceutical company may be the appropriate organization to move the project forward as depicted in the diagram below. These deals create thresholds that reward one organization for overcoming one set of risks and facilitate a transfer of ownership to an organization that may be better positioned to take on the next set of challenges as shown in Figure 8.[53]

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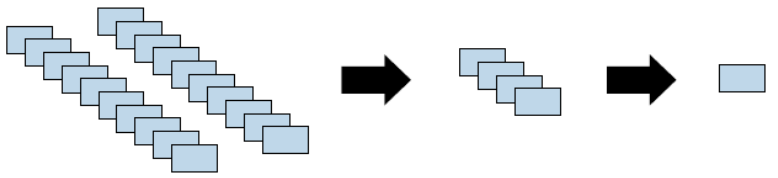
[50] Organisation for Economic Co-operation and Development (OECD), Retrieved March 6, 2014 from http://www.oecd.org/about/.

[51] Love, Patrick and Lattimore, Ralph, *OCED Insights – International Trade, Free, Fair, and Open*, (Paris, France,2009), Retrieved March 5, 2014 from http://www.ebook3000.com/-International-Trade--Free--Fair-and-Open---by-Patrick-Love--Ralph-Lattimore_56397.html.

[52] Pressman, Lori, Roessner, David, Bond, Jennifer, Okubo, Sumiye and Planting, Mark, "The Economic Contribution of University/Nonprofit Inventions in the United States: 1996–2010: Measures of Economic Impact of Licensed Inventions Commercialized by Licensees of U.S., Respondents to the AUTM Survey 1996-2010," Biotechnology Industry Organization (BIO), June 20, 2012.

[53] James McCarthy and Ben Bonifant, "BioPharma Royalty Rate Survey, A Review Of The Global BioPharmaceutical Royalty Rates And Deal Terms Survey: Licensing Executives Society (U.S.A. and Canada), Inc. And Licensing Executives Society International (LESI)," *Les Nouvelles*, pp 251-262, September 2011.

Diagram 1.



Mission	Academic	Value Creation	Value Creation
Investment Resources	Low	Modest	Large
Skills	Research	Pre-POC Development	Development/ Commercialization
Ownership	Non-Profit	Private or Public	Public
Success Rate (for example)	10-20%	30-50%	50-60%

FIGURE 8: ACADEMIC AND SMALL COMPANY DEALS

Source: Jim McCarthy, 2012 LES/ LESI Global BioPharma RR&DT Survey

The Global Biopharmaceutical Royalty Rates & Deal Terms Survey by the Licensing Executives Society (LES)[54] was conducted by LES USA/Canada In coordination with the Licensing Executives Society International (LESI). The 2012 LESI survey reveals that for academic and small company deals the average academic terms for a deal generated from the university at Stage 1 yield an average flat royalty of 3.6% and upfront payment of $0.13M. In comparison the survey show that for an average small company the terms at Stage 1 have an average flat royalty of $4.2% and 18.6% at Stage 2 and an average up-front payment of $11.5M. As well, for deals done by small companies with average royalty for tiered structure at $500M in sales, Stage 1 company deal averages 8.3% and a Stage 2 company 13.8% with a combined averaged up-front payment of $14.3M.[55]

[54] Licensing Executive Society USA/Canada, Retrieved March 6, 2014 from www.lesusacanada.org.

[55] James McCarthy and Ben Bonifant, BioPharma Royalty Rate Survey, A Review Of The Global BioPharmaceutical Royalty Rates And Deal Terms Survey: Licensing Executives Society (U.S.A. and Canada), Inc. And Licensing Executives Society International (LESI), (Les Nouvelles, 2012, Pre Publication).

4.2 Cultural

The engagement of universities in commercialization has been observed to create a culture of innovation within these academic research institutions. One example often referenced is to the luxury cars in the Stanford University parking lot belonging to the inventors with successful licenses or startup companies and the reaction of other researchers to file disclosures and explore commercialization options. Since 1939, Stanford faculty and students have founded more than 2,454 companies, such as Hewlett-Packard, Cisco, Sun Microsystems, Google, Yahoo, contributing to the economic dynamism of Silicon Valley.[56] While this is an idealized situation, the conclusion is that the success and the benefits that are associated with it such as prestige, resources, and value creation serve as inspiration and catalysts for others to engage in the commercialization process. As well, students who participate in entrepreneurship and innovation programs and often engage in the establishment or development of startup or spinoff companies. The selection of universities by both entrepreneurial faculty and students is often guided by academic offerings, programs and institutional funding, as well as invention related policies.

The development of networking and mentoring programs often leads to new or renewed relationship with industry, alumni, and legislators. Such collaboration provides a means of engaging the academic community in facilitating the development of new products and services to address unmet needs as a direct result of their inventions.

These programs may be within specific technology areas or across academic institutions such as Collegiate Entrepreneurs' Organization SM (CEO)[57] an entrepreneurship network with chapters on university campuses in over 43 states across North America. They may be segmented by types of technology. Networking organizations have also been established by gender for example Women in Technology International (WITI)[58] have established WITI networks for professionals, corporate, global executives and students.

Regional and global associations such as TechConnect[59], a global technology outreach & development organization that brings together emerging technology providers with corporate and investment development partners. The Midwest University Research Network (MRUN)[60] is an alliance of university, research, and industry business development professionals, accelerators, and early stage investors dedicated to facilitating growth and funding of technology spinout companies through start–up formation in the Midwest. The organization encompasses 14 Midwest states and 2 provinces of Canada.

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[56] Vinit Nijhawan, *Investing in University Spin-Offs*, Silicon India April 2011, Retrieved March 6, 2014 from http://www.siliconindia.com/magazine_articles/Investing_in_University_SpinOffs-EKFJ427674798.html.

[57] Collegiate Entrepreneurs Organization (CEO), Retrieved March 6, 2014 from http://www.c-e-o.org/.

[58] Women in Technology International (WITI), Retrieved March 6, 2014 from http://www.witi.com/.

[59] TechConnect, Retrieved March 6, 2014 from http://www.techconnect.org/about/.

[60] Midwest University Research Network (MRUN), Retrieved March 6, 2014 from http://www.mrun.us/.

4.3 Economic Development

University research and research-related activities contribute in many important ways to local, regional, and national, and global economic development through revenue realized through commercialization of technologies into products and companies, the expenditure on services to support this development, the establishment of new companies within the community, and the creation of new jobs.

The Association of University Technology Managers (AUTM)[61] reports that academic institutions have seen a significant increase in technology transfer activity and associated financial gain. Before 1980, fewer than 250 patents were issued to U.S. universities each year and research results and inventions were seldom commercialized for the public's benefit. Between FY 1991 and FY 2004, annual invention disclosures increased more than 290 percent (to 18,178), new patents filed increased nearly 450 percent (to 11,089) and new licenses and options executed increased about 510 percent (to 5,329). The AUTM 2010 Licensing Survey for North America showed total income of $2.4 billion, running royalty of $1.4 billion, cashed-in equity of $63.4 million, and other income of $452.3 million by its university members. The Survey also accounted for 657 new commercial products introduced, 4,284 licenses executed, 1,078 options executed, 398 executed licenses containing equity, 38,528 active licenses and options, 651 new companies formed and 3,657 startup companies still operating as of the end of FY2010 formed from university intellectual property.[62]

The measure of the economic impact of intellectual property is becoming a global effort. Metrics for Canada are also measured by AUTM and the organization is providing its format to the Association of European Science and Technology Transfer Professionals and Proton Europe (ASTP-Proton)[63] to gather more global data. In Asia, a study of the licensing impact of U.S. university research licensing activity over the period 1996 to 2007 estimated that the total contribution of university licensing to gross industry output at least $108.5 billion and as much as$457.1 billion. A moderately conservative estimate based on 5% royalty rates yields an estimated impact of university licensing on total industry output over 1996-2007 of $195.6 billion.[64]

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[61] Association of University Technology Managers (AUTM), Retrieved March 6, 2014 from http://www.autm.org/Home.htm.

[62] Association of University Technology Managers (AUTM) U.S. Licensing Activity Survey Highlights: FY2010, Retrieved March 6, 2014 from http://www.autm.net/FY_2010_Licensing_Survey/7008.htm.

[63] Retrieved March 6, 2014 from http://www.astp-proton.eu/.

[64] Technology Transfer, Intellectual Property and Effective University-Industry Partnerships, The Experience of China, India, Japan, Philippines, the Republic of Korea, Singapore and Thailand, WIPO Publication no. 928E.

4.4 Social

The International Chamber of Commerce[65] (ICC) states that the intellectual property system contributes to society by enriching the pool of public knowledge and culture; maintaining fair competition and encouraging the production of a wide range of quality goods and services; underpinning economic growth and employment; sustaining innovation and creation; and promoting technological and cultural advances and expression.[66] One of the key objectives of university researchers and their respective institutions is to impact the realm of knowledge and discover answers to questions that remain unsolved and problems that remain unresolved. Through the expansion of communication and knowledge management systems including the internet the world is a more connected community aware of global unmet needs and searching for ways to make a difference. While the protection of intellectual property arising from research is important as is the technology transfer of the intellectual property rights, generating income is not the only objective in the transfer of technology. This is especially relevant in the health sciences where there is greater risk that research results, if not properly protected, will be unable to create value and attract private or public entities seeking to use the research for public benefit.[67]

According to a report of The World Health Organization (WHO)[68], the directing and coordinating authority for health within the United Nations system, **"**currently, 4.8 billion people live in developing countries, representing 80% of the world population. Of this number, 2.7 billion, representing 43% of the world population, live on less than $2.00 (U.S) a day. Communicable diseases account for 50% of the developing countries' burden of disease. Furthermore, poverty, among other factors, directly affects the acquisition of health products and medical devices, especially in developing countries."[69] Today there are international collaborative programs focused on funding and commercialization to support addressing these and other global issues.

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[65] International Chamber of Commerce (ICC), Retrieved March 6, 2014 from http://www.iccwbo.org.

[66] International Chamber of Commerce (ICC), *The ICC Intellectual Property Roadmap*, 11th Edition, 2012 Retrieved March 5, 2014 from http://www.iccwbo.org/products-and-services/trade-facilitation/ip-roadmap/.

[67] Heher, Anthony D. , "Benchmarking of Technology Transfer Offices and What it Means for Developing Countries", *IP Handbook of Best Practices*, Chapter No. 3-5, Retrieved March 6, 2014 from http://www.iphandbook.org/handbook/ch03/p05/.

[68] World Health Organization (WHO), Commission on Intellectual Property, Innovation and Public Health, Sixty-First World Health Assembly WHA61.21, Global strategy and plan of action on public health, innovation and intellectual property, Agenda item 11.6 24 May 2008, Retrieved March 6, 2014 from http://apps.who.int/gb/ebwha/pdf_files/A61/A61_R21-en.pdf.

[69] World Intellectual Property Organization (WIPO) - UNU Joint Research Project, Impact of the Intellectual Property System on Economic Growth, Fact-Finding Surveys and Analysis in the Asian Region, General Remarks, Futoshi Yasuda, Associate Professor, National Graduate Institute for Policy Studies, Hiroshi Kato, Patent Examiner, Japan Patent Office, Retrieved March 6, 2014 from http://www.wipo.int/export/sites/www/freepublications/en/intproperty/1018/wipo_pub_1018.pdf.

The World Health Organization's Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property Rights (GSPoA)[70] calls for promotion of "transfer of technology and production of health products in developing countries through identification of best practices, and investment and capacity building provided by developed and developing countries where appropriate". The International Federation of Pharmaceutical and Manufacturer Association (IFPMA)[71] has published 50 examples of collaborative commercialization initiatives between companies in developed and developing countries that demonstrate that technology plays a central role in the economic and social transformation of these developing countries. These cases are accessible through the IFPMA Partnership Database[72] The study validates that the expanded use of technology in an economy tends that leads to improvement in the quality of production, generation of knowledge, improvement in living standards and productivity or efficiency of exports. Furthermore, it concludes that the technology transfer process results in investment in the production of food, medicines, steel, cars, electronics as one party gains access to a second party's technology, successfully learning and absorbing it, and implementing it in production.[73]

[70] World Health Organization (WHO), "Public health, innovation, intellectual property and trade," *The Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property*, Retrieved March 6, 2014 from http://www.who.int/phi/implementation/phi_globstat_action/en/index.html.

[71] International Federation of Pharmaceutical Manufacturers & Associations (IFPMA), Retrieved March 6, 2014 from http://www.ifpma.org/global-health/access/technology-transfer.html.

[72] International Federation of Pharmaceutical Manufacturers and Associations (IFMPA), "Developing World Health Partnerships Directory," Retrieved March 6, 2014 from http://partnerships.ifpma.org/.

[73] International Federation of Pharmaceutical Manufacturers and Associations (IFMPA), "Technology Transfer: a Collaborative Approach to Improve Global Health, Research-Based Pharmaceutical Industry Technology Transfer Policy Considerations, 2011," Retrieved March 6, 2014 from (http://www.ifpma.org/fileadmin/content/Publication/IFPMA_Technology_Transfer_Booklet_2011.pdf).

5 Methods of Commercialization

The commercialization of intellectual property rights from universities can occur through a number of pathways including internal development, accelerator models, incubation, joint ventures, and partnering.

5.1 Internal Development

Often the stage of development of the technology and research results underlying intellectual property rights is not sufficient to attract funding or the resources needed to create a startup or spinout company and the potential is yet to be proven or improved upon. In these cases it is often advantageous to explore the development of the technology and research results underlying intellectual property rights further though additional research and development within the university.

In many universities commercialization or proof of concept laboratories have been established along with seed funding to support this next stage of development. This is often helpful as the early stages of development often require a lot of hands on expertise by the inventor. Many universities are now engaging in interdisciplinary efforts to support the internal development of products.

One key example is in the area of pharmaceutical development where clinical translational research laboratories are providing the preclinical data and often performing clinical trials in affiliated hospitals. The Translational Genomics Research Institute (TGen)[74], a clinical commercialization network emerging from the University of Arizona as a non-profit 501(c)(3) research institutes, translates basic scientific discoveries into clinical applications such as new diagnostics and treatments. For reference, 501(c)(3), is a designation of the United States Internal Revenue Code for charitable organizations including many research universities, institutions, and foundations that deems them under a not for profit status and exempts them from many forms of taxes.[75] In the United States the National Institutes of Health has launched the National Center for Advancing Translational Sciences (NCATS)[76] as a new paradigm for translational research that involves government, academia, industry, philanthropy, and patient advocacy groups. Initially funded in 2012, the mission of NCATS to catalyze the generation of innovative methods and technologies that will enhance the development, testing and implementation of diagnostics and therapeutics across a wide range of human diseases and conditions.

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[74] The Translational Genomics Research Institute, Retrieved March 6, 2014 from http://www.tgen.org/.

[75] Fritz, Joanne, 501(c)(3) Charity, About.com Guide, Retrieved March 6, 2014 from http://nonprofit.about.com/od/glossary/g/501corporation.htm.

[76] U.S. Department of Health and Human Services, National Institutes of Health (NIH), “NIH Launches National Center for Advancing Translational Sciences," December 23, 2011, Retrieved March 6, 2014 from http://www.nih.gov/about/director/ncats/12232011_statement_NCATs.htm.

5.2 Acceleration and Incubation

The development of startup or spinoff companies commercializing university intellectual property is often conducted in an incubator and supported through accelerator programs which can provided the guidance, support and funding to assist in the development of these companies. The depiction below (Figure 9) shows the relationship between the incubator facility and the programs and people needed to establish successful companies.

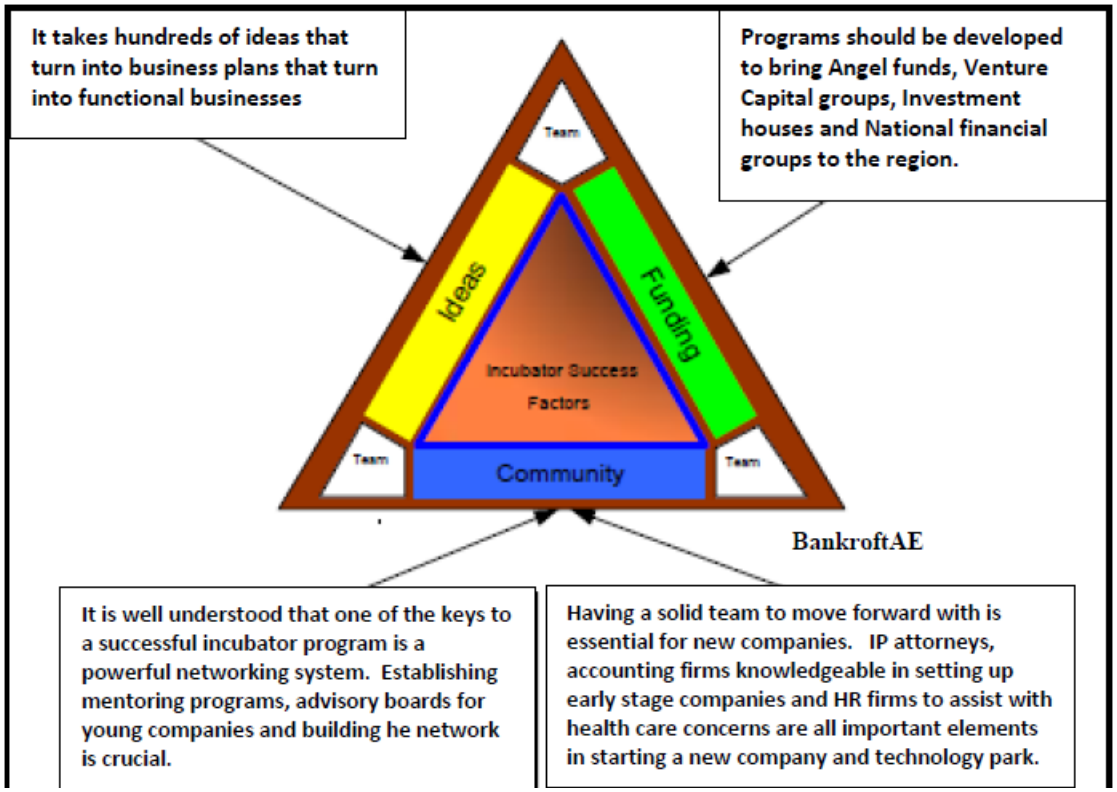

FIGURE 9: INCUBATOR PROGRAMS AND INITIATIVES

Source: Bancroft Architects + Engineers

An incubator is a facility that houses multiple early stage companies and is often associated with one or more universities and may be supported by a public, a private, or a public-private partnership. Incubators are may be located within a university campus, at a nearby research park or in a commercial space. Incubators often provide shared resources including research and business equipment, business development services, and support programs and guidance for early stage companies. The National Association of Business Incubation[77] (NBIA) estimates that there are 7,000 incubators worldwide.

[77] The National Association of Business Incubation (NBIA), Retrieved March 6, 2014 from http://www.nbia.org/about_nbia/.

Accelerators have evolved as a resource for the expanded services provided to early stage companies including support with technology transfer, partnering, business development, and are often affiliated with acquiring early stage funding for companies. These have been effectively established as program within universities, as part of the scope of incubators, or as independent programs or companies developing startup companies from university intellectual property. Accelerators are diverse in both the scope of services, resources, and programs that utilize to build value for the early stage companies they support and invest in.

One very successful accelerator model has been developed by YCombinator[78] which provides funding to multiple companies twice a year with the requirement that they engage in a 10 week boot camp in San Francisco that provides support, training, mentoring, and introduction to other investors. Established in 2005 under a new model for startup funding, YCombinator, invests twice year a seed investment averaging $18K in a large number of startups. These companies must who must move to Silicon Valley for 3 month for intensive training and development to build and prepare the company for their pitch to investors. The program culminates in a Demo Day when the startups present to a large audience of investors and afterwards continues with support through an alumni network.

Seeqnce[79], a Beirut, Lebanon accelerator launched in 2011 to accommodate the entrepreneurial startup opportunities in Arab countries adapted the YCombinator model and practices of other accelerators. Seeqnce ALICE, as it is now known, has a one year cycle that is composed of a 6 month selection process required of individuals. Those who go successfully through the selection process to form teams of a business person, a developer, and a designer based on members' expertise for a 6 month acceleration program.

5.3 Joint Ventures and Partnering

Often industries collaborate in the commercialization of intellectual properties from universities and want to engage the continued participation of the inventor and ability to gain access to the technology for their applications. This can be accomplished through a collaborative partnership directly with the university or with an established startup company that holds the license to the intellectual property. Today many major corporations have established corporate venture entities to maximize their outreach for new innovation as well as optimize the ability to apply value through their internal innovation resources and know how. One example is SR One[80], founded in 1985, is the corporate venture capital arm of GlaxoSmithKline and has invested over $680M globally in approximately 30 emerging biotech companies. The firm takes an active role in portfolio companies and works with management teams and other venture investors to optimize value.

Alternatively, a company can be established where the company is formed to hold the intellectual property and the industry partner has equity through a joint venture. This often provides an arm's length relationship to the company and enables the attraction of resources and acceleration of the development without encumbering the company's internal resources.

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[78] YCombinator, Retrieved March 6, 2014 from http://ycombinator.com/about.html.

[79] Seeqnce, Retrieved March 6, 2014 from http://www.crunchbase.com/company/seeqnce.

[80] SR One, Retrieved March 6, 2014 from http://www.srone.com/.

An example of this model isM2GEN[81], a for-profit Moffitt subsidiary of The H. Lee Moffitt Cancer Center & Research Institute (Tampa, Florida, USA) joint venture with Merck & Co. to connect patients to a cure by accelerating the discovery and delivery of personalized medicine.

5.4 Regional Ecosystems and Clusters

A cluster is defined as a geographic concentration of interconnected businesses, suppliers, and associated institutions in a particular field and is considered to increase the productivity with which companies can compete, nationally and globally. One of the key aspects of a cluster is the development of critical mass, a large enough concentration of companies to provide sharing of resources, secondary impact, and the attraction and development of new resources. Often this occurs as a matter of necessity as in the case of the emergence of San Diego as a technology community. While in the early 1980's the town was considered remote and without many technology companies, flagship companies including Hybritech formed the nexus of the initial biotech industry and the emergence of a new model. Today this model actualized by CONNECT[82] is based on distributed partnerships among complementary firms within and outside of the region may enhance the likelihood of the region producing large, vertically integrated biotech firms.[83] Originally founded as a part of the University of California (UC) San Diego , CONNECT is a regional program that catalyzes the creation of innovative technology and life sciences products in San Diego County by linking inventors and entrepreneurs with the resources they need for success. Since 1985, CONNECT has assisted in the formation and development of more than 3,000 companies through a unique culture of collaboration between industry, capital sources, professional service providers and research organizations.

[81] M2GEN, Retrieved March 6, 2014 from http://m2gen.com/.

[82] CONNECT, "About Connect," Retrieved March 6, 2014 from http://www.connect.org/about/.

[83] The United States Study Center at the University of Sydney, Biotechnology Cluster Project San Diego Analysis, Report prepared for the US Studies Centre by Global Connect, April 2010, Retrieved March 6, 2014 from http://connect.org/about-connect/.

Alliance for Commercialization of Canadian Technologies (ACCT Canada)
www.acctcanada.ca[84]

ACCT Canada is a nationwide organization supporting those working at the intersection of academia, research and industry to partner with and commercialize Canadian technologies. Serving as the nexus for Canada's innovation ecosystem, the organization centers on activity in four areas: advocacy, professional development, tools development & implementation and networking.

Established in 2005 as a not for profit organization, ACCT Canada's membership includes publicly funded research organizations such as universities, hospitals, colleges, polytechnics, and federal laboratories as well as private sector organizations, companies and individuals. Numerous partnerships have been formed with like-minded organizations in Canada and abroad. The organization has created and continues to develop platforms, instruments and training programs that address the complexities at the interface of academic research and business/industry.

Structure:

ACCT Canada is funded solely through its members and activities including membership dues, events and projects funded by stakeholders including government agencies. The academic membership reflects all areas of science and technology including the social sciences. Industry and association memberships and strategic alliances include the pharmaceutical and biotechnology industries, professional service provider organizations, sector-specific membership-based organizations and individuals interested in the academic research/industry interface.

Services:

Currently, ACCT Canada's membership includes over 130 organizations representing approximately 500 individuals. Membership benefits include access to a proactive website containing data and information links, dedicated communications including listservs and newsletters. Its main event is the Innovation Conference, a partnership conference for early stage technologies and companies and organizations to streamline and accelerate collaborative commercialization efforts. The other cornerstone conference is the annual Innovation Leaders Forum which brings together leadership of commercialization

[84] Alliance for Commercialization of Canadian Technologies (ACCT Canada), Retrieved March 6, 2014 from www.acctcanada.ca.

stakeholders and provides information on best practices through panels and keynote presentations.

Commercialization Activity:

According the Association of University Technology Managers Survey of Licensing Activity for 2011, Canadian academic research institutions established 68 startups, an increase of 36% over 2010, and a total of $5.4B in academic research. As well technology transfer offices in Canadian academic research institutions filed 951 U.S. patent applications and executed 460 licenses.

Key Issues:

There are some serious investment issues in Canada for early stage companies. Specifically, there is a gap in early stage capital with the appetite for long term investment to yield returns. As well there is a shortage of "deep pockets" from angels and venture capitalists for investment into early stage ventures in growth phases and often resulting in an outreach to the United States. Canadian companies struggle with low valuation as compared to their US counterparts.

FIGURE 10: CASE STUDY - ACCT CANADA

The development of a regional ecosystem for the commercialization of intellectual property from universities involves the participation and commitment from many stakeholders to build the resources needed to support the emergence and growth of startup companies. This includes intellectual property support, business development, facilities, management, and funding. Successful regional ecosystems also require the engagement of legislators to attract and allocate funding and resources to support the development of this "new economy". As technology led economic development occurs over extended periods of time it is imperative that there be a continuum of support to ensure continued growth.

6 Evaluation of Technologies for Commercial Potential

6.1 Commercialization Due Diligence

University and commercialization programs should establish a set of criteria for due diligence to evaluate the commercial potential of a new invention to develop a strategy for either licensing or a startup.

6.1.1 Commercialization Due Diligence Checklist

A due diligence checklist is often constructed to provide a process that both evaluates the commercial potential and gauges the interest and opportunity based on the inventor. This checklist is based on key criteria to help define the best pathway for creating value and impact from the invention and associated intellectual property. Most universities use a due diligence – commercialization checklist.[85] The checklist assesses the following areas:

1. Market Assessment
2. Intellectual Property Audit
3. Stage of Development
4. Regulatory Issues
5. Financial Requirements
6. Research and Development Requirements

Figure 11 below from the University of Utah Startup Guide[86] provides one summary used to define the key distinctions between licensing and startup preferences. Key criteria include assessment of the technology, intellectual property, market, funding, and regulatory.[87]

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[85] Mendes, Phillip, World Intellectual Property Organization (WIPO), "IP Due Diligence Readiness," Retrieved March 6, 2014 from http://www.biopark.ee/cmsimple/images/file/On-Line-material-on-Intellectual-Property-in-RD-and-Business.pdf.

[86] University of Utah Technology and Venture Commercialization, "Startup Up Guide," Retrieved March 6, 2014 from http://www.tvc.utah.edu/tco/startupguide.php.

[87] *ibid*.

Licensing preferences	Startup preferences
Technology	
Technology represents an incremental improvement to existing technology used by existing and already established companies Technology is market ready	Technology is usually disruptive Platform technology Technology is far from market ready No appropriate licensee Broad range of potential applications for technology
Intellectual property protection	
Crowded field, potential infringement risk	Potential to mitigate risk (exit strategy)
Market	
There is an existing market, customer loyalties exist towards particular companies Well established distribution channels have already been created by existing companies	New market with potentially high market demand Clearly defined and addressed need Reasonable chance for overcoming barriers for entry Short time to market Large market with significant growth potential Significant profit margins
Availability of Investment / Funding and Management	
Nature of technology makes raising capital difficult in comparison with others No management team available	Investors and funding can easily be identified Inventors are willing to dedicate time and resources and have the desire to be involved
Regulatory Considerations	
In house resources available at existing companies QA system in place	No Funds available to acquire No expertise in securing regulatory approval

FIGURE 11: KEY DISTINCTIONS BETWEEN LICENSING AND STARTUP PREFERENCES

Source: University of Utah Technology and Venture Commercialization Office

6.1.2 Commercialization Due Diligence Considerations

The objective of commercialization is the creation of value and reduction of risk and is centered on the key elements of time, money and management. The resources required for commercialization to convert an original or new idea, concept or design to a desired product available in the marketplace as defined by the United Nations Economic Commission for Europe[88] (UNECE) are time, funds (own or borrowed), creative effort, innovative effort (own, of employees and of external collaborators, partners, advisors and consultants), persistence, focused management of the entire process from idea to market. Furthermore, obtaining the existence of a customer or the ability to create customers and an entity controlling the manufacture and sale of the resulting products are needed.[89]

However, there are other considerations that may determine what the best options are. Figure 12 below is a decision chart developed by Foresight Science and Technology to analyze both the required activities and the points at which a choice should be made regarding the path to go forward or not.

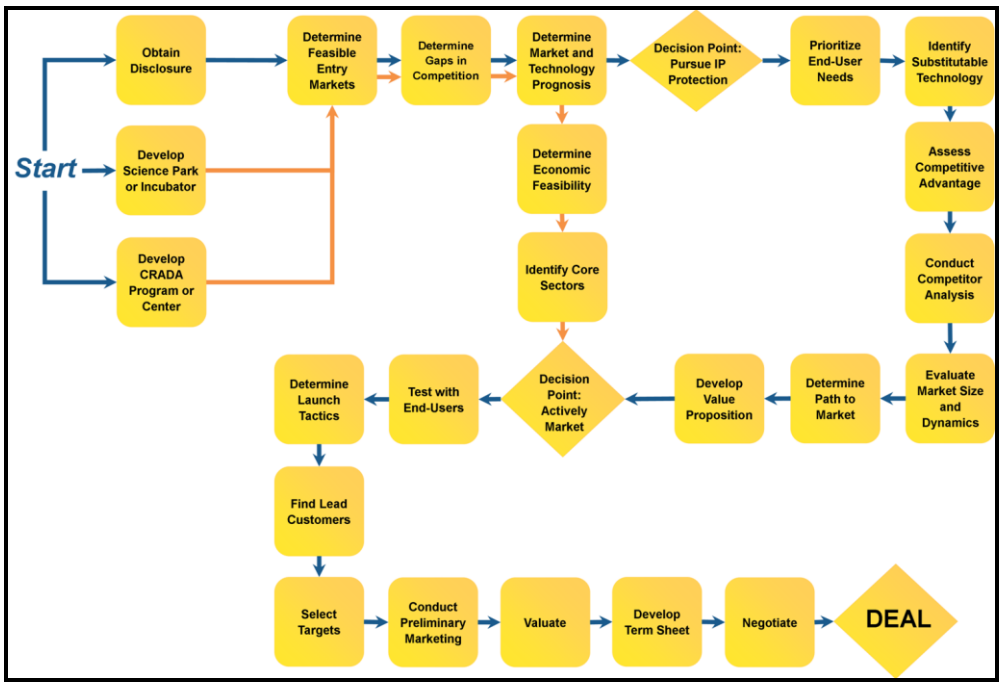

FIGURE 12: DECISION CHART FOR COMMERCIALIZATION

Source: Foresight Science & Technology

[88] United Nations Economic Commission for Europe (UNECE), Retrieved March 7, 2014 from http://www.unece.org.

[89] United Nations Economic Commission for Europe (UNECE), "Intellectual Property Commercialization: Policy Options and Practical Instruments," Retrieved March 7, 2014 from http://www.unece.org/fileadmin/DAM/ceci/publications/ip.pdf.

Some key considerations include:

Field of use or Market Area

Startups may pursue defined applications or markets based on demographic boundaries and others may be licensed by the university or through the startup company as a funding source. For example a broad medical platform may have both therapeutic and diagnostic applications. A startup company may have only the capacity to focus on one area and perhaps a few indications. The other areas of application or indications still hold value through licensing or partnership directly from the university or through the startup depending on the structure of the licensing agreement.

Freedom to Operate

To fully commercialize a technology there may be some need for access to and use of additional intellectual property rights from other sources. Freedom to operate (FTO) is the process of determining if the commercialization of a product or service can be done without infringing valid intellectual property rights of others. In order to do this study it is important to define the applications that are going to be developed, the manufacturing processes employed, and the countries in which you intend to pursue use. To accomplish this analysis there are both publically available open source intellectual property tools such as the databases of national and regional IP offices (e.g. USPTO, EPO, SIPO (China), JPO (Japan), DPMA (Germany), or those available through Patent Lens[90], a worldwide, open-access, free full-text patent informatics resource or there are a number of established commercial patent service providers and law firms that can determine freedom to operate.

Expertise in the Field

Early stages of development require the participation of the inventor in most cases and also often require additional expertise (such as process engineers, product development experts, designers, marketing and financial experts, IP lawyers, etc.). For many inventions the required expertise for development may not be readily available in the local community or easily accessed through remote networks and may be a consideration for pursuing commercialization. Often this will lead to a choice of creating partnerships and collaborations or reverting to a license for a technology for which there is not expertise to support the commercialization internally or as a university startup.

University Strategy

The focus of the university to support new startups and the commercialization of technologies will often determine the pathway of commercialization. The university can provide resources, acknowledgment, and academic reward or commercialization may be considered to be counter stance to the academic focus of the institution. This is a matter of the culture of the university towards intellectual property development and commercialization.

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[90] Patent Lens, Retrieved March 7, 2014 from http://www.patentlens.net/daisy/patentlens/patentlens.html.

Geron Corporation

Geron Corporation is a cancer therapeutics company focused on the use of innovative platform technologies. Currently the company is evaluating in clinical trials approaches that include inhibiting telomerase using proprietary nucleic acid chemistry and delivering an anti-cancer agent into the brain using a novel peptide-drug conjugate. A main thrust of the company's effort is in an additional innovative platform, embryonic stem cells.

The Company initially held exclusive rights to cell types derived from embryonic stem cells, as the result of paying for the research originally conducted by Dr. James Thomson at the University of Wisconsin–Madison. These stem cells include hepatocytes, myocytes, neural cells, pancreatic islet cells, hematopoietic cells and osteoblasts. The Wisconsin Alumni Research Foundation (WARF) is responsible for the patenting and licensing of IPRs for the University of Wisconsin to companies and granted exclusive license to Geron for R&D in therapeutic and diagnostic fields of use (1999) in what is considered a standard technology transfer agreement.

In 2001, pressure by the public on WARF to support the commercialization and development of these embryonic stem cell lines led to limiting of development by Geron for only three of the cell types. During this time in its development, the company developed an extensive portfolio of patents based on the expansion of method and application patents. The company pursued the first clinical trial. While Geron did treat four patients in a phase I trial for spinal cord injury, in November of 2011 the company returned all rights to WARF and exited the stem cell platform of their company. In November, 2012, The Company signed a letter of intent with BioTime Acquisition Corporation (BAC) for intellectual property and other assets related to Geron's discontinued human embryonic stem cell programs.[91], [92]

FIGURE 13: CASE STUDY - GERON CORPORATION

6.1.3 Optimizing Commercialization Due Diligence Review

Establishing a uniform process for commercial review of technologies often expedites the time required to complete due diligence and can improve the satisfaction for inventors. This process generally involves the technology transfer office, the inventors, and external advisors including those in business development, finance, and the market areas.

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[91] Geron Corporation, United States Securities and Exchange Commission, Form 10-K, December 31, 2011.

[92] Geron Corporation, Investor Relations, Geron Announces Non-Binding Letter of Intent with BioTime Regarding Stem Cell Assets, Retrieved March 7, 2014 from http://ir.geron.com/phoenix.zhtml?c=67323&p=irol-newsArticle&ID=1759506&highlight.

Universities will establish review teams that meet on a regular basis or as needed with a set review committee and external advisors or that have been constructed based on a particular opportunity to assess the commercial potential. The inclusion of external advisors also provides a non-university based perspective of the opportunity and may also lend access to resources to support licensing or startups.

6.1.4 Resources for Commercial Due Diligence

The review for commercial potential is often accomplished by conducting primary and secondary research on the intellectual property rights in the focused area for commercialization, competitors in the space, and the management. It may be useful to systematically prepare (or order the preparation) of a patent and technology landscape report, which can regularly be updated to reflect R&D and other developments. There are many resources to support the review process including:

Company and Competition

Company and competitor's literature and websites

Company and competitor's presentations and publications

Market Size

Financial information from US Security and Exchange Commission (SEC) Filings or national equivalent data, http://www.sec.gov/edgar.shtml[93]

Trade organizations and publications

Marketing reports: (ex. Frost and Sullivan[94], CHI[95], Decision Resources[96]

Management

Management background from resumes, and biographies

Management background from LinkedIn – www.linkedin.com[97]

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[93] U.S. Securities and Exchange Commission, Filings & Forms, Edgar, Retrieved March 7, 2014 from http://www.sec.gov/edgar.shtml.

[94] Frost and Sullivan, Industries and Markets, Retrieved March 7, 2014 from http://www.frost.com/prod/servlet/research.pag.

[95] Cambridge Healthtech Institute (CHI), Insight Pharma Reports, Retrieved March 7, 2014 from http://www.insightpharmareports.com/.

[96] Decision Resources, Product Overview, Retrieved March 7, 2014 from http://decisionresources.com/products-and-services.

[97] LinkedIn, Retrieved March 7, 2014 from www.linkedin.com.

Intellectual Property

Patent office searches for other technologies
WIPO GOLD – http://www.wipo.int/wipogold/en/[98]
EPO – http://www.epo.org/searching.html[99]
USPTO – http://www.uspto.gov/patents/process/search/[100]
Patent Lens – http://www.patentlens.net/[101]

[98] WIPO Gold, "The Global IP Reference Resource," Retrieved March 7, 2014 from http://www.wipo.int/wipogold/en/.

[99] European Patent Office, Searching for Patents, Retrieved March 7, 2014 from http://www.epo.org/searching.html.

[100] United States Patent and Trademark Office, Searching for Patents, Retrieved March 7, 2014 from http://www.uspto.gov/patents/process/search/.

[101] Patent Lens, "Searching for Patents," *op. cit.*

7 Determination of the Commercialization Pathway

Based on the review of the commercial potential the TTO or TLO of the university will often determine a preferred pathway for the technology transfer and commercialization that can include further internal development, commercial licensing, a joint venture or partnering or a startup or spinout.

7.1 Internal Development

For intellectual property with commercial potential in early stages additional internal development can be an excellent choice to further refine the invention, gather additional data, expand the intellectual property portfolio, develop a prototype or establish a proof of concept. Internal development also provides proximity to the inventor and easy access to the facilities, equipment, expertise, and expansion of intellectual property within or supported by the university.

Many universities have established proof of concept laboratories. Notable are the Deshpande Center at MIT[102] and the von Liebig Center at UCSD[103].[104] These centers are tied to university proof of concept funds and provide the resources to accomplish further development and fill the gap to early stage funding. These centers also provide access to a network of resources and mentors to support the development of the proof of concept.

7.2 Commercial Licensing

Commercial licensing may be determined to be the best pathway after analysis. These conclusions may include considerations related to the intellectual property, management, market, or financial considerations. Many universities will establish a list of minimum conditions related to these factors that determine the justification of a commercialization effort and make the technology and associated intellectual property rights attractive to potential partners and customers. The 411 below reflects some of the reasons why the commercialization may not yet be affordable and what has to be done to make the commercialization / licensing option viable.

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[102] Massachusetts Institute of Technology (MIT), Deschpande Center for Technological Innovation, Retrieved March 7, 2014 from http://web.mit.edu/deshpandecenter/.

[103] University of California San Diego (UCSD), Jacobs School of Engineering, Von Lebig School of Entrepreneurism Center, Retrieved March 7, 2014 from http://www.vonliebig.ucsd.edu/.

[104] Gulbranson, Christine A., Audretsch, David B., Groff, Isabel, and Dalton, Samantha, *Proof of Concept Centers: Accelerating the Commercialization of University Innovation*, Ewing Marion Kauffman Foundation, 2008, Retrieved March 6, 2014 from http://sites.kauffman.org/pdf/poc_centers_01242008.pdf.

Intellectual Property	Need for additional intellectual property to operate Scope of intellectual property claims is too narrow to support a startup
Management	Lack of startup interest by the inventor, retirement, relocation, or death Unable to generate interest or recruit management
Market	Market opportunity too small or field too narrow to support a startup Market is too crowded with alternative approaches
Financial	Capital investments needed for development exceed the capacity of investors Technology area is not in favor with investors

FIGURE 14: COMMERCIALIZATION CONSIDERATIONS FOR INTELLECTUAL PROPERTY

7.3 Joint Venture or Partnering

A choice to commercialize research results and technology and the related the IPR portfolio through a joint venture (JV) or partnering may be a preferable pathway. In a joint venture the businesses agree to set-up a new entity and new assets by each contributing equity. This provides for shared control over the enterprise and revenues, expenses and assets. Business partnering is "the development of successful, long term, strategic relationships between customers and suppliers, based on achieving best practice and sustainable competitive advantage" [105]

Often this approach enables the development of a new company that can best leverage the resources of each contributor to provide what is needed to ensure success, create value, and meet the established conditions of satisfaction. Often for early stage companies this is realized by engaging strategic investors whereby large companies provide financial investment, human capital, production, marketing, distribution, and sales as long term agreements. Based on the success of the company the strategic partner may also provide an exit strategy through acquisition.

IP owners (e.g. universities, inventors) should seriously consider the pro and cons of the options for participation in the JV through their IPRs – either to assign the IPRs to the new entity (JV, start-up, spin-off, etc.) or to grant an exclusive license for a clearly defined period of time. Assigning the IPRs may result in limiting the freedom to operate of the original IPR owner, while a license agreement for a time-barred exclusive license may clearly provide for preserving the rights of the inventor / IPR owner to continue using such IPRs for R&D and search for additional commercialization opportunities.

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[105] Lendrum T., *The Strategic Partnering Handbook, A Practice Guide for Managers*, (McGraw-Hill, Nook Company, 1997), Retrieved March 6, 2014 from http://www.amazon.com/Strategic-Partnering-Handbook-Tony-Lendrum/dp/0074713264.

7.4 Startup and Spinouts

Establishing a startup or spinout company to commercialize certain university intellectual property rights can be a viable option based on the resources of the external licensee or the university to support the success of the new company.

Startup and spinout companies are distinguished by the affiliation of the company founders within or outside of the university. A startup is a company created by people outside of a research institution and built on a university granted license for one or more technologies and draws its other resources from elsewhere. In a spinout company the institution invests its own resources to form and incubate the company up through the first round of venture capital investment and usually involves the transfer of existing university staff into the new company, either on a permanent or on a temporary basis.[106] Often both types of companies are referred to as startup companies.

8 Deal Structures for Commercialization

Once a startup pathway has been established for commercialization it is necessary to determine the structure of the licensing deal from the university. The review process can take up to six months. Depending on the structure of the university, the final approval for seeking intellectual property protection may be within the Intellectual Property Office or Technology Transfer Office, the Office of the Chancellor for Research, or elsewhere.

8.1 Distribution of Revenue

Usually the University Intellectual Property Policy also defines the allotment of revenue generated from intellectual property rights to ensure fair and equitable distribution of the benefits to of all from having contributed to the development of the innovations and inventions. This usually involves a split between the inventor(s) and the university as it relates to commercialization of intellectual property. Some university policies will eliminate revenue distributions to inventors if they are the founders of the licensing company. This policy is often established to eliminate a conflict of interest as well as profiting on both sides of the transaction.

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[106] Technology Application and Promotion Institute World Intellectual Property Organization (WIPO) Regional Seminar on Support Services for Inventors, Valuation and Commercialization of Inventions and Research Results organized by the World Intellectual Property Organization (WIPO) in cooperation with the Technology Application and Promotion Institute (TAPI) of the Department of Science and Technology of the Philippines, Manila, 1998, Retrieved March 6, 2014 from http://tiny.cc/ov7upx.

8.2 Licensing Options

For startups a licensing option is often seen as a fast and less expansive means of ensuring access to the intellectual property rights for commercialization while the company is raising funds. It usually includes terms that require the entrepreneur or company to raise some level of investment within six to twelve months that will apply to the established licensing fee or be relinquished if the terms are not met.

8.3 Upfront Fees

An up-front licensing fee is a onetime fee due at the execution of the license agreement, or on an otherwise agreed to date or payment schedule. The amount of this fee is related to the value of the invention and rights granted to the licensee. For startups, an issue fee might be postponed until capital is raised.

8.4 Annual Fees

An annual licensing fee is the fee for each year the license is in effect after the company's year of initial licensing. For early stage companies these may be moderated to accommodate the stage of investment and be more heavily weighted once the company is sufficiently funded.

8.5 Milestone Payments

Milestone payments are agreed upon fees as specific times or based upon the completion of stages of development in the commercialization process leading to the sales of products or the company. As well these may also be tied to the stages of investment for early stage companies.

8.6 Royalty

Royalties are usage-based payments made for the right to ongoing use of an asset, sometimes an intellectual property right. Royalties are typically agreed upon as a percentage of gross or net revenues. Royalties are often used as a way of putting the obligations of return from investment into the company through intellectual property into a later stage of development for the company and reducing or eliminating the upfront, annual, or milestone payments.

8.7 Equity

Equity is a stock or any other security representing ownership interest in a company. In many universities equity in early stage companies is used to ensure oversight of the activities of the company, enable the ability to support the growth and success, assist with follow on funding, and to provide an option for financial gain.

8.8 Sponsored Research

Sponsored Research is research under research contracts with industry that is performed by university employees that uses space, facilities, equipment, or property of the institution. Many licensing partners and early stage companies will engage in sponsored research agreements to gain access to the knowledge and skills of the inventors, key facilities, and equipment needed to accelerate and reduce the costs associated with the development of the invention or process.

9 Considerations for Startups and Spinouts

9.1 University Requirements

Universities have a number of variances in the requirements for new startup companies. The most common model is when a lead entrepreneur or venture capital investor establishes a corporation and a license is granted to the startup which is responsible for meeting the terms of the agreement. Key considerations by the university will include the participation and support of the university inventor, a commercialization or business plan with development milestones, a pathway to market launch and exit, and the ability to execute and perform. In addition, for a university startup there are intellectual property requirements, financial conditions, management obligations, and other concerns including conflict of interest.

As well, it is important to consider the relevance and ability to navigate university industry technology transfer impediments which include institutional, Informational, organizational, and environmental barriers.[107] This can often determine the go/no go decision to commercialize a technology weighed against the time, effort, associated costs and return on value.

9.1.1 Intellectual Property Requirements

The university requirements for startup companies include an established option or license of the intellectual property portfolio. The license agreement will often require the repayment of licensing and legal fees, the first option for license or inclusion of additional inventions, and the disclosure of all related inventions by the university inventor resulting from the funding and research of the university.

9.1.2 Financial Investment Requirements

Having access to capital is essential for the success of most startups. The university may establish a series of financial investment milestones based on time and amount of investment that determine the maintenance of the license. As there are often unseen obstacles and delays in company formation and financing these terms are often modified or renegotiated.

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[107] Kober, Christopher, Kulke, Elam and Dannenberg, Peter, *Enhancing Knowledge-Based Regional Economic Development: Potentials and Barriers for Technology Transfer Offices*, (Humboldt University of Berlin, Berlin, Germany, October 9, 2009).

9.1.3 Management Requirements

The university may establish conditions for the inclusion or attraction of seasoned management to the company including hiring an experienced entrepreneur either on a part time or full time basis aligned with the level of development and funding. As well, universities may or may not allow inventors to participate in the management of the company and may limit the time that they or other university faculty may spend as consultants.

9.1.4 Conflict of Interest

Having the participation of the inventor in the startup is key consideration for most universities. To ensure that this participation does not detract from the success of the company or relationship with the university the university may establish a conflict of interest policy. The conflict of interest policy addresses the participation and investment of university faculty in new startups based on the license of their intellectual property. This is done to ensure that there is no conflict related to the use of time, research funding, facilities, equipment, or university resources without formal agreement or compliance with other established university policies or requirements. Most universities have a policy as established by the office of technology transfer. An example is the Policy on Conflicts of Interest related to the Intellectual Property and Commercial Interests[108] at the University of Massachusetts.

9.2 University Policy for Startups

Having university policies in place that support, encourage, and enable the commercialization of technology is imperative for building a culture of innovation as is the availability of infrastructure to support the development and growth of commercialization initiatives inside and related to the universities research efforts. The American Distance Education Consortium[109] provides a list of University Intellectual Property Policies that can be used as a guideline.

9.2.1 Intellectual Property

Most universities have adopted university intellectual property policy guidelines that define the terms, conditions, and process for the development and management of intellectual property rights developed by the faculty and staff. Following are some of the key aspects of university intellectual property policy relevant to commercialization.

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[108] University of Massachusetts, *Conflict of Interest Relating to Intellectual Property and Commercial Ventures Policy*, Doc T96-039, April 2, 1997, Retrieved March 6, 2014 from http://www.umass.edu/research/conflict-interest-relating-intellectual-property-and-commercial-ventures-policy.

[109] The American Distance Education Consortium (AEDC), "University Intellectual Property Policies," Retrieved March 6, 2014 from http://www.adec.edu/user/ip-policies.html.

Rights to Invention

The definition of ownership of invention resulting from work conducted within the university by faculty and staff varies from country to country. In most many countries policy has emerged that has enabled the rights of invention to belong to the research institution. Often this is guided by national law. There are countries where inventions generated within research institutions belong to the research inventors. As well, within the university the intellectual property rights have to be defined related to the faculty and staff as well as the students.[110]

WIPO research on "A Study on Technology Transfer, Intellectual Property Rights and University-Industry Partnerships: The Experience of China, India, Japan, Philippines, the Republic of Korea, Singapore and Thailand" identified a number of key justifications for universities having ownership over the intellectual property of their academic inventors.[111]

These include:

- Generating additional income for the university
- Creating the necessary incentive for the university/R&D institution to support the transfer of technology
- Costs of patenting are too high for the individual researcher to fund
- Avoids fragmentation of ownership between multiple owners inhibiting commercialization
- Enables technology transfer activities and allows researchers to focus on research skills.
- Ownership by the university and management of IP rights.

Process for Invention Disclosure

For each possible invention that occurs within a research institution the intellectual property policy defines the Invention Disclosure Process for what needs to be revealed to the institution to determine the potential and merit for intellectual property coverage. It identifies as well the inventor(s) and their respective contribution to the invention. This process is normally defined to ensure that inventions are not disclosed to the public first through conversation, publication, or presentation, or grant filing without protection. What is required to be disclosed based on university based research normally includes:

- Patentable inventions, products, processes, discoveries, or plant varieties
- Materials including DNA libraries, bacterial strains, chemicals, and other compositions of matter copyrightable works

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[110]Canadian Association for Graduate Studies (CAGS), *A Guide to Intellectual Property for Graduate Students and Postdoctoral Scholars*, (Ottawa, ON)

[111] Krattiger, Anatole, Ed., *IP Handbook of Best Practices*, Chapter 13.5, "New Companies to Commercialize IP: Should You Spinout or Start-up?, " Cathy Garner, Chief Executive Officer, Manchester: Knowledge Capital, U.K., Philip Ternouth, Associate Director, R&D and Knowledge Transfer, Council for Industry and Higher Education, U.K., (http://www.iphandbook.org).

Disclosure Review

Upon receipt of the Invention Disclosure the technology is identified and submitted to an initial review that contains information about the invention's stage of development, novelty, market potential, possible licensees and collaborators, and the inventor intentions. This initial assessment is then often submitted to an Intellectual Property Review Committee who makes recommendations on how to proceed:

- Send the invention back for further development
- Release the invention to the inventor
- License to a research sponsor for development
- File for intellectual property protection

Filing Considerations

Constructing and filing for and obtaining intellectual property protection through the patent process can be time consuming (often in some cases six years or more) and expensive. It requires research to ensure the invention is patentable, has market potential, and that the patent application is well constructed with appropriate claims to ensure it will have value and practical application. While this may be accomplished internally with the appropriate support, often much of the process is outsourced to specialized patent legal firms for construction, and filing and follow-up.

Protection in other countries and Maintenance Considerations

The IP Policy will also provide guidance on seeking IP protection abroad. Obtaining and maintaining IP rights for research results is a capital and time intensive process. Following filing for patent protection in the home country, a decision has to be made whether and where to seek protection internationally. The best and cost effective way to seek IP protection in other countries is through the PCT (Patent Cooperation Treaty).

Furthermore, the Intellectual Property Policy will also define the options for ceasing the continuation of intellectual property protection or the selection of other options. After initial filing through the PCT for international protection in participant countries, the requirement to file and the associated fees for each state or region where protection is sought can be costly. At this this time consideration is often given to the progress in creating value, establishing partnership, licensees, and startups around the intellectual property. As well other considerations such as the death, retirement, or transfer of the researcher to another institution may affect either the abandonment or transfer of the intellectual property responsibility to the inventor, a research and development organization, or another institution. These considerations will often affect the choice to commercialize, license, or abandon the protection for the invention.

Abandonment or Assignment

If the university chooses not to continue with support for the protection of the intellectual property the Intellectual Property Policy defines what happens. Some institutions have decided that intellectual property may be owned by the research institution and may be assigned back to the inventor should the institution not choose to proceed with intellectual property support rather than abandonment of the protection. It also defines the responsibility for repayment of the intellectual property costs and may include a requirement payment of or allocation for licensing revenue, royalty, or equity depending on the pathway for commercialization.

9.2.2 Inventors and Faculty

An inventor's participation may be recognized by the university as necessary to enable the transfer of the know-how and application development process, the commercialization potential of the invention and to ensure the success of the license agreement. The ability for an inventor to participate as a member of the management of a startup or as a consultant to any company is detailed in universities Intellectual Property Policy.

Participation as Management

University Intellectual Property Policy often defines the encouragement, discouragement, or prohibition of faculty from serving as part-time or full-time management in a startup. If permitted, the policy will may also define the overload conditions for employees that are engaged in more than 100% of their full time employment capacity. The policy will also generally define options for sabbatical leave to allow the inventor to serve as support to the early stage development of the company and later transition back into the university.

Participation as Consultants

University Intellectual Property Policy usually defines the encouragement, discouragement, or prohibition of university faculty from serving as consultants to companies including startups. The policy will often define the amount of time that can be spent doing consulting by faculty, often ranging from 10% - 20% of their time. The policy will also establish the guidelines for the use of university resources for this consultancy and any requirements for university sponsored research. The policies come from academic affairs human resources. In U.S., Canada, and most EU countries, faculty is allowed to consult. In the U.S. it is typically 52 days per year. The activity is administered under the university's conflict of interest and commitment policies, usually under the oversight of research administration.

9.2.3 Financing and Licensing Revenue

The institution's Intellectual Property Policy will address the financial considerations associated with the intellectual property. This includes the expenditure of funds for intellectual property development and protection and to support commercialization. The policy also addresses the distribution of revenue realized from licensing, sale, or infringement of the intellectual property.

Distribution of Revenue

The university's Intellectual Property Policy defines the distribution of revenue generated from commercialization and related IPRs to ensure fair and equitable distribution of such income benefiting from innovations and inventions. This usually involves a split between the inventor(s), department or school and the university at large. This distribution defines revenue as proceeds from licensing including royalty and equity or sale of the IP through assignment. Within the university there may be more than one entity receiving a portion of the revenue (research department, office of research, intellectual property office). This distribution may be set on a sliding scale based on the amount of the revenue received. The policy will define as well any associated deductions for the development and maintenance of the intellectual property which may be withheld first.

University Investment

The university Intellectual Property Policy defines the financial resources allocated to the invention and intellectual property beyond the patent costs and filing fees. These additional costs may include subsequent investment by the university through proof of concept funds, seed funds, or venture capital, use of equipment, facilities or personnel and the requirements for repayment, conversion into equity, or defined as non-dilutive funding.

10 Development Resources for University Startups

10.1 Intellectual Property

The commercialization of intellectual property rights generated at universities often requires the development of additional resources that have been absent to support the development of a startup as indicated in Figure 15 below.

Intellectual Property

Intellectual property (IP) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce.

IP is divided into two categories: Industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and Copyright, which includes literary and artistic works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Rights related to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programs. For an introduction to IP for non-specialists, refer to:

- WIPO Intellectual Property Handbook (a comprehensive introduction to the policy, law and use of IP)
- Understanding Copyright and Related Rights
- Understanding Industrial Property

The innovations and creative expressions of indigenous and local communities are also IP, yet because they are "traditional" they may not be fully protected by existing IP systems. Access to, and equitable benefit-sharing in, genetic resources also raise IP questions. Normative and capacity-building programs are underway at WIPO to develop balanced and appropriate legal and practical responses to these issues. For more information, refer to:

- IP and Traditional Knowledge
- IP and Traditional Cultural Expressions/Folklore

FIGURE 15: CASE STUDY - INTELLECTUAL PROPERTY

Source WIPO[112]

[112] World Intellectual Property Organization (WIPO), "What is Intellectual Property," Retrieved March 6, 2014 from http://www.wipo.int/about-ip/en/.

10.1.1 Bundling of Intellectual Property

In many circumstances the development of intellectual property rights at universities alone is not sufficient to enable the development of a startup and the attraction of funding. While the most common solution is licensing, (Pre-Clinical) there are options to develop IP into more developed startups with higher benefits to the stakeholders including engaging in Pre-Proof of Concept (POC) and Post POC expansion. The first step is to explore access to complementary intellectual property rights (IPRs). Synergistic approaches to intellectual property rights may be available within the same university portfolio or in other universities, research institutions or for-profit companies to establish an intellectual property bundle that creates freedom to operate and/or expands the scope of applications to justify a startup with sufficient potential.

Patent pooling by bundling together intellectual property rights from a variety of sources in a particular field is an effective approach to create a license on a non-exclusive basis for a focused application. This can be utilized for more efficient licensing or to get to a startup company.

10.1.2 New Invention

Developing additional and/or complementary intellectual property rights to current or related inventions may create sufficient critical mass for the intellectual property portfolio and establish market opportunity for an invention. This can be accomplished through targeted additional research in the university, support for a startup within the university, or through the efforts of a startup external to the university.

Often the intellectual property rights from a university are not sufficient to enable the development of a startup and the attraction of funding. While this may lead to a licensing pathway, there is also the option to explore access to complementary intellectual property rights. Synergistic intellectual property rights may be available within the institution’s portfolio or from other universities, research institutions or companies to establish an intellectual property bundle that creates freedom to operate or expands the scope of applications justifying a startup with sufficient potential. Bundling intellectual property also occurs in patent pooling, were intellectual property rights from a variety of sources in a particular field is non-exclusively licensed to others to utilize the intellectual property as the basis for their of focused applications.

10.2 Human Capital

Successful startups require human capital and those people need to have skills such as business plan development, product development, market research, business and intellectual property law and practice, corporate guidance and mentoring. The provision of these skills for the benefit IP-related startups is often missing in a university setting. The human capital often exists, since students and faculty are usually the most effective means of translating research

discoveries into new technologies, but it is not organized effectively. Many successful university-industry interactions are based on the education and training of students who have the interest, knowledge and skills to meet real industry needs, or they are based on relationships that faculty members have developed with private companies.[113]

With the right approach, these skilled individuals may often be available within or retained by the university or affiliated commercialization programs. A team established for university startups may involve the faculty, science, engineering and business graduate students, postdoctoral students, and experienced entrepreneurs in a variety of combinations. The Kaufmann Foundation studied models for university startups that included four models based on the human capital being engaged to support the startup and an analysis if the effort required by the startup participant by phase. The study identified six stages for the early technology commercialization process at universities: idea generation, commercialization decision, prototype generation and establishment of commercial and technical viability, founding business leader formation, strategy and commercialization process determination, and fundraising to sustain activities.[114]

Four pathways to university spinoff development are based on varying roles played by faculty principle investigators (PIs), experienced entrepreneurs, PhD/post-doctoral students, and business school graduate students. The study presents four types of partnerships:

- Faculty PI and an experienced entrepreneur
- Faculty PI and PhD/post-doctoral students
- Faculty PI
- PhD/post-doctoral students, business school students, and student effort typically involving a master's/PhD student and business school student.

Figure 16 depiction represents the effort involvement of each individual at each stage of startup development.[115]

[113] "Understanding University Technology Transfer," (Association of American Universities, Washington, D.C., 2011).

[114] Fong Boh , Wai, De-Haan , Uzi, and Strom, Robert, *University Technology Transfer through Entrepreneurship: Faculty and students in Spinnoffs*, (Ewing Marion Kauffman Foundation, Kansas City, MO, 2012).
[115] "Understanding University Technology Transfer," *op. cit.*

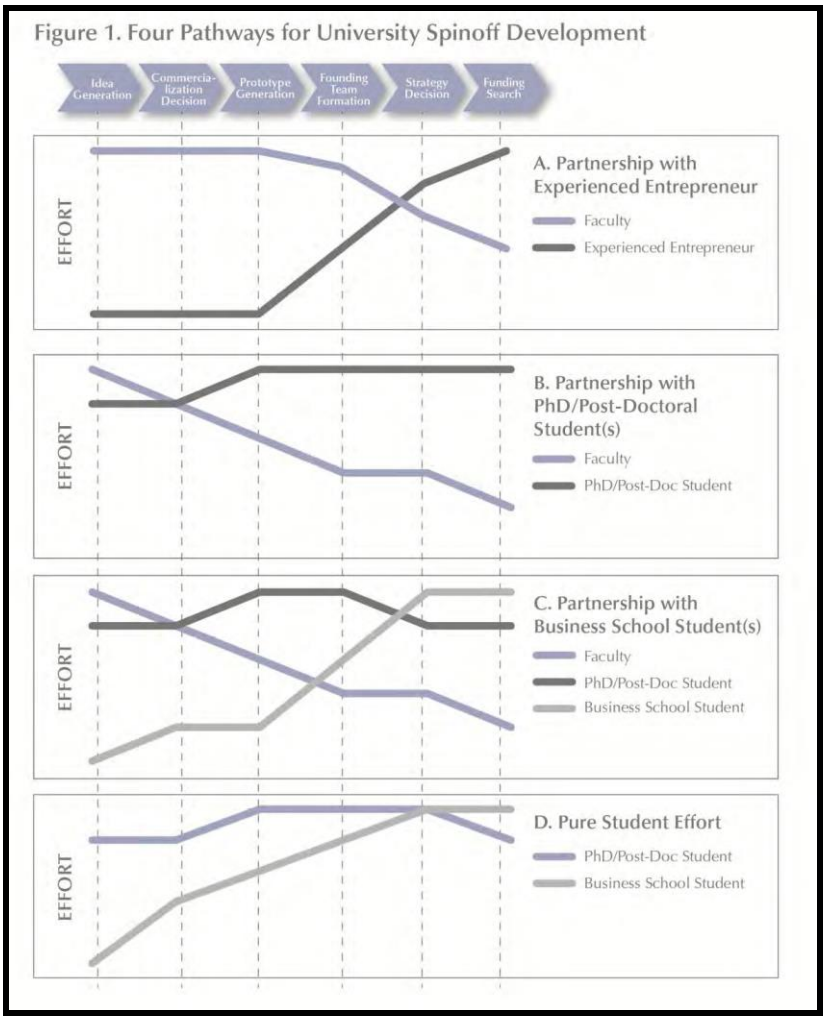

FIGURE 16: FOUR PATHWAYS FOR UNIVERSITY SPINOFF DEVELOPMENT

Source: Ewing Marion Kaufmann Foundation[116]

10.2.1 Business and Research Faculty Mentors

Many universities have set up programs to access internal talent to serve as mentors and advisors for new ventures. All university faculty have established expertise in technology and business related to fields and market areas that a startup is pursuing – the success of startup depends on their identification and organization. Faculty also often have industrial experience that can be helpful to better understand the likelihood for success.

[116]Fong Boh , Wai, et. al., *op. cit.*

10.2.2 Business and Law School Students

Business school students are often interested in and encouraged to participate in the development of a new startup. The IP/discovery for those start ups often resides in the same university. In this scenario, teams of students identify the intellectual property portfolio, prepare a business plan for a new company, and enter business plan competitions which provide funding, leading to either new university startups or the background culture for the development of a university startup by others.

Business school students frequently take leadership or intern roles in university startups to gain industry and entrepreneurial experience. Many expect to step into full time positions in these companies. The Student Entrepreneur Program (StEP)[117] at UMass Boston is a program designed for students interested in building a career in the entrepreneur economy and includes events, workshops, seminars, mentors, and paid internships with leading high tech start-ups.

The Brooklyn Law Incubator & Policy ("BLIP") Clinic[118] functions as a modern, technology-oriented law firm training a new generation of lawyers across the spectrum of skills needed to represent emerging tech, Internet, communications, and new media companies. BLIP has helped clients with incorporation, intellectual property protection, structuring licensing agreements, web documentation, and has also provided litigation support and general legal advice.

10.2.3 Entrepreneurs in Residence

A number of universities, incubators and accelerator programs have established Entrepreneur in Residence (EIR) programs. These programs are also referred to as an EIR or Mentor in Residence Programs. An EIR Program engages experienced early stage management to identify promising technologies in their area of expertise for commercialization and to support one or more startup companies either as interim management or a mentor to the company's management. Often the EIR will select a particular company and engage in a full time leadership position.

One example of a successful EIR program is at the University of Washington Center for Commercialization C4C[119] where veteran industry experts to join C4C for six to nine months at a time. EIRs at C4C help identify technologies with commercial promise and provide UW

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[117] University of Massachusetts Boston, Entrepreneurship Center College of Management, "Student Entrepreneur Program (StEP) Internships," Retrieved March 6, 2014 from http://www.umb.edu/entrepreneurship_center/step/.

[118] Brooklyn Law Incubator & Policy Clinic (BLIP), Retrieved March 6, 2014 from http://www.brooklaw.edu/academics/clinicalprogram/blip/More%20About%20BLIP.aspx.

[119] University of Washington Center for Commercialization (C4C), "Entrepreneurs in Residence," Retrived March 6, 2014 from http://www.umb.edu/entrepreneurship_center/step/.

researchers with real-world insights about the commercialization process along with expertise in target markets, product development, and fundraising strategies. The C4C program also retains a network of emeritus EIRS as a well as an extended network of industry experts and corporate executives.

10.2.4 Seasoned Management Mentoring

Many university mentoring programs engage professionals, corporate executives, and alumni to support and guide the development of startups. These mentors often provide expertise to the startups that include business, finance, technology development, sales and marketing, and law.

Several organizations provide outsourced resources for universities and governmental entities. One very exciting example is the Larta Institute[120], established in 1993 to identify, nurture, and promote promising early-stage high-tech and life science companies in Los Angeles and today serves as an "innovation hub" with global outreach that includes support across the U.S and 17 countries. The organization has assisted over 3,000 entrepreneurs from 17 countries in developing strategic relationships and raising over $1.5 billion in capital. In addition to the design and implementation of commercialization training and programs, the Larta Institute, has established a network that includes subject matter experts, seasoned entrepreneurs, investors and industry professionals to support development, investment, and establishing deals. The organization focuses on a global "network-centric" ecosystem approach to commercialization as depicted in the diagram below (Figure 17).[121]

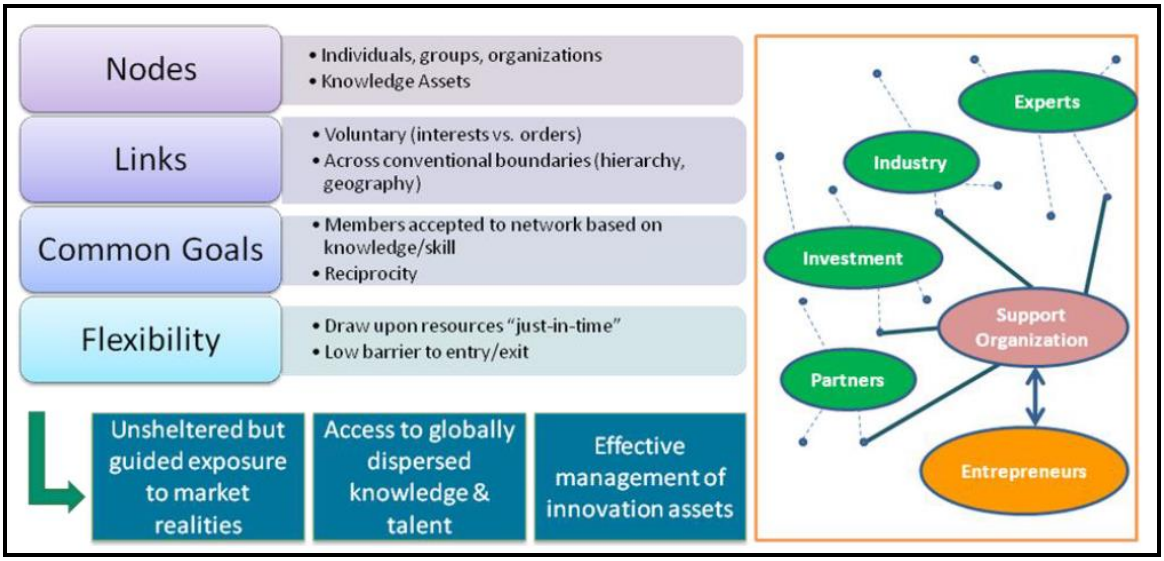

FIGURE 17: DESIGN FOR AN INNOVATION HUB
Source: University of Utah Technology and Venture Commercialization Office

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[120] The LARTA Institute, "Our Model," Retrieved March 6, 2014 from http://www.larta.org/model.

[121] Shukla, Robert K., Taking Triple Helix to a New Level: How to Cultivate Entrepreneurship in Developing Countries Using a "Network-Centric" Approach, April 15, 2012. Retrieved March 2, 2014 from http://www.larta.org/resources/publications.

10.3 Financing

University startups require a continuum of financing to commercialize intellectual property and to maintain associated licensing agreements. The funding stages and sources along the pathway from initial pursuit of commercialization to profitability and/or an exit are generally categorized as pre-seed, see/startup, gap funding, and early/late stage funding as described in Figure 18 below.

Funding Stage	Amount	Source
Pre-Seed	**$25,000 - $50,000**	**Founders, Friends and Family**
Seed - Startup	**$100,000 - $500,000**	**Internal Funding / Angel / Angel Syndicates**
Gap Funding	**$500,000 - $5,000,000**	**Angel Syndicates / Early Stage Venture**
Early / Late	**$5,000,000+**	**Venture Capital / Strategic Investment**

Figure 18: Funding States and Sources

The early stages of funding shown in Figure 19 are often referred to as “Gap Funding” which has been described by Mind the Gap, an initiative of Innovosource,[122] as university-driven or partnered funding programs (translational research, proof of concept, seed funds, and associated support programs that involve academic and business support.) that are targeted at providing capital to fund the evaluation and commercial transition of potential breakthrough technologies. Gap funding includes translational research, proof of concept, and start-up funding. A recent study of 40 institutions and 63 “gap funds” by research institutions in the U.S. by this organization provides some insight into the division of funding as grants and investments, the types and structure of investments.

[122] *Mind the Gap.* innovosource, 2011. Retrieved March 6, 2014 from http://www.gapfunding.org/about/aboutmtg/.

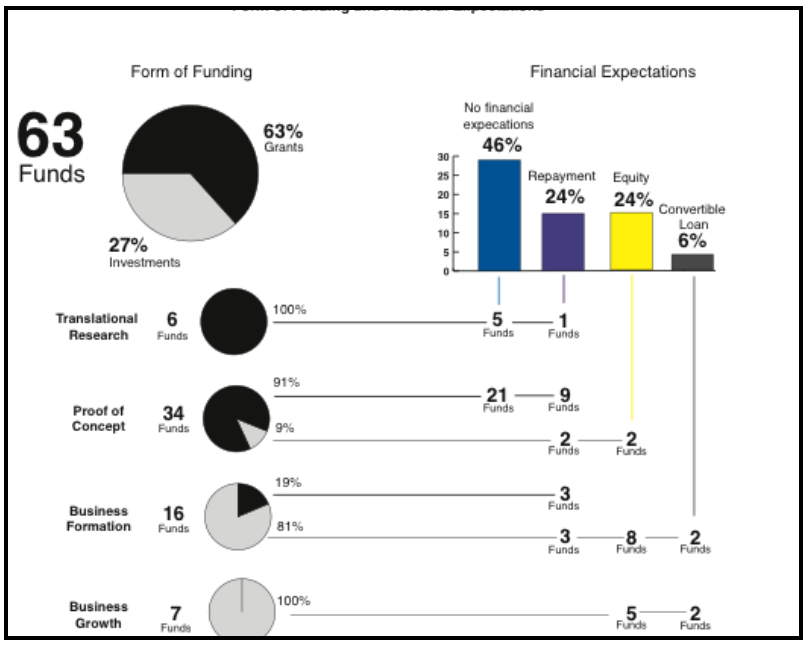

FIGURE 19: MIND THE GAP
Source: Mind the Gap (gapfunding.org)

Financial support many be non-dilutive capital from governmental, institutional, or philanthropic research grants. As well, dilutive funding which has defined terms for the amount of equity and the terms and conditions for dilution can be sourced from the university, friends and family, angel investors, or venture capital.

10.3.1 Internal Funding

Many universities have established funding sources to support the early evaluation and establishment of startup and spin off companies. These funding sources include proof of concept funds and seed funds. Proof of concept funds to support the internal development of the technologies covered by the intellectual property are used to both determine the feasibility for success and to demonstrate the value before establishing a startup company and are often in the amount of $25K to $75K. An innovative program supporting early stage cross boarder collaboration for the commercialization of technology is the MIT International Science and Technology Initiatives (MISTI) Global Seed Funds grant program. This program promotes and supports early-stage collaborations between MIT researchers and their counterparts around the globe including Belgium, Brazil, Chile, China, Egypt, France, Germany, Israel, Italy, Japan, Mexico, and Peru.

More specifically, the MIT-Chile Seed Funds, support new collaborations between faculty and research scientists at MIT and in Chile and primarily supports travel costs for exchange between a team at MIT and colleagues in universities and public research in Chile. The Chilean colleague(s) must be identified in the proposal and the award is $30,000 maximum. The programs all include criteria of having a balanced exchange between the MIT and Chilean

participants for a project that demonstrates complementarity between the teams with variations in the technology focus based on the institution. The Chilean MISTI programs include: MIT-Chile - Pontificia Universidad Católica de Chile Seed Fund, MIT-Chile - Universidad Adolfo Ibáñez Seed Fund, MIT-Chile - Universidad Diego Portales Seed Fund, and the MIT-Chile - Universidad Técnica Federico Santa María Seed Fund.

Many universities have established funding sources to support the early evaluation, technology development and establishment of startup and spin off companies. These funding sources include proof of concept funds and seed funds. Proof of concept funds to support the internal development of the technologies covered by the intellectual property are used to both determine the feasibility for success and to demonstrate the value before establishing a startup company and are often in the amount of $25K to $75K. Proof of concept funds may be provided as a grant, exchanged for equity or may require repayment upon the successful funding of the company. University seed funds are larger funds, in the amount $100K to $300K, primarily used to support the establishment of a startup or spin off company and the further development of the company's products and services and are often exchanged for equity or repayment upon financial milestones.

As an example, King Abdullah University of Science and Technology (KAUST), an international graduate research university in Saudi Arabia with a core mission of economic development, offers its researchers and entrepreneurs funding to assist with moving discoveries to the market place for public benefit.

The KAUST Innovation Fund[123] provides funding, strategic guidance and operational support to startup projects and companies coming out of KAUST as well as external innovative technology-based ventures in the Kingdom. The university also becomes an active strategic investor in those companies, providing hands-on assistance and acquiring equity within structured venture capital terms. The Innovation Fund can help move promising ideas forward toward formation into new businesses. The equity based funding provides support to entrepreneurs when they need it most to increase the likelihood of success.

The KAUST proof of concept funding, on the other hand, supports technology development. Proof of concept funding is utilized to give patented breakthroughs and transformative technologies the necessary financial support to offset earlier technological risks and enable better opportunity for the technology to reach the market.

The proof of concept program helps KAUST:
- Bridge the gap between research and/or idea-stage and commercialization needs;
- Develop and/or localize technology for Saudi industry adoption;
- Offset earlier technological risks and enable technology adoption by industry; and
- Develop the necessary know-how critical to the commercialization success.[124]

[123] King Abullah University of Science and Technology (KAUST), New Ventures, Seed Fund, Retrieved March 6, 2014 from http://newventures.kaust.edu.sa/seed-fund/about.html

[124] King Abullah University of Science and Technology (KAUST), Kaust Seed Fund, Retrieved March 6, 2014 from http://www.kaust.edu.sa/economic_development/seedfund/index.html.

10.3.2 Governmental Funding

The transfer of knowledge through IP protection and licensing is in the public interest because it generates economic and social benefits. But technology transfer is difficult for smaller research institutions to budget for and justify. Public sector support for such institutions to undertake technology transfer is therefore justified and necessary.[125]

Globally many countries have or are establishing governmental program funding to support the development of startup companies and to encourage and support the commercialization of intellectual property sourced from universities. Some examples in the United States include Small Business Administration (SBA)[126] loans which are secured against the founder's personal assets and the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) Programs.[127] The SBIR and STTR programs award research and development funds to small businesses to encourage them to explore their technological potential and innovative new technologies that will be made commercially available to the public. Similar approaches of government funding for the commercialization of research has also been implemented in numerous countries including the United Kingdom and Singapore.

The STTR program expands funding opportunities in the federal innovation research and development (R&D) arena to the public/private sector partnership. The program includes the option of joint venture opportunities for small businesses and nonprofit research institutions. Under the STTR program small business is encouraged to collaborate with a research institution and thus to bridge the gap between performance of basic R&D and commercialization of resulting innovations.

Developed in cooperation with the European Commission, the Joint European Resources for Micro to Medium Enterprises[128] (JEREMIE) initiative offers EU Member States, through their national or regional Managing Authorities, the opportunity to use part of their EU Structural Funds to finance small and medium-sized enterprises (SMEs) by means of equity, loans or guarantees, through a revolving Holding Fund acting as an umbrella fund. The JEREMIE Holding Fund can provide to selected financial intermediaries SME-focused financial instruments including guarantees, co-guarantees and counter-guarantees, equity guarantees,

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[125] Council on Government Relations, "A Tutorial on Technology Transfer in U.S. Colleges and Universities," Retrieved March 6, 2014 from http://www.cogr.edu/Pubs_intellectual.cfm.

[126] U.S. Small Business Administration (SBA), "SBA Loans and Grants," Retrieved March 6, 2014 from http://www.sba.gov/category/navigation-structure/loans-grants, (accessed on December 11, 2012).

[127] U.S. Small Business Administration (SBA), "U.S. Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) Programs," Retrieved March 6, 2014 from http://www.sbir.gov/.

[128] Joint European Resources for Micro to Medium Enterprises (JEREMIE), Retrieved March 6, 2014 from http://www.eif.org/what_we_do/jeremie/index.htm.

(micro) loans, export-credit insurance, securitization, venture capital, Business Angel Matching Funds and investments in Technology Transfer funds.

In developing countries new funds are being created. For example, the Kenya Investment Authority announced that The Treasury and the Authority are working on establishing the venture capital fund that will address the problem of limited access to bank loans. The fund will target entrepreneurs with good business ideas and in need of funds to roll out projects. The government will provide the seed capital for the fund. Other development finance institutions (DFIs) may be invited to contribute and run the fund. The reference levels for funding are benchmarked against investment between $50,000 to $1.5 million in SMEs, acquiring an equity stake and sharing profits and risk with the business for a period of up to seven years before exiting.[129]

10.3.3 Philanthropic Funding

Many philanthropic organizations exist based on specific technologies or medical areas will provide support to early stage companies to support their research and development on innovating discoveries that can impact their area of interest. As many of the most innovative therapies for unmet medical needs are being addressed by early stage companies and startups, these organizations have expanded to both fund university research as well as startups commercializing these breakthroughs. According to the European Venture Philanthropy Association[130] (EVPA) venture philanthropy works to build stronger social purpose organizations by providing them with both financial and non-financial support in order to increase their societal impact. [131]

Some of the philanthropic organizations will send teams into research settings around the world to identify the most promising opportunities and then engage their donors to provide financial support through the organization to support further research and development. This funding may come through company research grants focused on commercial application development or commercialization laboratories within academic settings (Walter H. Coulter Foundation)[132] focus on a particular disease such as Parkinson's (Michael J. Fox Foundation)[133], or in the case

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[129] Venture Capital, "Kenya Investment Authority creates a state-backed new venture fund, Admin in Kenya," (New Fund Announcement, State or Government Supported), June 16, 2012, Retrieved March 6, 2014 from http://www.gapfunding.org/kenya-investment-authority-creates-a-state-backed-new-venture-fund.

[130] European Venture Philanthropy Association (EVPA) , Retrieved March 6, 2014 from http://evpa.eu.com, (accessed on December 21, 2012).

[131] European Venture Philanthropy Association (EVPA), "What is VP?", Retrieved March 6, 2014 from http://evpa.eu.com/knowledge-centre/what-is-vp/.

[132] Wallace Coulter Foundation, Retrieved March 6, 2014 from http://www.whcf.org/.

[133] Michael J Fox Foundation for Parkinson's Research, Retrieved March 6, 2014 from https://www.michaeljfox.org/.

of BIO Ventures for Global Health (BVGH)[134], a non-profit organization, that funds the development of novel drugs, vaccines, and diagnostics that address the unmet medical needs of the developing world.

10.3.4 Founders, Friends and Family

Some of the first money used to support the establishment of startups is that from founders, friends and family. This funding is often based on the supporter's relationship with the founder and the desire to have the founder and company succeed. The terms for this funding are normally the most favorable and often these terms are adjusted during later rounds of investment to less favorable terms. As well, follow on investors often want to see the founders vested in the company through an initial investment of their own financing to provide assurance of their belief in and commitment to the success of the company. According to VentureCapital.Org[135], Normally this funding ranges up to $250K on a valuation of $500K, may have interest charged, and requires the least amount of supporting documentation even as little as an executive summary.

10.3.5 Crowd Funding

Crowd funding or crowdfunding (alternately crowd financing, equity crowdfunding, or hyper funding) is a collective approach to the funding of a company by selling small amounts of equity to many investors. This form of crowd funding has recently received attention from policymakers in the United States with direct mention in the JOBS Act[136]. This legislation provides for up to $1,000,000 of funding to companies with investments up 5% or 10% of the annual income or net worth of an individual depending on a $100,000 annual income threshold. This has opened the way for the use of internet portals to engage in fundraising for companies under SEC regulations.[137] Organizations focused on crowdfunding industry are the National Crowdfunding Association[138] (NLCFA) and the Crowdfunding Professional Association[139] (CfPA). As well CrowdFund Intermediary Regulatory Advocates[140] (CFIRA) is a group that has been established to work with the Securities & Exchange Commission (SEC), the Financial Industry Regulatory

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[134] BIO Ventures for Global Health (BVGH), Retrieved March 6, 2014 from http://www.bvgh.org/Who-We-Are.aspx.

[135] VentureCapital.org, "Founders, Friends, and Family," Retrieved March 6, 2014 from http://www.venturecapital.org/venture-capital-funding-fff.

[136] Jumpstart Our Business Startups Act (JOBS Act), H. R. 3606, Title III—Crowdfunding, ''Capital Raising Online While Deterring Fraud and Unethical Non-Disclosure Act of 2012'' or the ''Crowdfund Act'', Retrieved March 6, 2014 from http://www.gpo.gov/fdsys/pkg/BILLS-112hr3606enr/pdf/BILLS-112hr3606enr.pdf.

[137] United States Securities Exchange Commission (SEC), "Jumpstart Division of Trading and Markets, Our Business Startups Act, Frequently Asked Questions About Crowdfunding,," May 7, 2012, Retrieved March 6, 2014 from http://www.sec.gov/divisions/marketreg/tmjobsact-crowdfundingintermediariesfaq.htm.

[138] National Crowdfunding Association (NLCFA), Retrieved March 6, 2014 from http://www.nlcfa.org/main.html.
[139] Crowdfunding Professional Association (CfPA), Retrieved March 6, 2014 from http://cfpa.org.
[140] CrowdFund Intermediary Regulatory Advocates (CFIRA), Retrieved March 6, 2014 from http://www.cfira.org/.

Authority (FINRA), and other affected governmental and quasi-governmental entities to help establish industry standards and best practices.

Other models of crowdfunding include online portals for loan based accumulation towards projects through not for profits organizations such as Kiva.org[141] and Kopernik[142] (see Figure 20), and project based crowdfunding investment through for profit companies such as Kickstarter.com[143].

KOPERNIK (http://kopernik.info/)

Overview of Commercialization Model: Kopernik connects simple, life-changing technologies with remote communities in the developing world. To distribute these technologies, local organizations submit proposals to Kopernik for the technologies Kopernik makes available in its curated catalogue. Kopernik raises funds for technology projects by crowd-funding from individuals and corporations through its website. Funds raised are used to purchase technology for local partner organizations, on a consignment basis. The local organizations then sell the technologies in their communities and return the funds to Kopernik, which reinvests in purchasing more technology.

The key to Kopernik's ability to scale quickly lies in its strategic 'network model'—partnering with existing high performing local networks and organizations to distribute technology.

Structure: Kopernik is a US 501(c)(3) nonprofit corporation and Indonesian foundation.

Partners and Stakeholders: Kopernik's main partners and stakeholders include more than 50 technology producers; academic institutions, including MIT's D-Lab, Columbia University and Cambridge University; local NGOs and businesses; and corporations such as ExxonMobil, Daiwa Securities, JPMorgan, Amex, Benesse, Panasonic, and Deloitte.

Areas of Technology Focus: Simple, life-changing technologies like solar lights, water filters, fuel-efficient cookstoves and clean birth kits.

Service Model: Kopernik's three main services include a technology catalogue, impact and feedback collection and its Last Mile Consulting advisory arm. The main expansions underway are two micro-enterprise initiatives: Kopernik's Tech Kiosk program engages independently-owned small shops to sell simple technology alongside everyday goods, while their Tech Agent program empowers women to sell technologies in their communities, boosting their incomes and expanding access to life-changing technologies.

[141] Kiva.org, Retrieved March 6, 2014 from http://www.kiva.org.
[142] Kopernik, Retrieved March 6, 2014 from http://kopernik.info/.

[143] Kickstarter.com, Retrieved March 6, 2014 from http://www.kickstarter.com.

Geography: Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, China, Ghana, Haiti, India, Indonesia, Japan, Kenya, Micronesia, Myanmar, Nigeria, Philippines, Timor-Leste, Uganda and Viet Nam.

Outcomes: Since launching in 2010, Kopernik has implemented more than 100 projects in 19 countries, and has reached more than 200,000 people with life-changing technology.

FIGURE 20: CASE STUDY – KOPERNIK

10.3.6 Microfinancing

Microfinance is usually understood to entail the provision of financial services to micro-entrepreneurs and small businesses, which lack access to banking and related services due to the high transaction costs associated with serving these client categories. The developing world has limited risk capital which constrains growth. Young companies need high-risk, reasonably-sized, equity investments to expand, which is not possible with short-term, high interest debt. To justify this investment there needs to balance of risk and reward for the investors with some of the factors in developing countries including: limited experience in early stage of investment, weak managerial capacity, business environment risks, few exit opportunities, high transaction costs, limited deal flow, and currency risk.[144]

However, there are international investment sources such as the Acumen Fund[145], established in 2001, with seed capital from the Rockefeller Foundation, Cisco Systems Foundation and three individual philanthropists. Acumen Fund is a non-profit global venture fund that uses entrepreneurial approaches to solve the problems of global poverty. Acumen has invested in the BRAC Fund which provided support to entrepreneurs and startups through microfinancing. Today the fund has offices in United States, India, Kenya, Pakistan, and Ghana.

The Three Guineas Fund[146] is investing $1 Million in the BRAC Africa Loan Fund to scale BRAC's economic development operations in Tanzania, Uganda and Southern Sudan. BRAC, a leading international development organization founded in Bangladesh announced that it has successfully raised $62.6 million of debt capital to provide microfinance loans to poor borrowers in Tanzania, Uganda and Southern Sudan. The BRAC Africa Loan Fund provides long-term, local-currency funding that will enable BRAC to scale up its microfinance operations to reach over 700,000 borrowers through over 200 branches across the three countries. The Fund represents the largest single financing to date of a southern hemisphere development

[144] Patricof, Alan J., Sunderland, Julie and Apex Partners, "Venture Capital Development, The Private Sector in the Fight against Global Poverty, Session III: Does Size Matter? SME's, Microfinance & Large Nationals," Prepared for the Brookings Blum Roundtable , August 4, 2005, Retrieved March 6, 2014 from http://www.brookings.edu/global/200508blum_patricof.pdf.

[145] Acumen Fund, Retrieved March 6, 2014 from http://www.acumenfund.org/ten/.

[146] Three Guineas Fund, Retrieved March 6, 2014 from http://www.3gf.org/.

organization expanding into Africa.[147] BRAC provides a broad scope of services including microfinancing across Africa and beyond as depicted in Figure 21 below.

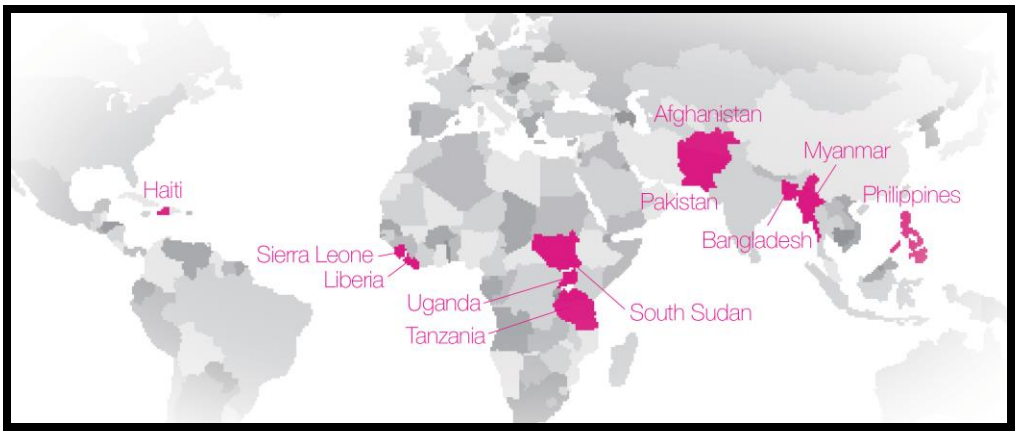

FIGURE 21: BRAC SERVICES SITES. SOURCE: BRAC

10.3.7 Angel Capital

Angel capital refers to the investment made by high net worth individuals or "accredited investors" into early stage and startup companies with the understanding of the high risk and with the anticipation of high rewards. The United States Securities Exchange Commission (SEC) defines an "accredited investor" as someone with over a million dollars in liquid assets or an income of over $200,000 a year. These investors may operate as independent investors or as part of an angel group of investors that review and invest in opportunities together. Angel capital represents an important source of seed and early stage equity based capital for new and emerging companies in order to bridge the "Valley of Death".

The National Angel Capital Organization (NACO)[148], Canada's Angel capital industry association reports an investment of over $1B per year in growth companies. The organization's 2011 report: *Investment Activity by Canadian Angel Groups*[149] notes increases in Angel activity with 63% of Canada's Angel Groups were established within four years and as well as an increase in funding of business plans selected for review from 4.5% in 2010 to 6.5% in 2011 . The investments are tracked by region and industry sector including ICT, Life Science, Cleantech and other as shown in Figure 22 below.

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[147] BRAC, "BRAC Africa Loan Fund Launched to Combat Poverty in East Africa, Retrieved March 6, 2014 from http://www.brac.net/node/674#.UNJjvG_hr-s.

[148] National Angel Capital Organization (NACO), Retrieved March 6, 2014 from http://www.nacocanada.com/.

[149] National Angel Capital Organization (NACO), "Investment Activity by Canadian Angel Groups: 2011 Report, July 17, 2012," Retrieved March 6, 2014 from https://nacocanada.com/wp-content/uploads/2012/12/NACO-2011-Report-Investment-Activity-By-Canadian-Angel-Groups.pdf.

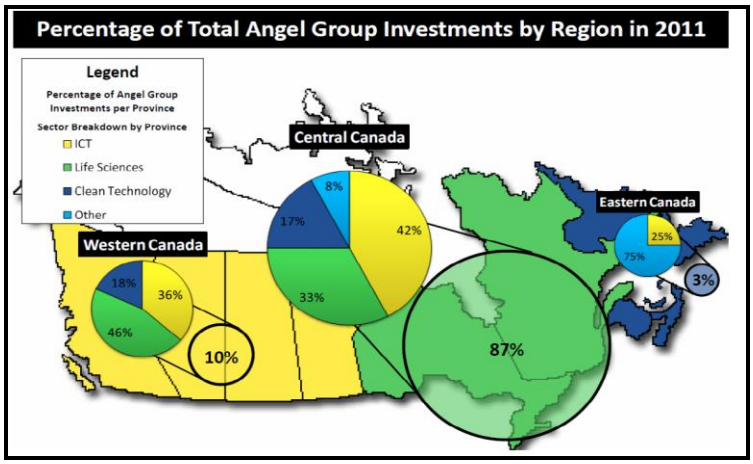

FIGURE 22: CANADIAN PERCENTAGE OF ANGEL GROUP INVESTMENTS BY REGION IN 2011

Source: National Angel Capital Organization (NCAO)

Angel networks which are comprised of angel investors with local, regional, national, or global interests. These syndicates now serve as an alternative to venture capital or may co-invest based on their ability to gather large amounts of investment. Angel investment through networks continues to increase in the United States and around the globe. The median size of angel & angel group syndicate rounds was $550K in 2011 according to the 2012 Halo Report of the Angel Resource Institute (ARI)[150], [151] . The report, which provides analysis and trends on US angel and angel group activity on investment alone, together, and with many other types of investors based on 342 deals and $467.7M in total rounds including co-investors. In the United States, while California does the most deals, 81% of the angel investment is spread throughout the country as depicted in Figure 23 below.[152] This organization also provides a compressive listing of Angel Capital Organizations in the United States, Canada, and Mexico.[153]

[150] Angel Research Institute (ARI), Retrieved March 6, 2014 from http://www.angelresourceinstitute.org/research.

[151] Angel Resource Institute (ARI), 1H 2012 Halo Report™: Angel Group Activity Update, September 25, 2012, Retrieved

March 6, 2014 from http://www.angelresourceinstitute.org/news-room/1h-2012-halo-report-angel-group-update.aspx.

[152] National Angel Capital Organization (NCAO), Investment Activity by Canadian Angel Groups: 2011 Report, July 17, 2012, https://nacocanada.com/wp-content/uploads/2012/12/NACO-2011-Report-Investment-Activity-By-Canadian-Angel-Groups.pdf**Error! Hyperlink reference not valid.**, (accessed on December 11, 2012).

[153] National Angel Capital Organization (NCAO), Listing of Groups, Retrieved March 6, 2014 from http://www.angelresourceinstitute.org/listing-of-groups/.

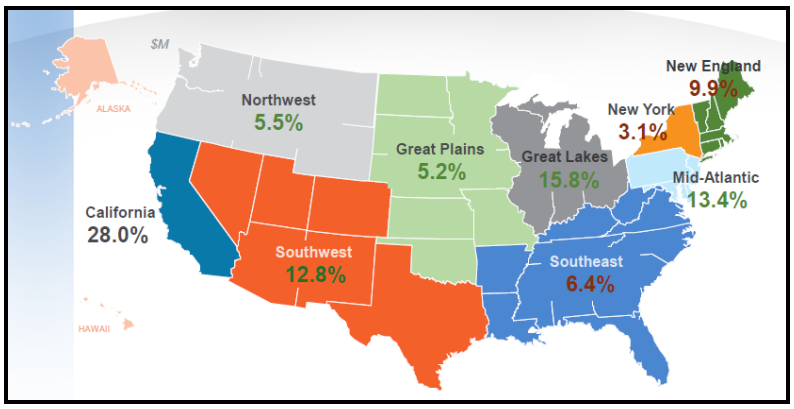

FIGURE 23: REGIONAL DISTRIBUTION OF ANGEL INVESTMENTS IN THE US

Source: Angel Resource Institute (ARI)

Organizations which have been established to support exchange of knowledge and best practices for angel capital financing of high growth and innovative startups. The Angel Capital Association[154] (ACA) for the United States provides a scope of services to its members for locating and forming angel investment networks. Internationally, the World Business Angels Association[155] (WBAA) brings together national delegates to address angel investment on a global level. These are not-for-profit organizations whose mission is to stimulate the exchange of knowledge and best practices in the field of global angel capital financing for high growth and innovative startups.

10.3.8 Seed Funding

Many universities have established seed funds to support investment in their own startups or have invested funding into venture capital funds that invest into early stage companies that may or may not include those of the university.

In Estonia, Swedbank, Tehnopol and Tallinn University of Technology have established the Prototron Fund[156] which finances young entrepreneurs or inventors to build their first product samples or prototypes. After building a successful prototype a business can be established and supported through Tehnopol's startup Incubator.

The National Association of Seed and Venture Funds (NASVF) is an international membership organization that advocates for the growth of seed and early-stage innovation capital and

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[154] Angel Capital Association (ACA), Retrieved March 6, 2014 from http://www.angelcapitalassociation.org/.

[155] World Business Angel Association (WBAA), Retrieved March 6, 2014 from http://wbaa.biz/.

[156] Prototron Fund, Retrieved March 6, 2014 from http://www.tehnopol.ee/en/startup/prototyping-fund-prototron.

connects the people in the world of venture capital and regional economic development and is being consolidated with the State Science & Technology Institute[157] (SSTI).[158]

In Europe, EBAN[159], a non-profit association representing the interests of business angels, business angels networks (BANs), seed funds and other entities involved in bridging the equity gap in Europe serves as a network and resource for early stage funding integrating across the early stage continuum as depicted below. The organization was established with the collaboration of the European Commission in 1999 by a group of pioneer business angel networks s in Europe and the European Association of Development Agencies [160](EURADA).

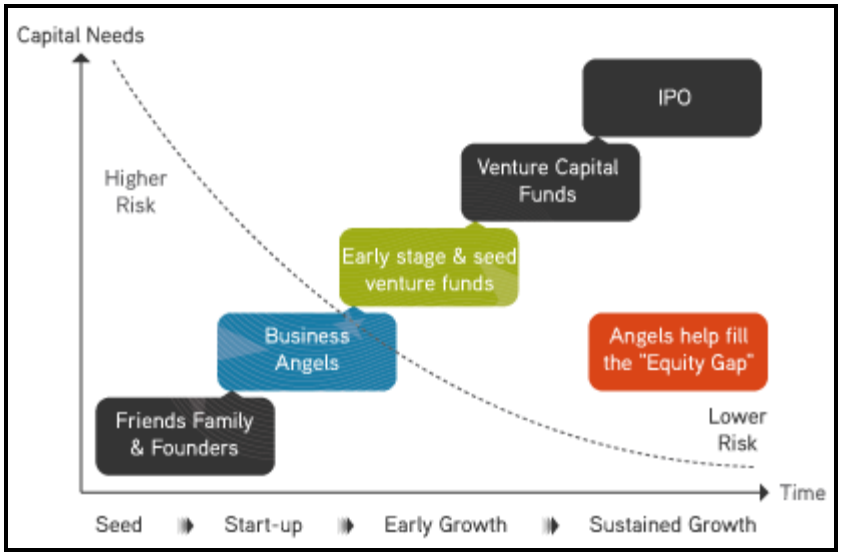

FIGURE 24: SOURCES OF SEED FUNDING

Source: EBAN

Other sources of seed funding may come from established programs with service providers as illustrated in Figure 24 above such as the Edwards Wildman Palmer LLP Helping Innovators Thrive (HIT) program is a $2 million annual commitment by the firm to help promising young companies and entrepreneurs with innovative technologies or innovative business models by

[157] State Science & Technology Institute (SSTI), Retrieved March 6, 2014 from http://www.ssti.org).

[158] NASVF and SSTI Joint Statement of Merger, October 2012, Retrieved March 6, 2014 from http://us2.campaign-archive2.com/?u=3b83ca94cd43c0588e1cc5785&id=3e5805a854.

[159] European Business Angels Network (EBAN), Retrieved March 6, 2014 from http://www.eban.org/.

[160] The European Association of Development Agencies (EURADA), Retrieved March 6, 2014 from http://www.eurada.org/.

providing flexible billing arrangements in the form of discounts, deferrals and grants of legal services.[161]

10.3.9 Venture Capital

Venture capital is funding provided by investors to startups that show promise of long-term growth potential and are based on high return for investment in high-risk companies. Venture capital is an important source of the funding cycle for early stage companies that do not have access to traditional capital markets as described by Cardullo[162] and illustrated by the figure revisited from earlier in this guide (Figure 25). Venture capital differs from traditional financing sources in that venture capital typically:

- Focuses on young, high-growth companies
- Invests equity capital, rather than debt
- Takes higher risks in exchange for potential higher returns
- Has a longer investment horizon than traditional financing
- Actively monitors portfolio companies via board participation, strategic marketing, governance, and capital structure.[163]

[161] Wildman, Edwards, Startup Companies, HIT (Helping Innovators Thrive), 2014, Retrieved April 28, 2014 from http://hit.edwardswildman.com/.

[162] Cardullo, M., *Technological Entrepreneurship: Enterprise Formation, Financing and Growth*, (Research Studies Press Ltd., United Kingdom, 1999).

[163] U.S Small Business Administration, Venture Capital, About Venture Capital, Retrieved March 6, 2014 from http://www.sba.gov/content/venture-capital.

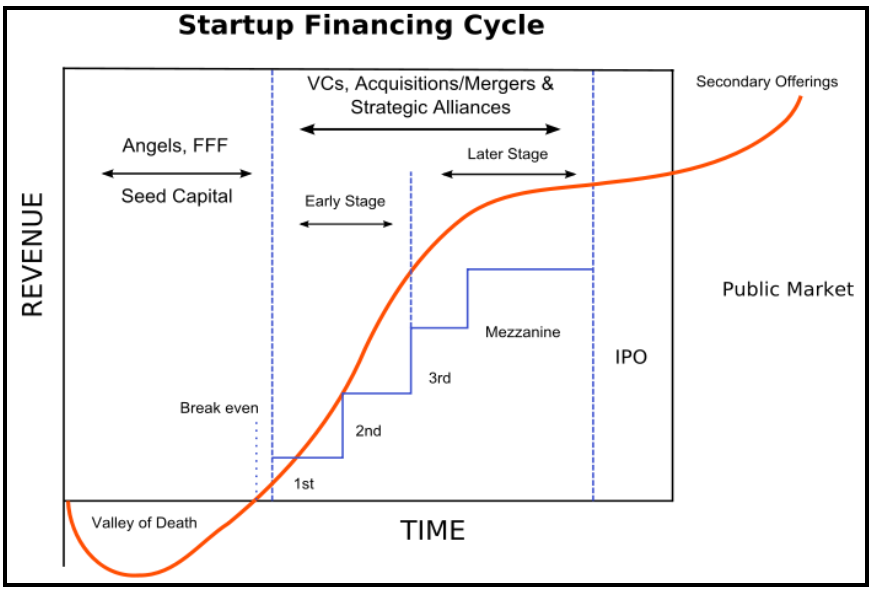

FIGURE 25: FINANCING CYCLE

Source: Kompere[164]

While venture capital funds are risky, they have been successfully used to create substantial returns for investors and the creation of new technology based companies. According to the European Venture Capital Association [165](EVCA), in Europe, private equity firms are invested in 24,000 small and medium size enterprises (SMEs) of the more than 20 million European SMEs in total. [166]

One example of a venture backed company yielding investment and support for new startups is Google Ventures[167]. Google Ventures, the venture investment arm of Google Inc. was established in 2009 and has invested approximately $100M per year in startups in industries including consumer Internet, software, hardware, clean-tech, biotech, health care and with a projected increase to $300M in 2013. Google Ventures takes a hands-on approach using a broad team of mentors and experts as well as development tools with its U.S. offices based in Cambridge, Mountain View, New York, and Seattle. The fund invests in about 40-50 "seed-stage" deals where it invests $250,000 or less in a company, and perhaps around 15 deals where it invests up to $10 million.

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[164] Kompere, *Op. cit.*

[165] European Venture Capital Association (EVCA), Retrieved March 6, 2014 from http://evca.eu.

[166] European Venture Capital Association (EVCA), The Facts, Retrieved March 6, 2014 from http://evca.eu/facts/.

[167] Google Ventures, Retrieved March 6, 2014 from http://www.googleventures.com/.

Some examples sourced from CrunchBase.com[168], a free database of technology companies, people, and investors include:

> Sequoia Capital has offices in the U.S., China, India and Israel and invests between $100,000 and $1 million in seed stage, between $1 million and $10 million in early stage, and between $10 million and $100 million in growth stage. Sequoia has funded Google, Yahoo, Paypal, Electronic Arts, NVIDIA, Cisco Systems (with 800 times ROI - $2.5 million turned to $2 billion), Oracle, Apple, YouTube, Admob and Zappos.
>
> U.S. Venture Partners (USVP) has invested more than $2.4 billion in over 420 companies including MyYearbook.com, Intermolecular (IPO), and Transparent Networks, Inc.
>
> Benchmark is an early stage venture capital firm focusing in Social, Mobile, Local and Cloud companies that disrupt various industries with offices in Menlo Park and San Francisco, California. Benchmark has invested in more than 250 early stage startups with a market value exceeding $100 billion. Investments have included eBay (with 800 times ROI - $5 million turned to $4 billion), Juniper Networks, MySQL, OpenTable, Yelp, Inc., Zillow, Friendster, JAMDAT, Instagram, Hortonworks, Dropbox, Uber, Twitter, Zipcar, Asana, Quora, Gaikai, Demandforce and DOMO.

In the Middle East North Africa (MENA) region many countries are privatizing state owned assets, opening new sectors for foreign investment, and streamlining corporate taxation requirements with a focus on diversifying their economies, reducing unemployment, and contributing to the prosperity of their economies. MENA governments are collaborating with international partners, including the MENA-OECD Investment Programme and unlocking the role for private equity financing. According to Zawya PE Monitor, $5.8 billion of private equity funds were raised in MENA between 1994 and 2005, 41% of which were raised in 2005 alone.[169]

11 University Startup and Spinoff Models

University startup models to support the commercialization of intellectual property may include internal university programs, external programs, and ways to both share university resources and attract other resources. These models include the development of programs that enable research and development and provide access to business services, management, and financing.

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[168] Crunchbase.com, Retrieved March 6, 2014 from http://www.crunchbase.com/.

[169] Middle East and North Africa (MENA) – OECD Investment Programme, "MENA Investment Policy Brief, Venture Capital Development in MENA Countries – Taking Advantage of the Current Opportunity," Issue 1, April, 2006, Retrieved April 24, 2014 from http://www.oecd.org/mena/investment/37256468.pdf.

11.1 University Commercialization Resources

Universities have established a series of programs that support commercialization of intellectual property and technology development.

11.1.1 Commercialization Programs

Proof of Concept

Proof of concept is used in order to demonstrate the feasible use of a certain idea or method, proving that it can be used successfully. Proof of concept programs are often used to determine the feasibility of establishing a startup, to reduce risk, and attract additional funding. Many universities have proof of concept funds that can be awarded to support the associated expenses including research, prototyping, and beta testing.

As noted earlier, the Deshpande Center at MIT[170] and the von Liebig Center at UCSD[171],[172] provide the resources to accomplish further development and funding for proof of concept to fill the gap to early stage funding. These centers also provide access to a network of resources and mentors to support the development of the proof of concept.

Networking

Networking events for entrepreneurship and innovation within universities provide a forum for developing relationships that support the startup companies and can provide access to collaborators, service providers, management, and mentors. The Von Allman Center for Entrepreneurship at the University of Kentucky conducts "Bench2Business"[173] Faculty Networking Events twice a year so that researchers at the university can network with other innovative faculty from colleges across campus and local businesses to discuss their research and commercialization plans.

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[170] Massachusetts Institute of Technology (MIT), Deschpande Center for Technological Innovation, Retrieved March 6, 2014 from http://web.mit.edu/deshpandecenter/.

[171] University of California San Diego (UCSD), Jacobs School of Engineering, Von Lebig School of Entrepreneurism Center, Retrieved March 6, 2014 from http://www.vonliebig.ucsd.edu/.

[172] Gulbranson, Christine A, and Audretsch, David B. , with research assistance provided by Isabel Groff and Samantha Dalton, and Derek Ozkal, "Proof of Concept Centers: Accelerating the Commercialization of University Innovation," (Ewing Marion Kauffman Foundation, Kansas City, MO, 2008), Retrieved April 24, 2014 from http://sites.kauffman.org/pdf/poc_centers_01242008.pdf.

[173] The University of Kentucky, Von Allman Center for Enterpreneurship, "Bench2Business" Faculty Networking Events," Retrieved March 6, 2014 from http://www.uky.edu/econdev/vonallmen/bench2business-faculty-networking-events.

Partnering

Partnering programs exist to connect startup companies to other companies as research and development collaborators, strategic investors, end-users, or providers of sales, marketing, and distribution. These programs build relationships that connect startups to a secondary relationships and additional introductions. In the United States the Startup America Partnership[174] supports a national network of startup communities dedicated to advancing the success of American startups. Hundreds of passionate founders, entrepreneurial leaders, investors, mentors and executives, (Startup Champions), are working together to strengthen their local communities and help young companies grow.

One resource supporting these interactions is the University Industry Development Partnership[175] (UIDP) which is an organization of universities and companies who seek to build a stronger relationship among these parties. UIDP provides a forum for university and industry representatives to meet and discuss contracting and intellectual property policy, publication and technology transfer preferences, and other issues.

Team Building

Interdisciplinary teams established through business schools, often as part of the entrepreneurship and innovation or business school MBA programs, focus on identifying and building a company around intellectual property within the university or a university startup. These teams work together to conduct additional research to validate applications, proof of concept, or establish a business strategy and associated business plan. The National Collegiate Inventors and Innovators Alliance[176] (NCIIA) helps commercialize concepts of more than 5,000 students, faculty innovators and entrepreneurs each year from nearly 200 colleges and universities across the United States. NCIIA awards almost $2 million annually in grants to support courses, programs and ventures with the potential for scalable impact.

At Northwestern University's Commercialization Lab[177] students work directly in the commercialization process for innovative technologies as part of four- or five-member team based on their skills, experience and interests. Each team functions as consultants to a Northwestern University research adviser who has invented a new technology with strong commercial potential. The team has the guidance of a faculty adviser to collaborate with the Technology Transfer Program and select appropriate technologies. The research adviser and the student team then form a "new enterprise" for commercial development.

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[174] Startup America Partnership, Retrieved March 6, 2014 from http://www.s.co/about.

[175] University Industry Development Partnership (UIDP), Retrieved March 6, 2014 from http://sites.nationalacademies.org/PGA/uidp/index.htm.

[176] National Collegiate Inventors and Innovators Alliance, Retrieved March 6, 2014 from http://nciia.org/. 2012).

[177] Northwestern University, Commercialization Lab, Retrieved April 4, 2014 from https://www4.kellogg.northwestern.edu/coursecatalogschedule/CourseDetail.aspx?CourseID=1694.

Business Plan Competitions

Many universities and university related organizations have established business plan competitions for university startup companies to provide experience of preparing a company for presentation and investment and to enable these startups to gain exposure to other investment, management, and development resources. Beyond universities there are business plan competitions have been established by a number of organizations that target university startups based on intellectual property, entrepreneurship and innovation, or by industry.

One useful resource to identify possible opportunities is Business Plan Competition (BC)[178] which lists the business plan contests available globally with a searchable database. Many of these competitions include IP legal assistance and business mentoring as awards. The Licensing Executive Society (LES) Foundation promotes mentorship and education of young professionals about the world on IP licensing and hosts the LES Foundation's Annual Graduate Student Business Plan Competition[179]. Entrants into the competition must submit a business plan with a core intellectual property component and strategies for how the intellectual property assets will be commercialized to achieve business objectives and are provided IP training, mentorship, and a cash grand prize for the winner.

Education and Training

Universities have established certified or accredited programs or courses that provide education and training on the commercialization of intellectual property and the creation of a startup company. Programs or courses are targeted to specific audiences such as graduate students, entrepreneurial faculty, external management, or are provided to a mixed audience. The intended outcomes are that the attendees have a better sense of what a startup entails and may be able to provide for better support as university faculty or staff in contrast to the advice of an external member of the team who may not be as familiar with the IP.

For example, at the University of New Castle in Australia, a Graduate Certificate in Innovation and Commercialisation[180] is available as postgraduate certificate and entails a program that provides research commercialization training for the next generation of researchers as a means of equipping them with the skills and knowledge necessary to bring research-based ideas, inventions and innovations to market.

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[178] Business Plan Competition (BCP), Retrieved March 6, 2014 from http://www.bizplancompetitions.com.

[179] "About the Competition," LES Foundation's Annual Graduate Student Business Plan Competition, Retrieved March 6, 2014 from http://www.lesfoundation.org/competition/index.html.

[180] University of New Castle, Graduate Certificate in Innovation and Commercialisation, Retrieved April 24, 2014 http://gradschool.edu.au/programs/overview/graduate-certificate-innovation-commercialisation.

Integrated business facing programs on intellectual property are being established such as the Illinois Institute of Technology (IIT), Master of Science in Intellectual Property Management and Markets[181] which is the first degree program in the United States to provide a foundational understanding of intellectual property that integrates perspectives and skills from five key disciplines of business, computer science, design, engineering, and law.

11.2 Technology Development

Universities often provide for the additional development of intellectual property of startup companies when they have the expertise in the area of development through the faculty inventor, or the facilities, equipment or other resources needed to move the development of products and services to the next level.

11.2.1 Sponsored Research Programs

Universities startups often employ sponsored research programs as a way of continuing business development within the university and ensuring that the associated costs can be maintained, deferred, or transferred into equity. This requires the clarification of the assignment of additional inventions created during this process and the rights to the associated intellectual property. This also allows startups without fully established facilities to gain access and meet the requirements of research based grant funding such as the STTR program in the United States.

11.2.2 Shared Research Resources

Universities often have shared research resources that may include access to core centers in different department to provide services or allow access to equipment. A few examples of these types of services include genomics, cell culture and banking, antibody screening and selection, toxicology, animal testing, and prototype development. Regional systems to share resources between universities or affiliated organizations such as hospital systems or medical schools also exist. These services are often defined with an established price that is paid by the company and usually contains a margin of profit.

11.3 Accelerator Models

Startup accelerators and business incubators provide resources and services to support early stage companies including the attraction of capital.

Business incubators often located near universities provide cost effective space and often provide a large range of programs and resources for startups. The National Business

[181]Illinois Institute of Technology (IIT), Master of Science in Intellectual Property Management and Markets, Retrieved April 24, 2014 from http://gradschool.edu.au/programs/overview/graduate-certificate-innovation-commercialisation.

Incubation Association (NBIA) is the world's leading organization advancing business incubation and entrepreneurship. In addition to the resources and references available the organization has established an NBIA International Locator[182].

A shift from the traditional model of incubators as a real estate play has evolved into the value based model of accelerators as depicted in Figure 26 below.[183]

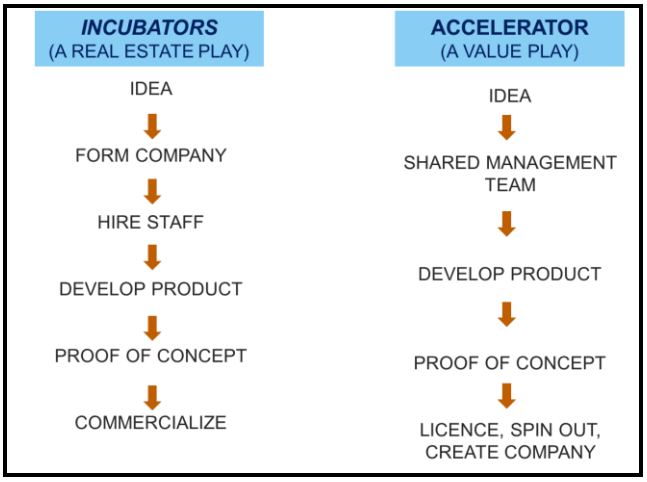

FIGURE 26: VALUE BASED ACCELERATOR MODEL

Source: Burrill & Co.[184]

There are a number of models for startup accelerators which may include business incubation services in addition to facilities. Reduced rent may or may not be limited to university startups. While incubator related acceleration programs are often limited to the tenants of the facility, accelerators often have a more open structure for providing service to many companies. Accelerators are often most intensely focused on those companies in which they may have a seed investment. While the incubators are typically run as nonprofits and charge startups for

[182] The National Association of Business Incubation (NBIA), International Incubator Associations & Organizations, NBIA International Locator, Retrieved March 6, 2014 from http://www.nbia.org/links_to_member_incubators/international.php.

[183] Stephen Burrill, Burrill & Co., "The Changing Landscape of Early-Stage Investment in an Era of Global Austerity," Midwest University Research Network (MRUN) – CATTEC-V Conference, Presentation, October 12, 2012.

[184] Presentation by Steven Burrill, Midwest University Research Network (MRUN), CATTEC VI Conference, Skokie, IL, October 9, 2013.

rent and services, accelerators are typically run as for profit ventures and provide entrepreneurs with startup funding. [185]

Seed accelerators are defined as those accelerators that have an allocation of funds, applied to support startups in exchange for equity, paired with other development services. Accelerator models may provide for open enrollment or enrollment of teams into an accelerator program at specific times. Some of the services provided by startup or seed accelerators as defined by Startup Owl[186] written by veteran entrepreneur, William Keyser, Managing Director of Venture Founders LLC are included in Figure 27:

Help with business basics	Links to higher education resources
Networking activities	Links to strategic partners
Marketing assistance	Access to investors or venture capital
High-speed Internet access	Business training programs
Help with accounting/financial management	Advisory boards and mentors
Access to bank loans, loan funds and guarantee programs	Technology assistance
Help with presentation skills	

FIGURE 27: SERVICES PROVIDED BY START UP OR SEED ACCELERATORS

Source: Startup Owl, William Keyser, Managing Director of Venture Founders LLC

The Seed Accelerator Knowledge Base has a List of Seed Accelerators[187]. Accelerators typically invest in companies in exchange for equity at pre-seed or seed stage and focus on the development of the company and the management through programs including mentoring.

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[185] Christiansen, Jed D., "Copying YCombinator, A framework for developing Seed Accelerator Programmes," MBA Dissertation / Individual Project Judge Business School & Jesus College, (Cambridge, University of Cambridge, 2009).

[186] Startup Owl, Retrieved March 6, 2014 from http://startupowl.com/resources/startup-boosters/incubators-and-accelerators/.

[187] Seed Accelerators Knowledge Base, List of Seed Accelerators, Retrieved March 6, 2014 from http://seedaccelerators.jedchristiansen.com/home/list-of-seed-accelerators.

Internal

Universities may establish accelerator program within the confines of the university providing investment, services, and possibly space to support startup companies. This model of accelerator is often affiliated with the intellectual property office, entrepreneurship and innovation programs, or other university business support resources.

External

Accelerators are often located off universities campuses within incubators or research parks or nearby commercial locations and may be privately owned. These models will generally focus on startups from one or more universities and may also include startups that are not based on university intellectual property.

An example of an external accelerator based on a focused technology area that has bridged academic, economic development, public and private resources is the nanotechnology initiative in Albany, New York (Figure 28 below).

Albany, NY – A Nanotech Community - Albany NanoTech Complex

The College of Nanoscale Science and Engineering (CNSE) at the State University of New York (SUNY), SUNY Polytechnic Institute (SUNY Poly) founded in 2004, is a global education, research, development and technology deployment resource dedicated to preparing the next generation of technicians, engineers, scientists and researchers in nanotechnology. CNSE has a model based on leveraging partnerships with business, government, research consortia and cross-border collaborations to accelerate high technology education and commercialization. The Albany NanoTech Complex has an integrated economic development strategy to create jobs and growth for nanotechnology-related industries.

Today nanotechnology is considered one of the regions greatest strengths with more than 2,600 R&D jobs. CNSE's Albany NanoTech $14 billion Complex is still expanding though it currently totals 800,000 square feet of cutting-edge facilities with 85,000 square feet of 300mm wafer, class 1 capable cleanrooms. CNSE has over 300 global corporate partners to date and has onsite corporate presence that includes IBM, Intel, Global Foundries, SEMATECH, Samsung, TSMC, Toshiba, Applied Materials, Tokyo Electron, ASML and Novellus Systems.

The Albany Nanotechnology community is an integrated complex of academic and industry collaborations, startup companies, joint ventures, and sponsored research occurring in a techno-centric regional environment with shared resources. The Albany NanoTech Complex demonstrates that synergistic commercialization approaches can yield unprecedented results.

- Albany NanoTech -- Albany, NY
- Center for Advanced Automation Technologies and Systems, Rensselaer Polytechnic Institute (CAT) -- Troy, NY
- Center for Advanced Interconnect Systems Technologies, Rensselaer Polytechnic Institute -- Troy, NY

- Center for Advanced Technology in Nanomaterials and Nanoelectronics, University at Albany (CATN2) -- Albany, NY
- Center for Integrated Electronics, Rensselaer Polytechnic Institute (CIE) -- Troy, NY
- Center of Excellence in Nanoelectronics, Albany -- Albany, NY
- Centro de Investigación en Materials Avanzados (CIMAV) - Chihuahua, Mexico
- Cornell NanoScale Science & Technology Facility (CNF) -- Ithaca, NY
- Energy & Environmental Technology Application Center (ANT) -- Albany, NY
- IBM - Albany NanoTech -- Albany, NY
- iCLEAN - Albany, Hudson Valley, Saratoga, NY
- Infineon - Albany NanoTech -- Albany, NY
- Intel - Albany NanoTech -- Albany, NY
- Micron - Albany NanoTech -- Albany, NY
- Nanoelectronics and Optoelectronics Research and Technology Center (STAR Center) -- Troy, NY
- Nanoscale Metrology and Imaging Center -- Albany, NY
- Nanotechnology Center (RPI) -- Troy, NY
- NanoQuebec - Province of Quebec, Canada
- New Energy New York -- Albany, NY
- New York-Israel Collaboration Program in Applicative Nanoscale Technologies - Albany, NY and Tel Aviv, Israel
- Rensselaer Nanotechnology Center for Directed Assembly of Nanostructures -- Troy, NY
- Saratoga Technology + Energy Park - Saratoga, NY
- Sematech North - Albany NanoTech -- Albany, NY
- Technische Univerität - Dresden, Germany
- Texas Instruments - Albany NanoTech -- Albany, NY
- Tokyo Electron Technology Center America - Albany NanoTech -- Albany, NY

FIGURE 28: CASE STUDY - ALBANY, NY – A NANOTECH COMMUNITY

Regional

Regional accelerators have been shown to be an effective approach to supporting the development of technologies and specifically in building support to assist in bridging the “valley of death” funding gap. The i6 Challenge is a national grant funding initiative in the United States to support the funding for innovations under the Startup Act (Case Inset below)

The i6 Challenge

The i6 Challenge is a multi-agency grant that encourages and rewards innovative, groundbreaking ideas that accelerate technology commercialization, new venture formation, job creation, and economic growth across the United States. The initiative seeks to accelerate innovative product development, spur the formation of start-ups, and create small businesses by supporting Proof of Concept Centers at universities and research consortiums across the country, which are helping to jumpstart the production of emerging technologies and revolutionize manufacturing processes. Proof of Concept Centers incorporate a range of services, such as technology and market evaluation as well as business planning, which are critical to regional economic growth and job creation. The iSix challenge has funded 20 Jobs and Innovation Accelerator Programs, 6 iSix challenge 2010 programs, and 6 iSix Green programs across the country to spur sustainable startups, small businesses, and new ventures.

Launched in 2010 as a component of the White House's Startup America initiative, the i6 Challenge is led by the U.S. Department of Commerce's Economic Development Administration Office of Innovation and Entrepreneurship (OIE) created in 2009. The office leads efforts to promote innovation-based, high-growth entrepreneurship, develops policy recommendations, and implements initiatives to commercialize technology developed through university and federally-funded research.[188]

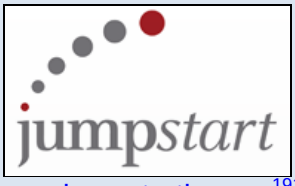
FIGURE 29: CASE STUDY - THE I6 CHALLENGE

Accelerators may have areas of outreach across entire states **(**The Florida Institute for the Commercialization of Public Research[189]) or on regional economies (Jumpstart, Northeast

[188] United States Department of Commerce, "Obama Administration Announces Winners of i6 Challenge Competition to Promote Innovation, Entrepreneurship and Job Creation," Press Release, September 19, 2012, Retrieved March 6, 2014 from http://www.commerce.gov/news/press-releases/2012/09/19/obama-administration-announces-winners-i6-challenge-competition-promo.

[189] The Florida Institute for the Commercialization of Public Research (FICPR), Retrieved March 6, 2014 from http://www.florida-institute.com/index.cfm.

Ohio[190](Case Inset Below). These initiatives are often public or public private partnerships tied to economic development initiatives



www.jumpstartinc.org[191]

Overview of Commercialization Model: JumpStart provides a wide range of commercialization and development services to hundreds of entrepreneurs located in northeast Ohio; these pro bono services include business and technology assistance, mentoring, and talent recruiting for senior management teams and boards of directors. In addition to providing these services, JumpStart also makes convertible note and/or equity investments of $250-650,000 in 10-12 pre-seed or seed stage firms each year.
Structure: JumpStart is a US 501(c)(3) nonprofit corporation.

Partners and Stakeholders: JumpStart has 20+ operating partners and collaborators who are part of the JumpStart Entrepreneurial Network (www.jumpstartnetwork.org). This network utilizes a collective impact strategy and operating framework to maximize efficient outcomes and includes:

- A Common Operating Agenda Amongst All Public, Private, Philanthropic and Institutional Partners
- A Shared Management System
- Continuous Communications Amongst Partners
- Mutually Reinforcing and Evolving Activities
- Backbone Support for Consistent Day-to-Day Management

JumpStart also has over 40 separate funders that provide philanthropic support to its mission with the largest four financial supporters being the Ohio Third Frontier, The Fund for Our Economic Future, The Cleveland Foundation and the Burton D. Morgan Foundation.

Areas of Technology Focus:

- Advanced Materials
- Aeropropulsion Power Management
- Fuel Cells and Energy Storage
- Solar Photovoltaics
- Medical Technology
- Software Applications for Business and Healthcare Sensing and Automation Technologies
- Situational Awareness and Surveillance Systems
- Agribusiness and Food Processing*
- Shale

[190] JumpStart Inc., Retrieved March 6, 2014 from http://www.jumpstartinc.org/en/aboutus.aspx.

[191] *ibid.*

Outcomes: Since 2007, Northeast Ohio startup firms have attracted over $1.1B in angel and venture capital while creating 7,000 total jobs partnering directly with JumpStart and the JumpStart Entrepreneurial Network.

FIGURE 30: CASE STUDY - JUMPSTART

National

Some accelerator programs are focused on funding startup programs within defined countries. These may be through research funding such as the SBIR and STTR programs in the United States, funding through loans or grants to support business development, operations, and infrastructure. The National Council of Entrepreneurship in Technology Transfer (NCET2)[192] is an organization of entrepreneurial universities whose activities include creating and funding university startups and connects investors, economic development organizations, public and private funds and tech transfer professionals in building communities of innovation at universities in the United States. Another organization Alliance for the Commercialization of Canadian Technologies (ACCT)[193] provides a unique nation-wide platform for all proponents in the Canadian innovation ecosystem to collaborate at the institution-industry interface. The organization involves over 110 academic-based research organizations including universities, hospitals, colleges and polytechnics, including over 400 knowledge and technology transfer/industry practitioners.

In European countries, seed and start-up funding for innovative start-ups often comes from the entrepreneur, friends, professional contacts and family. Increasingly, investment from business angels (wealthy individuals) is an option for many entrepreneurs. In addition, public interventions in most cases are necessary to develop the markets in early-stage equity finance.

Developing countries such as Lithuania (Case Study Appendix A) and Russia (Case Study Appendix B) are representative of changes occurring in many countries to address infrastructure, culture, funding, and human capital. One example of a country focused acceleration program is Malaysia's Coach & Grow Programme[194] as described in the case study following.

[192] National Center for Entrepreneurial Tech Transfer, Retrieved March 6, 2014 from http://www.ncet2.org/.

[193] Alliance for the Commercialization of Canadian Technologies (ACCT), Retrieved March 6, 2014 from http://www.acctcanada.ca/index.php?option=com_content&view=article&id=10&Itemid=7k.

[194] Coach & Grow Programme (CGP), Retrieved March 6, 2014 from http://cgp.com.my/.

The Coach & Grow Programme [195](CGP) is the only long term accelerator program in Malaysia aimed at coaching existing entrepreneurs to expand their business to a larger scale. The mission of the program is to encourage, support, stimulate and nurture the development of Malaysian entrepreneurship in ICT, bio-technology and life sciences, material sciences and high growth technology industries, and generate sustainable and scalable businesses that will drive Malaysia's vision of creating an innovative knowledge-based society and economy.

The program is funded by Ministry of Finance, Malaysia (MOF) and managed by Cradle Fund Sdn Bhd [196](Cradle), an agency under the Malaysian Ministry of Finance. Cradle Fund Sdn Bhd (Cradle), is a not-for-profit organization and has managed the RM100 million Cradle Investment Programme since its inception in 2003. An additional RM50 million was added to this allocation under the 10th Malaysian Plan for 2011 and 2012. The CGP marks a maturing process in Malaysia with the private sector playing a larger role compared with previous government initiatives.

Program Structure:
Cradle oversees the program. The Private Sector partner for the CGP is Proficeo Consultants Sdn Bhd (Proficeo), who were the architects and collaborating partner for implementation of the program.

Phase I
This phase of the program targets companies or teams from in Pre-Seed, Growth, Global and Pre-IPO stages of growth to pitch to a panel comprising of representatives from Cradle, TeAM (Technopreneurs Association of Malaysia) and MVCA (Malaysian Venture Capital and Private Equity Association) as well as training partners.

Applications are submitted online, and are judged on the entrepreneurs' passion, as well as the potential of the technology solution to go regional or global. After the pitching session, companies are selected to go into Phase 2. To date, over 270 companies/team have successfully completed the Program.

Phase 2
In this phase each company selected will receive individualized training and coaching over a 12-month period, which is divided into two phases. In the first six months of the program, all companies attend group session, workshops and seminars. The key objective is to provide tools and workbooks for the companies to examine their business model, customer segment and readiness for scale. At the end of the first six months, all companies are required to present their business, plans for growth and demonstrate key activities that will be implemented to achieve Key Performance Indicators (KPIs) that they commit to achieving. Following this process, the companies then commence implementation of the plans and are required to submit monthly progress reports to ensure that they meet the key performance indicators (KPIs). Following monthly submission of reports, coaches assigned to each company meet with them to assess progress, challenges faced and help the companies refine their plans and activities to ensure that companies stay on track, remain motivated and focused on the end goal. To date, over 270 companies and more than 1000 entrepreneurs have participated in the CGP. Participating companies have generated RM453.5 million in sales and raised RM179.3 million in capital.

FIGURE 31: CASE STUDY: COACH & GROW
Author/Owner Cradle Fund Sdn Bhd, Proficeo Consultants and Renuka Sena, CEO, Proficeo Consultants

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[195] *ibid*.

[196] Cradle Fund Sdn Bhd (Cradle), Retrieved March 6, 2014 from www.cradle.com.my. Proficeo Consultants Sdn Bhd (Proficeo) www.proficeo.com.

International

International accelerator models rely on the collaboration and shared resources of two or more countries to support the development of startups including those from universities. To bridge the gap for startup and emerging companies and to gain access to resources or reach markets in other parts of the world "soft landing" has been established to provide for companies to have a primary site in one country and establish a secondary location through an incubator in another country. The incubator also provides the resources to support both the early stage needs and facilitate in the additional national/international requirements. National Business Incubation Association (NBIA) provides a list of the international locations for members with a NBIA Soft Landing[197] designation where this model is being employed.

Other international models for startup acceleration include creating international networks of support and investment. An example of a global accelerator model is the Global Accelerator Network[198] (GAN) which consists of 50 independently owned and operated regional organizations that operate a high quality start-up accelerator programs on 6 continents. The organization supplies a listing of GAN Members[199]. The Network provides professional development, networking opportunities, and training, consulting and ongoing support for members. The Global Accelerator Network is an initiative supported under Startup America[200].

In Europe, financing for technology start-ups can be sought through the high growth and innovative SME facility which is available to small businesses in their start-up or expansion phase under the Competitiveness and Innovation framework Programme (CIP) which completed in 2013. The EC and the European Parliament have launched COSME - COSME, the EU programme for the Competitiveness of Enterprises and Small and Medium-sized Enterprises (SMEs) running from 2014 to 2020 with a planned budget of €2.3bn. COSME will support SMEs in the following area: Better access to finance for Small and Medium-sized Enterprises (SMEs), Access to markets, Supporting entrepreneurs and More favorable conditions for business creation and growth. (Case Inset below).[201]

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[197] The National Association of Business Incubation (NBIA), "Soft Landings International Incubator Designation," Retrieved March 6, 2014 from http://www.nbia.org/member_services/soft_landings/.

[198] Global Accelerator Network, Retrieved March 6, 2014 from http://gan.co/.

[199] Global Accelerator Network (GAN), "Member Listing," Retrieved March 6, 2014 from http://gan.co/members.

[200] Startup America, Progress Report, Retrieved March 6, 2014 from http://www.whitehouse.gov/economy/business/startup-america/progress-report.

[201] COSME (Competitiveness of Enterprises and Small and Medium-sized Enterprises (SMEs)), Retrieved April 24, 2014 from http://ec.europa.eu/enterprise/initiatives/cosme/index_en.htm.

The Programme for the Competitiveness of Enterprises and SMEs (COSME)

The Programme for the Competitiveness of Enterprises and SMEs[202] (COSME) 2014-2020 is a program of the European Commission aimed to improve the business environment and the competitiveness of European enterprises. With small and medium-size enterprises (SMEs), current and potential entrepreneurs and business support organizations as its main targets, the program will provide better access to finance, deliver business support services and promote entrepreneurship. Subject to the approval by the Council and the European Parliament, the Programme will run from 2014 to 2020 with a foreseen budget of € 2.5 billion. The COSME program will support current initiatives of the Entrepreneurship and Innovation Programme[203] (EIP). The program will also build on the expertise of the EU efforts of the European Investment Fund (EIF)[204] and Enterprise Europe Network [205](EEN).

Access to finance for SMEs through dedicated financial instruments:
An equity facility for start-up and growth phase investment will provide commercially oriented reimbursable equity financing primarily in the form of venture capital (VC) and a loan facility will provide risk sharing arrangements with financial intermediaries to cover loans for SMEs.

Enterprise Europe Network:
A "one-stop shop" for the business needs of SMEs in the EU and beyond. It provides enterprises with information and a range of quality and free-of-charge business support services to make them more competitive: information, guidance and customized assistance. It facilitates business expansion and partnering in the EU Single Market and beyond.

Support for initiatives to foster entrepreneurship:
Ease difficulties in setting up and transferring enterprises; encourage trans-national networks, exchange good practices and identify scope for expanding business activities.

Access to markets:
SME business support in markets outside the EU via specific centers and helpdesks. International business cooperation will be supported, inter alia, by reducing differences in regulatory and business environments between the EU and its main trading partners.

Expected Impact:
• An increase of the EU GDP of €1.1 billion per year and to create or safeguard 30,000 jobs per year through contribution to The Enterprise Europe Network
• Assist 40,000 companies with partnership agreements resulting in € 400 million annually in additional turnover for assisted companies and 1,200 new business products, services or processes annually through The Enterprise Europe Network.
• An increase of €3.5 billion in additional lending and/or investment for European enterprises per year by providing easier access to financing including the launch of cross-border activities.

FIGURE 32: CASE STUDY - COSME

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[202] "COSME Programme for the Competitiveness of Enterprises and SMEs (2014- 2020)," Retrieved April 24, 2014 from http://ec.europa.eu/cip/cosme/index_en.htm.

[203] European Union, Entrepreneurship and Innovation Programme (EIP), Retrieved March 6, 2014 from http://ec.europa.eu/cip/eip/index_en.htm.

[204] European Investment Fund (EIF), Retrieved March 6, 2014 from http://www.eif.org/.

[205] Enterprise Europe Network (EEN), Retrieved March 6, 2014 from http://portal.enterprise-europe-network.ec.europa.eu/.

The building of technology bridges between developed and developing countries is another model for new initiatives to leverage the value of intellectual property rights and build on the experience, expertise and resources from experts in startup development and established financing. One example is the Algerian Startup Initiative between Algeria and the United States (Figure 32).

Established in 2009 through the linkages between Algerians working in the ICT sector mainly in San Francisco, CA and their counterparts in Algeria with a focus on providing high quality know how and skill transfer to Algerian entrepreneurs. While the initial launch of this private sector initiative focused on the transfer of ICT best practices from Silicon Valley to Algeria, the second national business plan competition in 2012 expanded into new sectors including renewable energy, green technology, smart grid, and e-health.

In 2012, in response to the lack of early stage capital for startup companies, a few of the co-founders of ASI along with other local and foreign entrepreneurs created the first business angels network in Algeria, the Casbah Business Angels (CBA)[206]. The angel investor organization is comprised of Algerian and Silicon Valley CEOs who invest their time and money in new and existing startup companies.

Algerian Startup Initiative

The Algerian Startup Initiative (ASI) is a project of technological cooperation between the Algeria and the United States which aims to promote innovation and entrepreneurship, attract investment on new technologies and the outsourcing of services. The project creates a bridge to global contractors who provide experiences in business and intellectual property development, management, marketing and partnership for Algerian firms to have an option of soft landing in Silicon Valley where ASI has established relationships with early stage venture funding and angel investment groups.

Algerian Startup Initiative – Maghreb Startup Initiative (ASI-MSI)

One component of the project is the Algerian Startup Initiative – Maghreb Startup Initiative (ASI-MSI) competition leading to participation in the Intel Global Challenge Competition at UC Berkeley including the coverage of travel costs for the selected company. The competition, initiated by the Algerian government, is now also financially supported by the U.S. government based on the identification by the U.S. State Department as a power tool to be exported to neighboring countries now run within Morocco, Tunisia as well as Algeria to promote entrepreneurship. The competition has five stages:

Stage 0: Implementation phase (Launch)
Candidates can apply to participate in the competition through the website with the online application system.

Stage 1: Pre-selection phase
All received applications will be screened to identify viable ideas

Stage 2: Selection phase
The 25 teams/projects are selected as semifinalist after pitching to a selection /juror panel.

Stage 3: Linkage to Intel Global Challenge
The 25 semi-finalist from each country should submit their business plan to Intel to compete for one slot to participate in
the Intel Global Challenge in Berkley, CA.

[206] Casbah Business Angels (CBA), Retrieved March 6, 2014 from http://www.casbahbusinessangels.com/.

Stage 4: Mentoring & training of semi-finalists

The 25 semi-finalists /projects attend a 5-day GIST boot camp to provide them with training in business plan and entrepreneurship development.

Mentoring will begin for the 25 teams in Tunisia and Morocco.

Stage 5: Final selection phase & support for startup creation

Up to 5 teams are selected out of the 25 semi-finalists based on live pitching session in front of a jury panel. Winners will receive a cash prize.

Mentoring begins for teams in Algeria.

The winners participate in the cross-border exchange and entrepreneurship training

GIST Startup Boot Camp/"GIST Tech - I" Competition

Another ASI initiative includes program is in partnership with the Global Innovation through Science and Technology (GIST). GIST forges links at the individual and institutional levels among technology entrepreneurs, angel investors, and the marketplace to improve quality of life through economic prosperity. The GIST initiative builds entrepreneurial ecosystems in 43 countries across the Middle East, Central and South East Asia, and Africa by identifying, coaching, and funding the most promising entrepreneurs through its competitions, start-up acceleration services, online social media platform and interactive mentorship programs. The GIST Initiative is implemented by CRDF Global and funded by the U.S. Department of State.

The GIST Startup Boot Camp, an intense and interactive two day program of training and heavy mentoring designed to spark innovative thinking and trigger the creation of new startup ideas among promising technology entrepreneurs. The startup boot camps gather technology entrepreneurs, experienced entrepreneurs based in the country, governmental officials, non-profit representatives, and prospective local angel investors in order to catalyze the entrepreneurial ecosystem. This is correlated to the invitation by GIST for ASI companies to participate with motivated entrepreneurs from Africa, Asia, the Middle East and Turkey in its annual "GIST Tech - I" competition. Submit a Go-To-Market Plan (Executive Summary & Pitch 2 minute Video) for a chance to win over $200K in price and 1 Fellowship amongst 5 in GIST Accelerator, 6 weeks of immersion program in Silicon Valley.

FIGURE 33: CASE STUDY - ALGERIAN STARTUP INITIATIVE

Source: Algerian Startup Initiative and Innovation Division Ministry of Industry for Algeria

12 Benchmarking and Metrics

Metrics have been established and benchmarking is performed by a number of organizations and governments to compare the status of technology transfer, innovation, and economic impact based on multiple parameters related to the commercialization of intellectual property. We measure what we value, and if we only measure money, we confound the non-profit mission of the research institution. If we measure economic impact, the non-profit technology transfer office is often expected to become the economic developer with responsibilities for and real estate and business development with technology transfer, often without additional funding.[207] Institutions and innovation systems need to take into account the inherent variability of innovation returns. In the early stages, more emphasis needs to be placed on intermediate benchmark measures and less on such traditional measures as license revenues and spinout-company formation.[208]

Economists established the central role played in innovation in economic growth in the 1950s, when early empirical efforts to account for growth in U.S. output by measuring labor and capital inputs left the largest part of growth unexplained. Pioneering work by Abromowitz [209] (1956) and Solow [210] (1957) pointed to improvements in technology as constituting the single most important driver of increases in U.S. output per person. In the 1980s and 1990s, increasingly sophisticated efforts by economists to define the growth process in advanced industrial economies placed the process of invention the center of their models.[211]

Today one there are Annual Surveys conducted by the Association of University Technology Manager (AUTM) to provide reports on standardized metrics. However, most recently the organization in conjunction with UNICO selected “New Metrics” to measure both final and intermediary steps in the technology transfer and commercialization process. AUTM suggests these categories, because research institutions operate within a context. The city; local, regional and national government; business support services and policies; funding; etc. all impact what an institution can do. In addition, once an organization external to the research

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[207] Tarzian Sorensen, Jill Ann, and Chambers, Donald A., "Evaluating academic technology transfer performance by how well access to knowledge is facilitated—defining an access metric," *The Journal of Technology Transfer*, Volume 33, Issue 5, October 2008, pp 534-547.

[208] Heher, Anthony D., *Benchmarking of Technology Transfer Offices and What it Means for Developing Countries: IP Handbook of Best Practices*, Chapter No. 3-5, Retrieved March 6, 2014 from http://www.iphandbook.org/handbook/ch03/p05/.

[209] Abramowitz, Moses, "Resource and Output Trends in the United States Since 1980," *The American Economic Review*, 46, May 1956, pp. 5 – 23.

[210] Solow, Robert M., "Technical Change and the Aggregate Production Function," *Review of Economics and Statistics*, 39, August, 1957, pp. 312-320, Retrieved on April 24, 2014 from http://www9.georgetown.edu/faculty/mh5/class/econ489/Solow-Growth-Accounting.pdf.

[211] U.S. Department of Commerce, National Economic Council, "The Competitiveness and Innovative Capacity of the United States," January 2012.

institution has control over a research institution asset, that external organization's actions are much more critical to any potential impact than the institution's activities.[212]

Today there are Annual Surveys conducted by the Association of University Technology Manager (AUTM) to provide reports on standardized metrics. However, most recently the organization in conjunction with PraxisUnico (formerly UNICO) selected "New Metrics" to measure both final and intermediary steps in the technology transfer and commercialization process. AUTM suggests these categories, because research institutions operate within a context. The city; local, regional and national government; business support services and policies; funding; etc. all impact what an institution can do. In addition, once an organization external to the research institution has control over a research institution asset, that external organization's actions are much more critical to any potential impact than the institution's activities.[213]

PraxisUnico, a leading Technology Transfer membership organization in the United Kingdom commissioned a study (2006) to determine how to successfully measure how universities engage in technology transfer activities and to develop agreement upon the measurement tools selected. The objective was to create a knowledge transfer framework to measure knowledge transfer activities in UK universities. The metrics selected for measurement include the traditional measures as well as intermediaries looking at the licensing and commercialization process as shown below.[214]

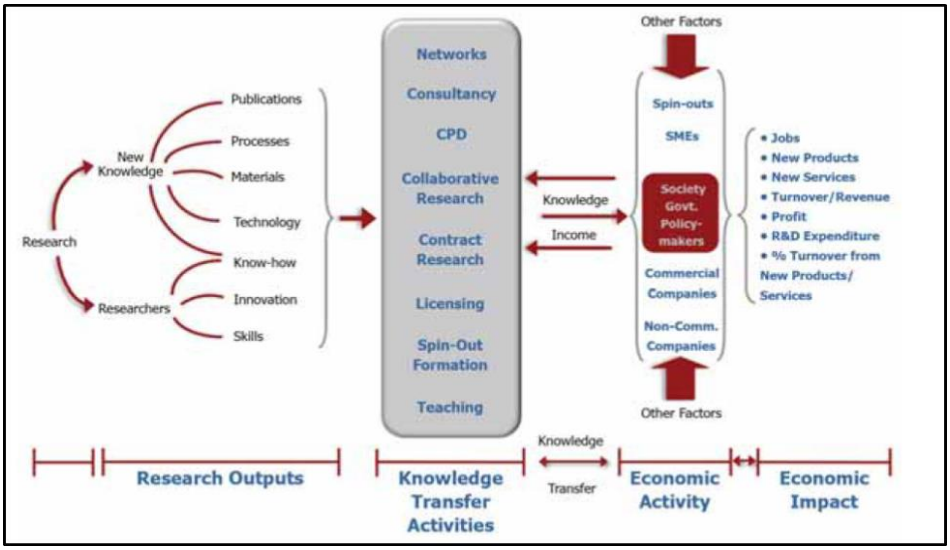

FIGURE 34: KNOWLEDGE TRANSFER FRAMEWORK
SOURCE: DR KEVIN KULLEN

[212] Association of University Technology Managers (AUTM), "New Metrics, AUTM's Proposal for the Institutional Economic Engagement Index," Retrieved March 6, 2014 from http://www.autm.net/New_Metrics/4063.htm.

[213] Association of University Technology Managers (AUTM), "New Metrics, AUTM's Proposal for the Institutional Economic Engagement Index," Retrieved March 6, 2014 from http://www.autm.net/New_Metrics/4063.htm.

[214] Metrics for the Evaluation of Knowledge Transfer Activities at Universities, UNICO, 2012, Retrieved on April 24, 2014 from http://www.praxisunico.org.uk/uploads/Library%20House%202008%20-%20Unico%20(lowres_final).pdf.

The National Center for Entrepreneurship in Technology Transfer (NCET2) has implemented a survey to vice-presidents of research and deans of the schools of medicine, business and engineering at the top 200 U.S. research universities. They were surveyed to further understand their institution's current engagement in the National Advisory Council for Innovation and Entrepreneurship (NACIE) recommendations to the Secretary of Commerce.[215] This survey captures the key choices of both current and future activities of U.S. universities related to the commercialization of intellectual property including resources, policy, funding, and programs, facilities, and partnerships. The Global Startup Ecosystem Index established by compass.co[216] (Figure 35) is based on data from more than 50,000 startups around the world and analyses the state of entrepreneurship around the world.[217]

Ecosystem	Ranking	Startup Output Index	Funding Index	Performance Index	Talent Index	Support Index	Mindset Index	Trendsetter Index	Differentiation from SV Index
Silicon Valley	1	1	1	1	1	1	1	1	1
Tel Aviv	2	2	1	12	5	5	9	17	18
Los Angeles	3	4	6	2	3	13	11	4	11
Seattle	4	19	7	6	2	4	6	11	14
New York City	5	3	4	8	12	9	8	7	8
Boston	6	10	1	7	7	8	7	5	20
London	7	7	5	10	9	2	3	14	17
Toronto	8	6	9	3	10	3	15	12	5
Vancouver	9	13	12	9	4	14	2	9	19
Chicago	10	8	15	5	14	7	13	18	9
Paris	11	14	13	4	17	6	12	15	6
Sydney	12	5	14	16	6	12	16	1	3
Sao Paulo	13	9	10	15	19	11	5	16	4
Moscow	14	16	19	18	11	10	14	8	2
Berlin	15	15	11	13	13	20	18	5	16
Waterloo	16	11	16	14	16	17	17	10	13
Singapore	17	18	8	19	8	16	20	19	12
Melbourne	18	12	17	20	15	18	19	3	15
Bangalore	19	17	18	17	18	15	10	20	10
Santiago	20	20	20	11	20	19	4	13	7

FIGURE 35: THE GLOBAL STARTUP ECOSYSTEM INDEX

Source: Compass.co

13 Recommendations for Future Development

The Guide on Intellectual Property (IP) Commercialization is an active resource on issues concerning the commercialization of intellectual property with a focus on academic research. The Guide provides a compilation of resources for reference and use. It includes descriptions on how to achieve the commercialization of university inventions, research results and knowledge and the reports on the collaborative development and funding processes to make them successful.

The Guide is an active resource for and reference on the commercialization process as effectively developed and used in universities. It presents references to and overviews on commercialization programs and acceleration models. It is a useful reference for emerging countries developing commercialization systems and systems of support for the commercialization process.

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[215] "Survey on Innovation and Entrepreneurship," Prepared for the Presidents-Investors Summit, National Center for Entrepreneurship in Technology Transfer (NCET2), Retrieved March 6, 2014 from http://center.ncet2.org/survey.
[216] Startup Genome, Retrieved April 24, 2014 from http://www.startupgenome.co/.

[217] Startup Ecosystem Report 2012, Startup Genome, Cracking the Code of Innovation, Retrieved March 6, 2014 from http://blog.startupcompass.co/pages/entrepreneurship-ecosystem-report.

The Guide is a foundational resource for university technology transfer and commercialization globally. The intent in its publication is to develop cooperation through partnerships and networked collaborations with the air of global impact for innovation. To achieve this we propose to establish a WIPO Global Commercialization Portal to support access to the broad scope of resources available and as a means of expanding and updating the information available as commercialization efforts continue to grow and change. This portal will enable updating of the database as an international reference for commercialization and funding sources provided in the Guide. As well, the portal will provide for feedback and requests for customized support. The portal will be a living tool for innovation for cross boarder commercialization and partnership development and a resource for across global best practices.

The Guide will serve as the basis for WIPO Workshops on Intellectual Property Commercialization. These workshops will provide a forum for commercialization stakeholders to establish cooperative alliances, exchange information and share benefits and failures from their experiences. These workshops will utilize the Guide content, examples, case studies, and resources to support the development of commercialization efforts in emerging and developing countries. Outcomes from the workshops will be the basis for refining and expanding the next version. The Guide will also serve as a resource for the development of customized workshops for targeted countries developing and expanding commercialization efforts.

We envision the development of commercialization roadmaps for institutions and countries and the ability to measure their capacity using the Guide and the associated tools developed to accompany it.

Standalone workshops for stakeholders in developing and emerging countries based on the Guide will be available upon request to further commercialization efforts or to establish commercialization roadmaps.

We welcome your recommendations upon review of the Guide and insights into the development of future versions by contacting Ali Jazairy, Senior Counsellor, PCT International Cooperation Division, Patents and Technology Sector, WIPO (ali.jazairy@wipo.int) or Gary Keller, Chief Executive Officer, Xomix Ltd. (gary.keller@xomix.com).

APPENDIX A: INTERNATIONAL CASE STUDY - LITHUANIA

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1. Overview of IP Commercialization

Gradual shift of technology/IP focus from public to private sector

Lithuania saw the origins of high-tech industry in state-funded research centres. This is particularly true for lasers and biotechnology – the two most internationally acknowledged Lithuanian export sectors – which started their development from Soviet-era research projects (military research gave the kick start for laser technologies while the need to satisfy industrial production sparked the advancements in modern biotechnology) in Lithuania in 1960s-70s.

Backed with governmental funding and public industry research orders, research hubs were established and ultimately developed specialized research lines and attracted some of the most prominent scientific talent in the field. Before the collapse of the Soviet regime the focus of technological advance remained limited to satisfaction of public needs leaving IP and commercialization far behind.

The shift towards commercialization of R&D results for profit was gradual and followed the struggle of adaptation to the emerging market economy in early 1990s. Both laser and biotech industries have undergone similar industry development patterns. The initial step was the diversification of public research fields and initiatives of scientists to establish private spin-offs of public research institutions to further develop and commercialize the technology. In this way, current global laser industry leaders UAB Ekspla, UAB Light Conversion, UAB Standa, and UAB Altechna as well as globally and regionally renowned biotech companies UAB Thermo Fisher Scientific Lithuania Holding, UAB Sicor Biotech, UAB Biok, and UAB Biocentras emerged.

Ability of scientists to exploit existing R&D for business purposes was a characteristic feature of early Lithuanian high tech ventures and an undisputed precondition of future success.

Determinants to successful R&D result commercialization and the remaining challenges

Strategic national public policy goals later facilitated successful commercialization of IP assets. Aspiration for an European Union (EU) integration have lead Lithuania to align its legal IP protection framework with international and EU standards while subsequent access to EU structural support coupled with foresighted strategic public finance planning made relevant R&D infrastructure (science and technology parks, business incubators, technology transfer offices) as well as supporting consultancy services available. Technology-oriented public policy led to significant results. According to certain institutions in 2011 there were more than 130 companies and 47 institutions operating in the field of life sciences in Lithuania.

Innovation-driven sectors also owe part of their success to the overall political orientation of Lithuania towards a technology-based economy. The laser and biotech industries are among few other sectors that are officially declared to be breakthrough sectors and enjoy enhanced political support and promotion. Political declarations are being properly implemented by prioritizing these industries as national and EU funds are allocated. It is estimated that the Life Sciences industries acquire 20% of all EU funds destined for R&D enhancement in Lithuania

while the biotech field alone was afforded 16% of such funds or 23m EUR in the period 2008-2011.

Although the innovation ecosystem (academia capable to prepare professionals and outstanding research, businesses capable of commercializing R&D results, supporting service network and infrastructure) seems to be established in Lithuania, there are signs that R&D activities have not penetrated the whole economy yet. Official statistics[218] suggest that less than a third of all companies engage into R&D activities in Lithuania. Limited market size, industry practices and industry structure with a few innovating sectors might justify this[219], however, it seems more likely that the real issue behind the reluctance of other businesses to engage in R&D activities is lack of competence to find profitable practical applications for their IP assets and to estimate the market for them. This seems to be the first challenge to boost commercialization of IP assets in future.

2. **Research Infrastructure**

Lithuania has developed all the levels of national research ecosystem. In some fields fundamental academic research culture has been flourishing for decades already. Building of the supporting infrastructure has been accelerated by the accession into the EU. Legal framework on technology transfer is becoming increasingly flexible and simple, thus reducing the burden to the business licensee. However, few unresolved issues still remain in every level of research infrastructure.

a. **Universities**

Lithuanian law allows public research institutions to own intellectual assets regardless whether acquired or internally created. Any income received from IPR commercialization of can also be owned by research institution; however, no less than 1/3 of the profit gained through commercial use of IPRs developed by employees of public research institution must be allocated to the author (co-authors). The employee's share might, however, be reduced through inclusion of respective provisions into the employment or other agreement concluded between the public research institution and the employee.

The law entitles public research institutions to individually adopt internal rules for its employees to govern the reporting of R&D results achieved during the course of employment in the research institution upon the use of experience, technologies or equipment. Inbound and outbound tech transfer to and from a public research institution is governed by common rules and contracts.

Lithuanian law encourages public research institution self-regulation in the field of IP management and transfer. Internal policies are the recommended format to this end. To date, such a policy is only adopted in Kaunas Technology University and treated as an exemplary practice. The scheme of IP management and commercialization is built on the obligation of academic staff to notify R&D results to the university administration and on the subsequent university senior officials' making decisions regarding the future ownership and protection for

[218] http://www.stat.gov.lt/lt/catalog/pages_list/?id=2292.

[219] http://www.vpb.lt/index.php?&n=298&nn=archyve&nn=568 .

such IP assets. University staff is motivated to generate IP with 30% of commercialization revenue (after IP maintenance and other costs have been deducted).

The main problems encountered by public research institutions in relation to IP commercialization in Lithuania are the following:

- Limited commercial interest and competence of research institutions/scientists to engage in market analysis, to conduct a patent search, to determine relevant jurisdiction for IP asset protection, to identify commercial value of an invention, to negotiate with potential investor.
- Publications are to a large extent the priority for Lithuanian researchers
- Insufficient investment in IP
- Lack of skills to negotiate with potential investors and negotiate favourable terms for a tech Transfer contract
- Lack of experimental facilities for development of "proof of concept" studies or prototypes
- Lack of practice and skills in the valuation of IP for financial statements
- Limited links to investors.

Three technically oriented universities (Vilnius University, Vilnius Gediminas Technical University and Kaunas Technology University) currently dominate contract research and patent filing in Lithuania. In 2011 Lithuanian research institutions have filed 28 patent applications which constitutes over 60% of all national filings.

b. **Technology development zones**

Science and technology centres are among the priority projects in Lithuanian research infrastructure development policy: 11 technology parks[220] and 5 science and technology valleys[221] are currently operating in Lithuania.

Technology parks provide premises for R&D based companies and specific supporting services such as business incubation, consultancy and tech transfer. Parks aim to develop competitiveness and encourage innovativeness in certain region and are established so that the entire territory of Lithuania is covered. The biggest cities, however, have higher concentration of more specialised parks, e.g. on nanotechnologies and laser physics or IT and renewable energy.

Sunrise and Santara science and technology valleys are based in Vilnius, Nemunas and Santaka valleys are situated in Kaunas and there is Baltic valley in Klaipeda. Compared to technology parks, valleys are more specialized in their activities (e.g. Santara valley in Vilnius focuses on medical biotechnology, Sunrise valley on lasers and optics; Nemunas focuses on agricultural and forestry areas; Baltic valley - on marine technologies) and are oriented to fostering science and business partnerships, encouraging practical applied research and commercialization.

[220] http://www.mita.lt/lt/nuorodos/mokslo-ir-technologiju-parkai/.

[221] http://www.mita.lt/lt/nuorodos/sleniai/.

EU structural and national support estimated at 400m EUR is strategically directed towards developing these 5 technology valleys. Modern laboratories and equipment are available for open access in some of them. Technology transfer centres serving as a meeting point for science and business institutions and providing supportive training on IP and business management currently operate under the auspices of Sunrise valley and will likely be established on other valleys.

The main issue commonly attributed to the technology development centres in Lithuania is that they are criticised for failing to attract higher numbers of innovative companies, for being too much dependent on EU financial support and so far failing to raise the overall level of innovative business in the country. The current situation suggests that the next inevitable step towards a hi-tech economy will require more investment and training programs to enhance business skills necessary for management and marketing of innovative products.

c. Incubators/ Accelerators

Seven incubators currently operate in Lithuania. They are spread across the territory so that they could be accessible to start-ups from any part of the country. Incubators rent offices and equipment at a reduced rate and provide consultations to companies with potential for high added value products, potential for creation of new jobs and engaging in innovative business practices. Incubators have become very popular among start-ups. As a result, in some regions incubators need expansion; however, funding seems to be insufficient to this end for some incubators. The most successful, the Kaunas Technology University incubator has expanded the scope of services offered so that it eventually turned into a technology park.

3. Key Government Intellectual Property Policies

Innovation is prioritised throughout the number of high level political framework documents.

- The Strategic national programming document *State Progress Strategy "Lithuania 2030"*envisions the creation of a smart economy which is globally competitive and based on the knowledge and innovation entrepreneurship by 2030. Another long-term programming document *Lithuanian Innovation Strategy for the Years 2010-2020* approved by the Lithuanian Government includes SWOT analysis on development of innovation in Lithuania and sets clear goals to develop an economy based on added-value production and promote sectors with particular potential including biotech, lasers and optics and ICT.

- *Government Program* is the main mid-term programming document clarifying the plan of leading political powers to develop national economic policies. A new government is currently under formation in Lithuania and will likely continue the long-standing practice to declare support priorities for innovation driven industry sectors.

Various programs set the development strategy for a particular sector. As a rule, these apply for a few years only and include investment priorities that determine available funding.

- *Program for Industrial Biotechnologies Development for the Years 2011-2013* aims to enhance biotech industry development in Lithuania through R&D of renewable resources, bio plastics, bio catalysers, veterinary and medicinal products and provides a EUR 14.5 million funding pool;

- *Program for High Technologies Development for the Years 2011-2013* aims to promote R&D in biotech, mechatronics, laser, IT, nanotechnology industries. EUR 2.63 million are allocated to be delivered to projects on competing application basis during 3 years;

- *Concept for the Development of Science and Technology Parks* approved by Lithuanian Government in 2003 stresses the importance to establish science and / or technology parks. Public subsidies, provision of state assets, EU funds are listed among the possible sources to develop them;

- *Long-term Strategy for Scientific Research and Experimental Development* approved by Lithuanian Government in 2003 emphasises that Lithuania shall improve legal, political, economic environment for hi-tech industries. This is declared to be a national priority for allocating EU structural funds;

4. Recent or Pending Changes to the Patent Law

The Law on Patents has been enacted in the new wording in early 2012. It aimed to eradicate excessive formalities and make patent law more business-friendly. The main changes included: simplification of formalities to acquire priority date allowing those filing patents to postpone submission of certain documentation later, introduction of legal possibility to re-establish rights after the failure to comply with procedural term, changes to representation requirements on representation of applicants, and the possibility to agree not to pay royalties for employee inventors.

On-going European patent law reform aiming to establish unitary patents that would be applicable in the most of EU countries and uniform patent court to examine infringement and validity disputes of European and unitary patents is closely followed in Lithuania. A legal study requested by the Ministry of Justice concluded that unitary patent court would be in line with Lithuanian constitutional law. Some questions related to the implementation of the reform (e.g. whether Lithuania will have a local chamber of uniform patent court or rather will adjudicate patent disputes in regional chamber established outside Lithuania) are still open and will require political input in the years to come.

5. Commercialization Economic Incentives

a. Tax incentives

In Lithuania engagement in R&D activities brings an opportunity of *triple deduction of R&D costs* from income for the tax period during which they are incurred where such R&D activity is related to the activities of such entity. The sums that are allowed to be deducted include (i) job remuneration, (ii) business trip costs, (iii) purchasing costs of materials used for R&D activities, (iv) purchasing price of outsourced R&D activities conducted in the European Economic Area or the state which has an effective treaty for the avoidance of double taxation with the Republic of Lithuania.

Amortisation of fixed assets used to carry out R&D could be deducted from income under certain procedure, thus reducing corporate income tax. Amortisation applied to such fixed assets is reduced, namely, to 2 years instead of 3-8 years to respective assets (machinery, software etc.).

b. Compensation of patenting costs and micro grants

Pubic authorities in Lithuania, such as the Agency for Science, Innovation and Technology (MITA), do allocate funding (de minims state aid) to fully or partly reimburse the costs of private companies or academic institutions incurred while patenting their inventions under European or International PCT route or registering Community or international design. A number of national undertakings have already taken advantage of this possibility.

Micro grants or “innovation cheques”– financial support program is a great success in terms of industry attention. Grants of 3,000 EUR or 6,000 EUR are available to facilitate research project or to mitigate the shortage in equipment for small and medium enterprises (SMEs).

c. Science-business partnership incentives

Boosting innovation of local company’s cooperation between scientific and business entities is encouraged by the state. The implementation of this objective so far is mostly successful through allocating public and EU funds to joint science and business venture projects and developing science and technology parks. In total more than 500m EUR was allocated for these purposes during the last financial aid programming period of 2007-2013 in Lithuania alone.

d. Remaining issues

The main condition while applying for R&D incentives in Lithuania is to prove to tax authority that activity is clearly novel and was performed in search for a solution for technical problem. Note that purely statistical, analytical or data collection activities are generally excluded from R&D and, therefore, falls outside the scope of incentives.

Experiments and testing activity also falls outside the R&D activity and thus cause some hassle in qualifying clinical trial activities for the purposes of applying R&D incentives. Patenting activity is considered as R&D activity and is incentivised accordingly only if relates to R&D activity.

Stakeholders also usually point to administrative incapacities of public authorities engaged in developing and encouraging R&D activities. The lacks of competences in encouraging partnerships and cluster activities as well as issues with budget planning are among the most pressing issues that negatively affect the otherwise appropriate system.

6. State of Early Stage Capital

Lithuania private equity market overview

Private equity market is rather national with local players dominating (LitCapital, BaltCap, Amber Trust, etc.). The deals mainly relate to development of already prospective businesses. National banks are also active on this market and for some time have been more visible than the funds, especially in distressed asset area. Larger deals attract regional venture capital funds like Enterprise Investors and MID Europa Partners. It is sometimes observed that, as a result of the small size of Lithuanian market, in some segments the supply for private equity services is excessive, while in others (e.g. seed capital) the need is not met. Compared to the EU level Lithuanian private equity market amounts to a small fraction of national GDP.

With 14 concluded investment deals 2011 was very active compared to 2 in 2010. Although 86% of investment transactions were with start-up companies, 80% of the overall investment was allocated for the rest 14% of later stage IT ventures. As an overall trend, venture capital investments in Lithuania are diversified and available not only to hi-tech ventures but for companies with a wider business profile (in 2011 33%of transactions were with hi-tech start-ups).[222]

The main financing instruments for private equity investments remain the acquisition of shares, the increase of share capital, convertible or subordinated loans, and stock options.

a. Start-up capital market in Lithuania

Start-up capital sector is seemingly less active.

In 2010, 3 national funds ("BaltCap Lithuania SME fund I"," LitCapital I", "Verslo angelų fondas I") were united under JEREMIE (Joint European resources for micro and medium enterprises) program - an initiative of the European Commission and the European Investment Fund aimed to improve SME access to specific investment measures financed under EU structural funds. JEREMIE invests in individual projects ranging from mobile app developers to healthcare companies and is focused on later stage prospective business development rather than on seed capital. The JEREMIE initiative is recognised to have made as a significant input in revitalising national private equity market for early stage investment in 2011.

b. Seed capital market in Lithuania

Seed capital is at its early development stage in Lithuania.

Pre-seed/angel stage IT-focused ventures are the focus of private idea development fund "Venture.lt" established by 7 business angels. Up to 14.5k EUR are available for a selected number of projects. Consultations on financial and business administration matters are provided.

In September 2012 INVEGA (a state run company engaged in providing guarantees for SME bank credits) aiming to encourage tech transfer and subsequent commercialisation of IP assets of research institutions has created 2 venture capital funds – "Seed" and "Start-up". These funds will be designed to support very small companies and SMEs operating in hi-tech sectors. "Seed" will focus on funding the development of initial business ideas and "Start-up" will support non-trading SMEs on product development and marketing. "Seed" and "Start-up" will differ in the amount of guaranteed financial resources. INVEGA will provide all the funds for "Seed", and allocate 70% of funds to "Start-up" and will require the rest to be generated by fund manager from private sources. In total INVEGA allocated 11.6m EUR to this initiative.

[222] Based on information provided by Lithuania private capital association, see http://rizikoskapitalas.eu/sites/rizikoskapitalas.eu/files/LT%20PE%20metine%20apzvalga2011_final.pdf.

The first business angel network facilitating communication between potential angel investors and starting entrepreneurs is established in Sunrise valley. The development of business angel network is still slow to a large extent because of lack of trust in starting entrepreneurs as well as frequent conflicts of interest and limited exit possibilities determined by Lithuanian market size.

7. State of Technology Commercialization

Relevant infrastructure for tech transfers exists alongside the main technology parks and valleys. Professional private and public consultancies are available for businesses. However, tech transfer and commercialization level is often identified to be low. Lack of research planning as well as insufficient market analysis for developed R&D results is a pressing issue at the moment. Poor awareness of market and business needs in turn precludes development of commercially successful innovations.[223]

Current situation further stifles applied research in Lithuania and encourages the focus on purely fundamental research and publications rather than scientific solutions to issues with commercial potential. Businesses in turn are forced to establish their own R&D departments to deliver needed innovations.

Public authorities encourage public research institutions to realign their research agenda with existing business needs and attempt to bridge the current gap between businesses and the researcher's community to bring them together at specialized awareness raising events. This does not seem to be effective so far. Reform of public spending on research institutions encouraging them to co-finance their research activities on alternative sources might be the first step towards market-oriented research.

Currently the most successful public research institutes in Lithuania boast of receiving only 30% of their income from public budgets. The rest are declared to be scientific grants allocated by international or regional structures on competitive basis.[224] Following this example would allow for the introduction of research support programs co-funded by business and public funds to perhaps drive scientific research agendas towards applied research more effectively.

8. Key Programs and Organizations

The Lithuanian Business Support Agency is a public institution managing EU structural support projects related to innovative business development. A number of EU programs are open to support projects of various levels: from minor research studies for innovative start-ups ("Ideja LT" program) to ones are encouraging major direct investment to manufacturing or service industries ("Invest LT" program). Separate programs exist exclusively for projects related to the science and technology clusters. Two financial support programs namely „Invest LT" and „Invest LT+" were developed specifically for attracting direct foreign investment to innovative industry sectors. These programs offer direct cash grants to subsidize construction,

[223] Based on statements of public Agency for Science, Innovation and Technology (MITA) on its website www.mita.lt/en.

[224] Biotechnology institute of Vilnius University website information: www.ibt.lt/en.

equipment, personnel training and salary costs. Costs incurred on training of research staff or part of the salary of high-level scientists hired specifically to conduct R&D in the company may be compensated under specific programs.

Lithuanian Innovation Centre assists national companies with business expansion services, especially to finding partners and clients abroad. All services are free of charge.

Invest Lithuania and **Enterprise Lithuania** are two public enterprises resulting from the Governmental Program of 2008-2012 which prioritized innovation and investments. Invest Lithuania specializes at presenting the Lithuanian economic situation and business environment to corporate investors while the Enterprise Lithuania facilitates local business to develop and export products and services

The Agency for Science, Innovation and Technology (MITA) is another public enterprise established as a result of Lithuanian innovation strategy 2010-2020 and is in charge of implementing innovation policy in Lithuania. It administers national funds allocated for R&D projects and provides related trainings for the private and public sectors.

The State Patent Bureau is a public authority registering industrial property rights and providing relevant consultations and trainings.

Success Stories

Based on achievement in business and business development the following innovative companies can be considered successful.

Thermo Fisher Scientific Lithuania Holding and *Sicor Biotech/TEVA* are two national biotech companies that were acquired (in 2010 and 2004 respectively) by globally renowned strategic investors. Both companies were once spin-offs of the current Biotechnology Institute of Vilnius University. Thermo Fisher Scientific Lithuania Holding creates and manufactures molecular biological products used in life sciences research labs and diagnostics and has already acquired a large global market share. Sicor Biotech/TEVA is a company creating and manufacturing biosimilar medical products. In 2008 the company was has been granted centralized approval to market the biosimilar product Tevagrastim in the EU.

GetJar.com is a world's largest free internet web store for mobile apps and games founded in 2004 in Lithuania. GetJar.com has over 3bn downloads, more than 760k apps or games available and has more than 490k registered developers. It is also the first Lithuanian company to establish operations in the Silicon Valley.

Eskimi.com aims to be the largest growing social network established in 2010 in Lithuania as a mobile app for meeting people. With total of over 7.7m users it is currently most popular in Africa. It was selected for an annual export award in a national IT conference log in 2012.
Vittamed Technologijos is a company which has created and commercialized non-invasive ultrasonic technology to measure intracranial pressure. With wide medical application patents over the technology and positive clinical trial outcomes it is a promising venture.
Integrated Optics is a high potential laser start-up that has developed technology to make laser devices more compact. Established in 2012, the company has pursued IP protection and is actively engaged in technological development. The company was awarded a visit to Akron

technology accelerator by Enterprise Lithuania in the Life Sciences Baltics 2012 regional conference.

9. Metrics

a. Rate of IP based start-up formation

Numbers of initiatives to develop and commercialise R&D results in a corporate form increased as a result of emergence of governmental and private programs to financially support innovation. MITA has been particularly active in this field running R&D commercialisation program supporting newly formed spin-offs and start-ups. The trend to engage in innovative entrepreneurship is fuelled by private accelerators organising contests to support and develop businesses. No exact figures exist to measure the trend.

b. Patent statistics

In 2011 Lithuanian applicants filed 93 national patent applications to State patent bureau and 85 were granted. National applicants submitted 25 international PCT patent applications and 2 European patent applications (through State Patent Bureau only). The national filing rate of legal entities is constantly rising whereas that of natural persons is declining. In 2011 the corporate filings was almost equal to natural person filings (46 to 47 respectively).

In 2011 Lithuanian public research institutions filed 28 national patent applications which accounts for 60% of all corporate applicants. Vilnius Gediminas Technical University filed 13 patent applications and Kaunas Technology University filed 7 applications. National Research Institute for Physical Science and Technology Centre and Vilnius University each filed 2 applications.

Vilnius Gediminas Technical University which is the most actively filing public research institution has so far submitted more than 70 national and 5 European patent applications in total and has been granted 59 national patents (20 are still valid).

The most of patents granted for Lithuanian applicants in 2011 were in the field of: human necessities (21), engineering (19), physics (15), and chemistry (13).

In 2011 State patent Bureau registered 65 patent transfers (59 for European patents) and 3 patent license agreements (1 for European patent). No statistics exist for Lithuanian residents.

APPENDIX B: INTERNATIONAL CASE STUDIES - RUSSIAN FEDERATION

Daniel Satinsky, Esq., M.A.L.D. With Metrics and Policies by **Margarita Divina**, **Elena** Nullans, Baker & McKenzie - CIS, Limited

1. Overview of Russia - Commercialization

Russia is a country of contradictions. Some of the most notable contradictions are in the area of science, engineering and high technology. Russia's considerable store of intellectual capital, highly literate population and obvious strengths in certain high technology sectors, particularly space, atomic energy and military technologies are well known. At the same time, Russia is not a world-leader in commercialization of new technologies, particularly in consumer-oriented or non-military related areas. There are notable Russian success stories, primarily in software or Internet-related areas, but they are overshadowed by the general lack of innovative products within the domestic economy.

Historically government has been the leading force in all economic transformations in Russian history. The current efforts to modernize and diversify the Russian economy are consistent with this historical pattern. The push for restoration of Russia's status as a leader in science and technology began under the Presidency of Vladimir Putin. This early initiative was amplified in the election platform of his successor Dmitry Medvedev as a full scale call for transition to an innovative, knowledge-based economy. This push for modernization from the very top level of government has resulted in a multitude of reforms, new legislation and new public and quasi-public institutions to promote science, innovation and entrepreneurship. Almost every Russian Ministry or administrative body at all levels has some element of "innovation" program.

As a general matter, innovation rests upon fundamental science and engineering skills. These provide the raw material for commercialization of science and introduction of innovation into the economy. Therefore in looking at the Russian innovation environment, it makes sense to begin with a survey of the current institutional base for science. This requires a brief overview of the system inherited from the Soviet Union before outlining the changes that have taken place, particularly over the past 10 years.

a. Influence of Soviet Organization of Science & Technology

The current institutional basis of science and technology in Russia reflects the legacy inherited from the system constructed by the Soviet Union. The institutions promoting and developing science and technology under the Soviet system were divided into four general categories:

<u>The Russian Academy of Sciences ("RAS")</u>

The Russian Academy of Sciences predates the Soviet Union and is actually the product of an earlier period of modernization under Peter the Great. In Soviet times, the highest level research was conducted in the Institutes grouped into the Russian Academy of Sciences, which

carried out roughly two-thirds of the basic research. In 1990, there were 535 Institutes of the Russian Academy of Sciences. In the post-Soviet period these Institutes suffered greatly from lack of funding and began contracting.

Higher education

The higher education sector, primarily universities, was responsible for training scientists, engineers, and researchers. Universities carried out far less basic research but did carry out contract research with enterprises and institutes. In the beginning of 1992, there were 450 educational institutions carrying out scientific research on a contract basis. These institutions also suffered a disastrous decline from lack of funding in post-Soviet Russia.

Industrial sector R&D

There was also a set of sector-specific institutes connected with the economic ministries of the centrally planned economy that acted as centers of applied research for each specific sector. All of the enterprises under a particular ministry would receive their technology and innovation from the institute of their ministry. In 1990, these industrial R&D institutes accounted for 75% of the applied research, 88% of the development research, and 78% of total research conducted in that year. Most of these institutes have disappeared, transforming themselves into real estate companies or becoming affiliated with large corporations.

Enterprise R&D

These institutes were attached to a particular industrial enterprise and were responsible for adapting the technologies developed by the industrial sector R&D institutes from the ministry level to the particular conditions of that individual enterprise. Some of these institutes made a transition to profitable R&D organizations, particularly in the oil, gas, and some natural resource sectors.

Soviet Science Cities

Another aspect of the Soviet system was the system of science cities or “Naukograds” that were disbursed around Russia, often as secret or closed cities. There were about 70 of these science cities. Most were located near a city, but were separated by high security from the local area and had no relationship to the local economy. These cities were concentrated collections of scientists supported directly by the central government and integrated into the overall Soviet economy through the ministries of the centrally planned economy and often overlapping with the RAS. Without any independent economic base, most of them faced extreme hardship when the Soviet Union was disbanded.

b. Current Key Government Ministries or Commissions

Russia has a bifurcated political system split between the “Government,” which is the administrative bodies under the Prime Minister and the “Presidential Administration,” which is composed of separate bodies reporting directly to the President. In regard to innovation and modernization there are three main top-level policy bodies that reflect the dual nature of the Russian political structure.

Innovation policy is primarily implemented by the following ministries, which report to the Prime Minister:

- **Ministry of Education and Science** (http://eng.mon.gov.ru/). The Ministry of Education and Science has broad responsibility for policy creation and regulation in education and research. However, the Ministry has no formal responsibility for commercialization of research. It is leading the reform of the university system and it provides targeted grants to implement the transition.
- **Ministry of Economic Development** (http://www.economy.gov.ru/minec/main/). The activities of the Ministry with regard to innovation as officially stated include stimulation of innovative activity of existing enterprises, assistance in creation of new innovative companies, stimulation of demand for innovative production, and support of orientation towards innovation in the science and education sector. The Ministry has within it a Department of Special Economic Zones and Project Finance (http://www.economy.gov.ru/minec/activity/sections/specialEconomicAreasMain/index.html) that is responsible for special economic zones (SEZs).
- **Ministry of Telecommunications and Mass Communications** (www.minsvyaz.ru). In addition to its general responsibilities, the Ministry administers the network of high-tech parks. It is responsible for e-government programs and for expanding adoption of information and communication technologies across Russia.

In a formal sense, official policy through the activities of these ministries shows a clear intent to promote innovation. At the same time, there is no one person or agency responsible for the innovation ecosystem as a whole or for administering programs to adopt new technologies in public institutions and state-controlled companies.

2. Research Infrastructure

a. Russian Academy of Sciences.

The RAS continues to play an important role in basic scientific research through its network of geographically disbursed Institutes, each focused on very specialized fundamental research and science. However, the future role of the RAS is uncertain. The Ministry of Education is working to transform the leading universities into research universities with the goal of dramatically increasing their role in scientific research and commercialization. At the regional level, there is a lot of overlap between the leading researchers in the Institutes of the RAS and the universities. The RAS at the national level has recognized the necessity of commercialization of science and has a project with Rusnano to develop such a center.

b. Universities.

The Russian university system has gone through a recent reform, with the goal of facilitating more practical interactions related to the needs of the real economy. These reforms have created several new administrative categories within the university system, Presidential Universities, Federal Universities and National Research Universities.

Moscow State University and St. Petersburg State University have been designated as “Presidential Universities,” meaning that their rectors are appointed directly by President

Medvedev. They are directly funded from the State budget, and they can set their own standards, independent of the Ministry of Education.

There are now seven “Federal Universities,” often the result of consolidations of existing universities, with rectors appointed by the Prime Minister. They are subordinate to the Ministry of Education and have to re-compete for their status every 5 years. They are the Siberian Federal University in Krasnoyarsk, the Southern Federal University in Rostov, the Northern Federal University in Arkhangelsk, the Volga Federal University in Kazan, the Urals Federal University in Yekaterinburg, the Northeastern Federal University in Yakutia, and the Far Eastern Federal University in Vladivostok.

The Ministry of Education has established the status of “National Research Universities” with the goal of transforming these into institutions that unite fundamental and applied research. In 2009 and 2010, the Ministry held competitions in which existing universities applied to be designated as a National Research University. A total of 29 universities received this designation and access to additional funding to implement this mission. As part of this process all of these universities are establishing business incubators, tech transfer offices and programs to establish startup companies.

In 2009, Russia passed legislation that was intended to mimic the U.S. Bayh-Dole Act and enable Russian universities to establish their own commercialization offices. As of the summer of 2010, some 475 commercialization offices were registered by universities and institutions of higher education.

This evolution of the universities is just at the beginning stages. University-based entrepreneurship programs, incubators and tech transfer offices are very weak at this point. Human resources are very thin. There are few experienced business people teaching in universities so education is mostly theoretical and there are problems motivating students to take part in entrepreneurship programs. Tech transfer offices in the regions focus on registering Russian patents mostly as a measure of prestige, not commercial activity and there is little or no understanding of international patents.

c. Science Cities.

Around the year 2000, special legislation was created to give tax privileges to cities designated as Naukograds. There are current 14 cities that have this designation. The four leading cities are Obninsk (nuclear, special materials and medical tech), Dubna (nuclear research), Korolyov (space) and Koltsovo (biotech).

d. Incubators/Accelerators

Over the past decade the Russian government adopted a series of institutional measures to build a new physical infrastructure to support new businesses, including Special Economic Zones (SEZs”) and tech parks.

Russian SEZs are geographically defined areas in which resident companies receive special benefits to encourage entrepreneurial activities. These benefits include incentives and tax

privileges. The tax benefits include a reduction in corporate income tax and exemptions from customs duties and property and land taxes. SEZs are specialized areas that can be industrial production zones, technology development zones, tourism and recreation zones, or port zones.

To date several SEZs have been established, including industrial production zones in the Lipetsk Region and the Republic of Tatarstan and technology development zones in Saint Petersburg, Zelenograd, Dubna, and Tomsk.

In addition to SEZs, the Russian government created a program for a network of high-technology parks, or "techno parks." A techno park is supposed to be developed as a small town of between 10 and 15 thousand residents. It acts as a full-fledged scientific and technological cluster, including residential space to upgrade the living conditions of researchers and scientists. Each techno park is linked to a large educational institution or a leading scientific institution. Unlike a SEZ, a techno park does not offer special customs or tax benefits. It is an open, commercial environment.

Within the Russian federal government initiative, the following new techno parks are planned or in the beginning stages of implementation:

- Chernogolovka Technopark (Moscow Region): chemistry, information technology.
- Technopark "Idea" (Kazan, Tatarstan Republic): information technology, petrochemicals.
- West-Siberian Innovation Center (Tyumen): oil and gas exploration and production technology, information technology.
- Academparkt (Novosibirsk suburb Akademgorodok): biotechnology, information technology, electronics and scientific instruments, nanotechnology.
- Obninsk Technopark (Obninsk, Kaluga Region): nuclear technology, information technology, biotechnology, medical technology.
- Ankudinovka Technopark (Nizhny Novgorod): information technology, biotechnology.
- St. Petersburg IT Park: information technology.
- Kemerovo Technopark: coal safety technology, chemistry.
- Technopark of the Republic of Mordovia: microelectronics, telecommunications.

There is a rapidly growing set of Russian Internet networks, Regional innovation events, business plan competitions and private organizations dedicated to promoting entrepreneurship and tech startup companies. This is a growing support network for entrepreneurship that is often interlocked with Russian development agencies, techno parks, SEZs and Regional or local governments. They are often modeled on their counterpart organizations in the U.S., particularly in Silicon Valley. It is a dynamic set of shifting and evolving institutional and personal relationships that may over time will expand the innovation ecosystem in Russia.

Certain Russian regions have established their position as leaders in support for innovation and development of new technology. The Tomsk Region has a long history of political support for innovation. Tatarstan has also demonstrated significant government support for innovation and modernization. Other regions in which political support for innovation has been significant include Novosibirsk, Perm, Kaluga and Nizhny Novgorod.

3. Key Government Intellectual Property Policies

- Civil Code of the Russian Federation (Part Four) (Federal Law No. 230-FZ of December 18, 2006). This is the main IP law establishing the legal regime of intellectual property prosecution, protection and enforcement, IP licensing and assignment, employment related IP, etc.

- Federal Law No. 284-FZ of December 25, 2008 on Transfer of Rights to Unified Technologies. This law regulates commercialization of IP rights to state-owned civil, military or special technologies.

- Federal Law No. 98-FZ of July 29, 2004 on Trade Secret. The law sets forth the measures required for a legal protection of trade secrets (know-how).

- Federal Law No. 127-FZ of August 23, 1996 on Science and State Policy on Science and Technology. This law regulates relations between entities engaged in scientific and R&D activities, state authorities and users of developed products, as well as state support of the innovative activities.

- Law of the USSR on Industrial Designs No. 2328-1 of 10 July 1991 (Extracts). This law is effective to the extent that its provisions do not contradict the Civil Code of the Russian Federation (Part Four). It regulates remuneration of employee inventor.

- Law of the USSR on Inventions in the USSR No. 2213-1 of 31 May 1991 (Extracts). This law is effective to the extent that its provisions do not contradict the Civil Code of the Russian Federation (Part Four). It regulates remuneration of employee inventor.

- Decree of Russian Federation Government No. 1020 of December 24, 2008 on State Registration of Contracts for Disposal of Exclusive Rights in Inventions, Utility Models, Industrial Designs, Registered Layout Designs of Integrated Circuits, Software, and Databases and State Registration of Non-Contractual Transfer of Exclusive Rights in Inventions, Utility Models, Industrial Designs, Trademarks, Appellations of Origins, Registered Layout Designs of Integrated Circuits, Software, and Databases.

- Decree of Russian Federation Government No. 342 of April 22, 2009 on Ownership of IP Rights to R&D Results. This decree establishes certain cases where the IP rights to results of state funded R&D works should belong to the Russian state.

4. Recent or Pending Changes to the Patent Law

- Law Project No. 47538-6 on Amendments to Parts One, Two, Three and Four of Civil Code of the Russian Federation. When adopted, this law may significantly change Russian IP legislation. The project is still under discussion in Russian legislative body - The State Duma.

5. Key Commercialization Incentives

In order to stimulate funding of innovation in Russia, the Russian government has established a number of state-sponsored development agencies. The principal ones are the following:

Skolkovo Foundation (www.i-gorod.com). The Skolkovo Foundation is the best known of the Russian development agencies and has become the "brand" for innovation and innovation policy in Russia. It was officially registered as a Russian non-profit "Foundation for Development of the Center of Research and Commercializing of New Technologies" in May 2010. The three core pillars of the new science city will be:

- Skolkovo Institute of Science and Technology ("SkolTech"). A world-class graduate university being developed in collaboration with the Massachusetts Institute of Technology (www.skolkovotech.ru);

- SkoLkovo Technopark (www.community.sk.ru/technopark): a major technopark under development to nurture new research and start-up companies, currently serving 750 member companies as a virtual tech park; and

- A series of R&D facilities for major technology companies, both international and Russian.

Even When in full operation, the new science city will be devoted exclusively to research, with production carried out elsewhere.

- **RUSNANO (www.rusnano.com)**. Originally established as the Russian Corporation of Nanotechnologies in 2007, it became RUSNANO in March 2011, as an open joint stock company 100% owned by the Russian Government. Its mission is to be a co-investor in large-scale nanotech projects to develop the Russian economy. It was initially capitalized with $5 billion dollars and another $5 billion dollars in guarantees. In its recent reorganization, a non-profit organization, the Fund for Infrastructure and Education, was established to establish nanotechnology infrastructure and training for nanotechnology specialists.

- **Russian Venture Company ("RVC")** (http://www.rusventure.ru/en/). The RVC is a government fund of funds that acts as a development institute for the Russian Federation. Its stated mission is "creating a self-sustained VC industry in synergy with other development institutions, engaging private venture capital, nurturing innovative entrepreneurship and technology business expertise, and mobilizing Russian human resources." RVC has authorized capital of $983 million dollars.

- **Fund for Development of Small Enterprises in Science and Technology (commonly referred to as the "Bortnik Fund")** (http://www.fasie.ru). This Fund was founded by Ivan M. Bortnik in 1994 to support small business in the science and technology sphere. It provides seed grants through the "Start" program and research and development grants through the "UMNIK" program. It also supports a network of 29 Information Technology Centers in universities and Institutes of the RAS across Russia. The Fund is a critical financial resource for start-up companies and is unique in providing grant financing at that level. The Fund is not a true commercialization fund and does not involve itself with the next stages of startup company development.

- **Russian Technologies Corporation** (http://www.rostechnologii.ru/en/). The main functions of the Russian Technologies Corporation is also active high-tech industrial products and closely associated with the military-industrial complex and other traditional industrial enterprises.

- **State Atomic Energy Corporation Rosatom** (www.rosatom.ru/en). Rosatom has also begun to position itself as a development agency and is restructuring its R&D activities.

6. State of Early Stage Capital

Private funding for innovation in Russia is extremely limited. Private equity funds usually do not invest in technology companies. Venture capital and angel funding institutions have begun to establish themselves in Russia, but still do not have an adequate legal basis for operation as they would in more developed markets. The most important Russian VC organization is the Russian Venture Capital Association (www.rvca.ru/en). The most prominent angel investor organization is the Union of Business Angels in Russia (http://www.russba.ru/language/en/). The leading foreign private equity funds are Barings Vostok, Almaz Capital and Russia Partners.

As a result of the overall weakness of the innovation ecosystem, there are few tech projects ready and able to accept private investment. Thus, private investors have a difficult time constructing a project pipeline. Statistics from the Russian Venture Capital Association show that 80% of investment capital is dedicated to financing restructuring or business expansion and only 20% is earmarked for early-stage financing of new companies. VC firms have to look primarily for export-oriented or consumer-oriented business, like internet or telecom businesses. This seriously limits the pipeline of projects.

Several of the leading Russian funds have adapted by investing in international projects or by copying Western projects to bring into the Russian market without any real technological innovation. The best example of this strategy was the investments of the Russian fund Digital Sky Technologies through their investments in Russian copycat Internet companies Vkontakte and Mail.ru and subsequent investments in Facebook and other US tech companies. What these examples illustrate is the oft-repeated statement that there is no shortage of investment money in Russia; there is a shortage of projects.

7. State of Technology Commercialization

There is a long history of private, public, foreign and Russian attempts to establish reliable channels for commercialization of science and technology. The results have so far been fairly dismal, with a few notable exceptions. Nonetheless, it is important to catalogue the various organizations that remain in existence with the goal of tech transfer. It is not possible within the bounds of this article to evaluate the effectiveness of any of these organizations or to make a fair comparison of their expertise and rate of success. The list below should be taken as a mere catalogue with the organizational description sometimes taken directly from their website.

- **Russian Technology Transfer Network** (www.rttn.ru). Founded in 2002, RTTN is an association of 68 Russian Innovation Centres from 25 regions of Russia and CIS. It was initiated by the Obninsk Regional Innovation Technology Centre (RITC-Obninsk) (www.ocst.ru) and the Innovation Centre Koltsovo (ICK) (www.ick-rttn.ru) under a grant from the EU aid program “TACIS.”

- **French National Innovation Agency** (www.oseo.fr).

- **British-Russian Innovation Network** (www.brin.org.uk)

- **The Russian Union of Innovation Technology Centers ("RUITC")** (http://eng.unitc.ru/). RUITC was established in 2000 in order to support the development of Russian Innovation Technology Centers (ITCs) of Russia. These ITCs are supported by FASIE, (the Bortnik Fund) and provide consulting on technological business creation, legal and patent support, trainings and business planning for start-ups.

- **The Russian Agency for Small and Medium Enterprises Support** (http://www.siora.ru/en). This Agency was set up in 1992 by the Russian Government with initial support of the "Know-How Fund" of the UK Government. It is a network of 50 local business support agencies in Russian Regions.

- **CRDF Global** (www.crdf.org). CRDF Global is an independent nonprofit organization that promotes international scientific and technical collaboration through grants, technical resources, and training. It was originally founded by the U.S. Government. As one of its programs, CRDF manages a network of 20 Research and Educational Centers in Russian universities focused on tech transfer.

- **US-Russia Center for Entrepreneurship** (www.cfe.ru). The Center was founded in 2002 as a spin out of the US-Russia Investment Fund as an entrepreneurship training, education and development organization.

- **International Science and Technology Center** (www.istc.ru). ISTC was founded in 1992 to provide Russian and CIS former weapons scientists, particularly those with knowledge and skills related to weapons of mass destruction and their delivery systems, opportunities to redirect their talents to peaceful activities. **Enterprise Europe Network** (www.Gate2RuBIN.ru/en). Gate2RuBIN was established in June 2008 under a program of the EC Directorate General for Enterprise and Industry to bring together a consortium of the Russian tech transfer organizations that were founded based on an earlier round of European funding.

- **Enhancing University Research and Entrepreneurial Capacity (EURECA) program** (http://apps.americancouncils.org/eureca_launch/?q=node/30). A multi-year initiative to strengthen the capacity of Russian National Research Universities to commercialize the results of their research, and foster entrepreneurial activity on their campuses. EURECA was launched in 2010 by a consortium of the New Eurasia Foundation, the American Councils for International Education and the National Council for East European and Eurasian Research.

8. Key Programs and Organizations

Other important programs and organizations not mentioned previously include:

- **Department of Science, Industrial Policy and Entrepreneurship of the City of Moscow** www.dnpp.mos.ru
- **Moscow Seed Fund.** http://mosinnov.ru
- **Vnesheconombank**. www.veb.ru

- **Chamber of Commerce and Industry of the Russian Federation**. www.tpprf.ru
- **Russian Union of Industrialists & Entrepreneurs.** http://eng.rspp.ru
- **OPORA RUSSIA.** http://eng.opora.ru
- **Business Russia**. www.deloros.ru
- **Association of Innovative Regions of Russia**. www.i-regions.org
- **Moscow School of Management SKOLKOVO.** www.skolkovo.ru
- **National Association (Russia) Business Angels (NBAA)**. http://www.ebancongress2012.org/174.html

9. Success Stories

One notable area of success has been in software outsourcing and software products, where Russian companies have been able to successfully enter international technology markets. Russian software outsourcing companies grew out of the crisis in the early 1990's in Russian universities in which university funding disappeared. Academics, particularly mathematicians, who had foreign ties and who had an entrepreneurial character began to create small companies to provide software outsourcing services for foreign clients. These small companies gradually accumulated experience with foreign business culture, foreign market requirements, project management and foreign market presence that allowed them to steadily grow in size and revenue. Today the largest of these companies compose a significant technology-based industry sector for Russia. Leading companies include EPAM, Luxoft, Artezio, Exigen Services, Auriga and many others. As the industry has matured, they formed RUSSOFT (www.russoft.org), as a private industry association.

An analogous process has taken place with the development of Russian software product companies that have become successful in selling their products in foreign markets, often while not promoting their Russian origins. Successful companies in this sector include Kaspersky Labs, ABBYY, Acronis, Parallels, Prognoz and SoftLab-NSK. All of these companies derive a significant portion of their revenue from sales in the world market.

At the breakup of the Soviet Union, multinational companies, particularly in technology, were quick to take advantage to gain access the rich intellectual human capital in Russia. As they expanded their sales of advanced technology products into the Russian market, they also began to establish R&D or development centers that were integrated into their worldwide networks. More recently, multinationals have begun to play a more direct role in promoting the establishment of new technology companies in Russia. This role is expected to accelerate as many multinationals have committed to build out new R&D facilities as part of the Skolkovo science city.

The U.S. multinational technology companies Intel, Cisco and Microsoft are examples of this process and all are currently accelerating their role in the Russian innovation ecosphere.

On June 15, 2011, Intel celebrated 20 years of operations in Russia. Currently Russia is one of Intel's largest R&D centers outside of the U.S., with offices in five Russian cities. In addition to Intel's operational presence, Intel Capital is also active in Russia and at the time of their anniversary celebration announced investments in two Russian Internet companies.

Cisco has a similarly long history of operations in Russia. During President Medvedev's visit to the U.S. in June 2010, John Chambers, Cisco Chairman and CEO committed Cisco to a long-term program to support the sustainable development of innovation in Russia. One of the programs already implemented within this commitment is the Cisco I-prize awarded through a crowdsourcing competition in Russia for groundbreaking technologies.

Microsoft Russia has a very diverse set of programs designed to assist new companies formed on the basis of Microsoft software platforms. The company provides free software and training to startup companies and more than 1,000 companies in Russia have participated in this program. Microsoft has also started a program of grants to startup companies at the end of 2010.

All three of these companies, along with others such as Alstom, Bouygues, EADS, Nokia, Philips, Siemans, TATA, Boeing, IBM and many more have signed agreements to participate in the Skolkovo project and thus foreign business involvement in development of the innovation ecosphere in Russia is expected to dramatically increase and thus more firmly integrate Russia into world technology markets.

10. Metrics

The information provided is accurate as of November 2012. The information regarding the number of patents filed and commercialized is provided according to the 2011 Annual Report of the Federal Service for Intellectual Property of the Russian Federation, (http://www.rupto.ru/rupto/portal/665c3483-8d34-11e1-1ed9-9c8e9921fb2c?lang=en)

Patents Filed in the Russian Federation

The information regarding the number of patents filed and commercialized is provided according to the 2011 Annual Report of the Federal Service for Intellectual Property of the Russian Federation, Civil Code of the Russian Federation (Part Four) Federal Law No. 230-FZ of December 18, 2006, http://www.rupto.ru/rupto/portal/665c3483-8d34-11e1-1ed9-9c8e9921fb2c?lang=en, (accessed on December 18, 2012)

	2007	2008	2009	2010	2011
Inventions	39439	41849	38564	42500	41414
Utility Models	10075	10995	11153	12262	13241
Industrial Designs	4823	4711	3740	3997	4197

Patents Issued in the Russian Federation

	2007	2008	2009	2010	2011
Inventions	23028	28808	34824	30322	29999
Utility Models	9757	9673	10919	10581	11079
Industrial Designs	4020	3657	4766	3566	3489

Contracts for Patents Licensing and Assignment in the Russian Federation (including inventions, utility models and industrial designs)

	2007	2008	2009	2010	2011
Patent Assignment Contracts	1674	1524	1054	1356	1445
Exclusive License Contracts	276	215	228	264	272
Non-Exclusive License Contracts	902	1005	1083	1240	1490
Total Number of Registered Contracts	2852	2744	2365	2860	3207

Patents Licensed or Assigned in the Russian Federation (including inventions, utility models and industrial designs)

	2009	2010	2011
Total number of registered contracts/ Total number of patents licensed or assigned	2365/4503	2860/5680	3207/6242
Inventions	1550/2568	1833/3415	2027/3561
Utility Models	576/1305	718/1556	878/1932
Industrial Designs	239/630	309/709	302/749

APPENDIX C: GLOSSARY

Accredited Investor	According to U.S. SEC regulations rule 501 an individual accredited investor is any natural person whose individual net worth or joint net worth with that person's spouse at the time of his purchase exceeds $1,000,000 or any natural person who had an individual income in excess of $200,000 in each of the two most recent years or joint income with that person's spouse in excess of $300,000 in each of those years and has a reasonable expectation of reaching the same income level in the current year.
Acquisition	The act or process of obtaining control, possession, or ownership of a private portfolio company.
Administration	The group of people who make the management decisions or the process of making those decisions in an organization or the staff functions that support the management team.
Advisory Board/Council	A group of outside experts recruited to provide regular input and suggestions to management and the company.
Agent	A person with the authority to act on behalf of another person or entity.
Agreement	A mutual understanding between two or more parties.
Angel Fund	Investment capital raised from high net worth investors.
Angel investor	An independent investor or network of high net worth investors into businesses, technologies and ideas.
Angel Network	A formal group of angel investors that cooperate on investments.

Annual Report	A document prepared by a company at the end of its reporting year.
Application	Request for patent protection for an invention filed with a patent office.
Assignee	One who receives rights in a patent from another by an assignment.
Assignment	The outright sale of IP by the owner to a third party.
Assignor	One who assigns rights to a patent.
Balance Sheet	An accounting statement showing the financial condition of a company.
Board of Directors	Voting leadership of a corporation with fiduciary responsible for overseeing the company.
Bridge Financing	A limited amount of funding for equity or short-term debt financing.
Budget	An estimate of the amount of funds (income and expenditures) for a designated time period.
Business Model	A conceptual approach to the development of a technology, product, or service that renders profitability and value creation as a way of optimizing return on investment for the company and investors.
Business Plan	A comprehensive overview of the development of a product, service, and the company that will engaged in the execution and delivery.
Business to Business (B2B)	Companies that sell to other companies.
Business to Consumer (B2C)	Companies that sell to consumers.
Buyer	A person who purchases goods or services.
Bylaws	Rules which a govern a corporation and under which the board of directors operate a corporation.

Capital	Funding necessary to start and operate a company.
Capital Investments	Funding used to purchase capital items such as real estate and equipment.
Capitalization (Cap) Table	Accounting table showing the total amount of the various securities issued by a firm, amount contributed by each investor, stocks, options, shares, and classifications as well as projections for dilution based on future rounds of funding.
Claims	The portion of a patent application that defines the specific unique capacity of the invention fully supported by the accompanying description.
Coinvestment	Syndication of multiple investment sources in a private equity financing round.
Commercialization of Intellectual Property (IP)	A continuum of activities and actions that provide for the protection, management, evaluation, development and value-creation of ideas, inventions, and innovations to reduce them to practice through prototypes and implemented processes leading to the development of products and services by entrepreneurs, startups, existing companies as well as governments resulting in economic, cultural and societal benefits.
Company	An organization comprised of individuals with a purpose of commercial or industrial enterprise.
Compensation	Reimbursement for the contribution of individual and companies for their participation in adding a creating value towards defined corporate objectives.
Competition	Rivalry between two individuals or companies in the same space competing for resources and customers with products and services.
Competitive Analysis	A depth look at the factors that define a company's existing or proposed products or services against others that are already

	providing or developing these, trends of buyers, and economic factors that affect buying decisions and market growth.
Competitor	A product, solution or company that solves the same problem as the one being commercialized or currently offered.
Confidential Disclosure Agreement (CDA)	Also known as a non-disclosure agreement (NDA). Formal agreement to maintain information as proprietary for a specified period of time.
Consultant	Person who provides services that serve the development of products and companies with specific skill sets that are necessary for successful development, manufacturing, sales, delivery or compliance or other critical aspect required from outside the company's internal talent pool based on capabilities or time.
Copyright	An intellectual property right given to creators of literary or artistic works.
Corporate Partner	A company with which a formal or informal strategic alliance and business arrangement is established.
Corporate Strategy	The plan of a company for conducting business based on established criteria that establish direction and milestones.
Corporate Venturing	Venture capital provided by large corporations to further their own strategic interests based on product development, market expansion, or return on investment.
Corporation	A legal, taxable entity chartered by a state or the federal government with ownership held by stockholders.
Credit	the ability to borrow money or purchase items with the understanding that the balance will be repaid at a later date

Customer	An individual or organization that has a need and interest with the ability to provide compensation for products or services provided by another individual or company.
Database	An integrated collection of digitally stored data content.
Demographics	The statistical science of defining populations by age, sex, family size, income, or other criteria.
Dilution	A reduction in the percentage ownership of company caused by the issuance of new shares
Director	An individual elected to serve on the board of directors of a company by its shareholders.
Distribution Rights	The rights to distribute another company's products or services.
Drawing	The illustration of an invention which is required for the understanding the invention and claims of a patent application or patent.
Due Diligence	A process to analyze and assess the desirability, value, and potential of an opportunity by prospective investors.
Early Stage	A technology-based venture that is in still in its infancy regarding the formation of the company and the development and focus of the product or services and usually without having achieved any substantive investment.
Ecosystem	An innovation community of different individuals organizations, mentors, investors, and service providers that support the development and commercialization of technologies and support the environment and resources required for this to occur.

Elevator Pitch	A short, truncated and impactful overview of the value proposition of a company or technology for the purpose of engaging interest in attracting resources including investment.
Employees	Individuals who work on a part time or full time basis for a company.
End user	Those who use the technology, product or service which may be the same or different from the entity which is making the purchase.
Entrepreneur	The individual who is actively engaged in the development of a new product or service based venture.
Equity	The funds invested into a company in return for shareholder interest.
Executive	An individual who holds a decision making role and has the authority to execute the decisions made.
Financing	Securing funding for a business.
First Round Financing	The first financing of external funding into a new venture.
Founders' Shares	Corporate shares of a company assigned to the founders upon formation.
Grant	Non-dilutive financial support made to an organization, individual, or company for specific projects.
Idea	A thought or a concept for the possibility of a process or invention.
Incorporate	The establishment of a corporation according to the laws applicable to where the company is being formed.
Incubators	Incubators serve to collocate early stage companies in a common area or building and often provide shared services and business operational and development support.

Industry	A pool of end-users and businesses that form a common network based on the definition of certain parameters related to commerce.
Infringement	The violation of intellectual property rights to which the user does not have rights or permission.
Initial Public Offering (IPO)	A company's first sale of stock to the public on an exchange.
Institutional Investors	Investment into a corporate venture providing stock in return for equity by other companies or organizations, that professionally invest such as investment firms, pension funds, mutual funds, and endowment funds.
Intangible Assets	Those things with have no physical presence but have economic value and benefit to a company.
Intellectual property (IP)	Creations of the mind which include copyright, patents, and industrial design rights; the rights that protect trademarks, trade dress, and trade secrets.
Interest Rate	A percentage rate charged on the amount of money that is borrowed.
Invention Disclosure	Written notification that an invention has been made to the accountable representatives for technology transfer and intellectual property protection.
Inventor	Someone who contributes to the conception and reduction to practice of one or more of the claims in a patent application or patent.
Investing	Putting forth money for the purpose of generating a return which has a financial gain for the risk and time associated.
Investment Capital	The cash required for the development, growth and expansion of a product or service as a company.

Investor	An individual or entity that provides funding for a venture with the expectation of an increased return.
IPR	Intellectual property right.
Joint Venture	A new corporate entity comprised of investment and effort by two or more corporate entities to develop new products, combine products in a target area or both.
Key benefit	The feature or value added component of a product or service that adds substantial gain for the user and distinguishes the product or service from competitors.
License	The legal transfer of rights of usage from the initial owner to an end-user in whole or part based on fields of use, location or other factors.
M&A (Merger and Acquisition)	Combination of two or more legal entities into one corporate entity or business unit.
Maintenance Fee	The patent fees due at 4, 8 and 12 years needed to keep a U. S. utility or plant patent in force.
Market	The combination of potential buyers for a defined set of product or services or by other defining factor such as disease.
Material Transfer Agreement	A legal document used for the transfer of biological materials between scientists, institutions and organizations.
Merger	The legal combination of two or more organizations into one business unit.
Metrics	A standard of measurement.
Microloans	Loans for $50,000 or less by government agencies and banks to help support very small businesses (microenterprises).

Negotiation	The process of discussion and compromise between two parties regarding positions on key points in a goal of reaching agreement.
Network	The distributed relationships among individuals, organizations, and companies with common areas of interest, needs, or objectives.
New Venture	A new business providing products or services.
NEWCO	A term commonly used to describe a newly organized company.
Niche Market	A small segment of the overall defined business area in which the technology or company has a strong competitive edge.
Non Exclusive License	A transfer or rights under agreement with the retention of rights by the original holder for certain area, applications or places of use that can be retained or provided to others.
Non-Disclosure Agreements	See Confidential Disclosure Agreement (CDA).
Nonprofit Corporation	An organization formed to provide activities and services for the benefit of society with a focus on the investment of any profit back into the operations to ensure the achievement of the social mission.
Novelty	One of the key criteria of patentability, based on not anticipated by the prior art.
Obviousness	A descriptor of patentability, describes that if a person with ordinary skill in the relevant field of technology can readily deduce the innovation from publicly available information (prior art) it would not be appropriate as a new invention.
Offering	The financial terms presented by a new venture for investment.
Offering Documents	The documents in a private investment into a startup venture.
Offering Memorandum	A summary of the terms and key provisions of a private or public offering to obtain financing.

Officer	One of the recorded executive or board leaders of a company.
Option	A security granting the holder the right to purchase A specified number of a company's securities at a designated price at some point in the future.
Option Agreement	An agreement granting a company the exclusive right to evaluate a technology for a short period of time prior to executing a license agreement.
Organizational Chart	A diagram outlining the linage of accountability in a corporate structure based on key areas of focus, product lines, or other determining factors such as area or area of operations.
Outsourcing	The use of external resource products or services for conducting or sourcing aspects of responsibilities necessary for the success of the company.
Partner	An individual or corporate entity that the inventor or business enters into a business agreement with for the development of the company's products and or services.
Patent	A government authorized or licensed right or title for a set period to exclude others from making, using, or selling an invention.
Patent Application	A request for patent protection for an invention filed with a patent office.
Portal	A website that acts a gateway to content on a focused area of topics including subject matter, markets, or fields of interest.
Private Equity	Investments that include angel capital, venture capital and buyout funds in private companies.
Product	The goods and services purchased by consumers

Promissory Note (Note)	A debt financing instrument in which the receiver of financing promises to pay the holder according to the agreed upon terms.
Prospectus	A formal written offer to sell investment into a corporate entity that provides an investor with the necessary background, current, and projected information to make an informed decision about the opportunity.
Prototype	An original model or working example of the product or innovation.
Public Disclosure	The unveiling of an invention or confidential information in a non-confidential forum without the corresponding agreements for privacy that would be required to protect invention and release of information to the public such as a non-confidential disclosure agreement.
Publication	The publication of a patent application after a period for eighteen months from the date of filing.
Revenue	The gross income received before any expenses are deducted.
Right of First Refusal	A privilege given to the holder based on contractual agreement to meet any other offer before the proposed contract is accepted.
ROI	Return on Investment.
Royalties	Payments made for the use of intellectual property rights.
Salary	Fixed compensation for an employee in exchange for the work performed over a defined time period.

Seed Money	The first round of capital for a start-up business. Seed money usually takes the structure of preferred stock or convertible bonds, although sometimes it is common stock. Seed money provides startup companies with the capital required for their initial development and growth. Angel investors and early-stage venture capital funds often provide seed money.
Seed Stage	A technology-based company with products and services still in research and development and that has not yet established full commercial operations.
Segment	A subsector of the market where there is a shared need.
Self Employed	An individual who earns income from a business which he or she owns.
SMEs	Small and medium-sized enterprises.
Social Entrepreneur	An individual who develops a business with the objective of making a profit along with a social difference through its methods, products, and services as a commercial entity.
Spinoff	The divestiture of a business operation into a separate legal entity.
Sponsored Research Agreements	The use of university or corporate scientific research and development, clinical development, engineering, manufacturing or other capabilities through a pay for service legal approach.
Startup	An early stage company.
Startup Capital	The initial funds required to launch a new venture.
Stock	The equity of a company divided into portions or shares reflecting company ownership.

Stock Option Plan	A form of deferred compensation which gives stock ownership to a company employee as a purchase option for a given period of time at an established price.
Stockholders	The owners of a corporation.
Strategic Investors	Corporate or individual investors that add value to investments they make through industry relationships that can assist companies in commercializing technology, increasing revenues and expanding markets.
Syndication	A group of investors or underwriters who collaborate in the investment of startup or early stage venture(s).
Target Market	A defined segment of an available market on which a company chooses to focus the development and penetration of their products and/or services.
Technology Transfer	The process of converting science and technology findings from research laboratories into commercially viable products. This may be accomplished through licenses, sales or assignments to the inventor.
Term Sheet	A summary of the conditions of offer that an investor is prepared to accept as a basis for providing funding and a guiding point for a formal agreement that will be the basis of the investment deal.
Trade Secret	Any type of information that derives independent value from not being generally known to others who could obtain economic value from its knowledge including a formulas, patterns, compilations, programs, devices, methods, techniques, or processes.
Valuation	The established worth given to a private or public company based on the market share price and volume or by the estimated market penetration and the anticipated sales and growth.

Venture	A new or existing business endeavor that involves a high level of risk and chance.
Venture Capitalist	An investor who provides growth financing to new innovation based ventures with an objective of rapid and profitable growth.

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Mr. Gary Keller is CEO of Xomix, a Chicago-based technology accelerator and consultancy providing intellectual asset management, commercialization, and global businesses development services. Keller has more than 25 years of experience in international business development for leading biotechnology companies and is responsible for the development, funding and launch of numerous technology and commercialization initiatives and startup companies.

He is President of the Midwest University Research Network (MRUN), a not for profit commercialization collaborative of research, accelerators and early stage inventors across 14 Midwest states and 2 Canadian provinces. He is the author for the development of the Guide to Commercialization of Intellectual Property and workshops.

His startups include Conkwest Inc. a San Diego based biopharma company developing natural killer (NK) cell based products and the Florida Institute for Commercialization of Public Research, a statewide, quasi-government, not-for-profit enabling commercialization of new discoveries generated from public and privately funded research. He directed Strategic Initiatives and Workforce Development for the Chicago Technology Park Corporation.

He serves as an International Delegate and Founding Chairman of the Emerging Enterprises Committee for LES USA Canada and is V.P. of Knowledge Management and Vice Chair of Education for LES International. He is a member of AUTM, and previously served as Co-Chair of the BIO Technology Transfer Committee and is a member of the Board of Trustees of Sinai Hospital System - Chicago. Mr. Keller has a Masters of Biotechnology from Northwestern University and a Bachelors of Science from Pennsylvania State University.

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