Innovative Ventures INCORPORATED

Manager of US Venture Capital Funds
Investment Advisor to International Financial Institutions
& Governments in Private Equity

Contract #105

REPORT OF THE CONTRACTOR
The GoForward Plan on SME & Start-up Creation from University Technology

Contractor: Thomas D. Nastas
Founder & President
Innovative Ventures Inc.
Haslett, MI USA

Presented to:
Evgeny Evdokimov &Anatoly Zaikin
Infrastructure Department
Russian Corporation for Nanotechnologies
Moscow, Russia

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US: Haslett, MI. 48840, Tel. # 1.517.339.9354
www.IVIpe.com; e-mail Info@IVIpe.com

SUMMARY OF THE PROJECT

Introduction

This report presents project results of the initiative, Russian Corporation of Nanotechnologies (Rusnano) and Thomas D. Nastas, Innovative Ventures Inc (IVI). We researched and evaluated the business formation activities that technology transfer offices (TTOs) of US universities use to create start-ups around academic technologies, and better exploit the STI (science, technology & innovation) results of facility & researchers. The team included Rusnano staff Evgeny Evdokimov/Anatoly Zaikin & Tom Nastas (the Contractor).

It is these strategies this project studied, to determine prospects to transfer them to Nanotech Centers, to accelerate & improve their results in STI commercialization. Nanocenters will commercialize nanotech to the market by licensing to existing Russian companies and/or licensing to new start-ups created by them.

Business formation teams in US universities work to two interrelated goals:

1. Evaluate the potential of commercializing technology through the creation of a new start-up.

2. Provide operational assistance in SME creation through three interventions:
   - Develop the business plan/model including early technology evaluation with 1st customers
   - Recruit talent to the venture, e.g., attract serial entrepreneurs and seasoned CEOs to new start-ups in the local community, encourage (and groom) 1st time unproven entrepreneurs for start-ups
   - Assist in raising capital, i.e., proof-of-concept, prototyping and early product development as grant programs and secure 1st round 'series A' venture capital (VC) investment

   These interventions are done to achieve interrelated goals:

1. Increase the ROI on university STI for the benefit of the university and the TTO, to increase $ available for more research & emerging STI creation, provide a steady stream of $ for STI funding programs and advance student programs in entrepreneurship.

2. Make an economic development impact on the local community by creating more jobs and advancing employment diversification, increase tax revenues & diversify the tax base.

3. Develop the infrastructure for more VC investment and more entrepreneurship in the local community, to reduce the uncertainty and risk of angel and seed investing in university start-ups.

California and Massachusetts have well developed ecosystems for STI & VC investment, and the private sector provides the services to create start-ups which SME formation teams perform in other universities. Moreover these two states have the largest amounts of VC in the USA, attract US/international investors and serial entrepreneurs to 'suck' innovation from Stanford and MIT; consequently these two universities have little need for business formation strategies in their TTOs.

But states with a short history in entrepreneurship and difficult economic environments like Pennsylvania, Michigan, Indiana, Illinois, Washington, Florida, Utah and Colorado lack the ecosystem advantages of Silicon Valley & Boston/Route 128. They are forced to 'push' STI into the market, to execute effectively and efficiently without being 'pushy' or obnoxious to investors; they developed progressive strategies in business formation to overcome geographic/economic disadvantages and strengthen the private sector with university leadership and initiatives to create a better environment for start-up creation.

Project Objectives

The Contractor executed this project to achieve two sets of objectives:

Objective #1: Research & Evaluate the SME Formation Model Used by Universities in the USA

1. Conduct meetings in the USA with selected university TTOs. Discuss the following subjects:
   - Business model of business formation by universities, their internal policies and procedures and the success factors in business formation, i.e., team, motivation, qualifications and education
   - Main business strategies used in the commercialization of STI
   - Mechanisms & conditions of decision making, to determine STI commercialization strategy, i.e., licensing vs. creation of start-ups
   - Mechanisms for promoting technologies and the search for customers (licensees)

Objective #2: Define Initiatives of Possible Cooperation, US Universities & Rusnano Ecosystem

1. Suggest and propose ideas for cooperation between university TTOs and Rusnano, their receptivity to work with Rusnano, particularly Nanotechnology Centers. Possibilities for cooperation include:
   - Joint research projects between Nanotechnology Centers and US universities
   - Share resources in technology transfer & commercialization. This could take several forms, e.g., using a US partner's resources to create a business formation unit in Russia, relocate one or more university staff from the US to Russia and Russians to the US, for skill transfer
   - Cooperative agreements on any one (or all) of the business development tasks that business formation teams do
   - Entrepreneurial educational opportunities between Rusnano, Russian institutes and/or nanocenters and US universities, mainly their MBA & engineering schools
   - Create educational or employment opportunities for US students, consulting or research opportunities for US facility in Nanotechnology Centers

Tasks Executed in the Project

Criteria Used to Identify & Select US Universities to Meet With

The project team used several inputs to select universities to meet with.

1. Published data sources
   - Database, Association of University Technology Managers (AUTM), a global network of more than 3,500 technology transfer professionals from academic, research, government, legal and commercial organizations. AUTM promotes and supports technology transfer through education, advocacy, networking and communication. AUTM's objective is to support and advance academic technology transfer globally.[1]

     Over 150 US universities (Harvard, Stanford, MIT, Duke, Universities of California, Colorado, Michigan, Illinois, Ohio, New York, Washington, Oregon, Utah, etc.) report data to the AUTM on the dollar amounts of research conducted per year, technology licenses & options granted, # of start-ups created/year, patents issued/disclosed, cumulative adjusted gross income received from technology and licensing income/year. AUTM compiles this data and publishes an annual survey that reports metrics on each individual university, and these metrics from 2007 were used to compare and rank universities most successful in creating start-ups.

[1] AUTM at www.autm.org or www.autm.net

Twenty-two (22) universities were screened as most successful in start-up creation, highlighted in red type; see Appendix, beginning page 25 to view AUTM's list for 2007.[2]

The ranking of the top 10 universities in start-up creation vary from year to year as a function of the ups and downs in the local angel/VC investment community and the national VC industry, angel & VC willingness to invest in start-ups, the innovativeness of the university technology created, ability to engage and recruit CEOs and management to the start-up, quickness in negotiating a licensing agreement from the university, etc. In 2008, the ranking changed vs. 2007 with the top ten (10) universities in new companies created shown below:

Top schools

FOR LICENSING REVENUE AND PATENT ACTIVITY, 2008 FISCAL YEAR

RANK	SCHOOL	NO. OF NEW COMPANIES
1.	University of Utah	20
1.	Massachusetts Institute of Technology	20
2.	University of Florida	14
2.	California Institute of Technology	14
3.	University of Michigan	13
4.	Harvard University	12
4.	John Hopkins University	12
5.	Purdue Research Foundation	11
6.	Carnegie Mellon University	10
7.	Brigham Young University	9
7.	Georgia Institute of Technology	9

SOURCE: Association of University Technology Managers

DESERET NEWS GRAPHIC

2. Networking in the Industry
   - Personal contact The Contractor evaluated the programs of screened universities through Internet searches, the depth and quality of their programs from content on their web sites, conducted telephone interviews with staff of TTOs, local VCs and other sources in his network to learn about their programs and most importantly, their willingness to conduct discussions and negotiations with the project team.

   - Several universities formed an ad hoc group called the 'University Venture League.' This is a self-selected group, those experimenting with new ideas in business formation. Members challenge the status-quo in university policies like conflict-of-interest concerns (i.e., permit university faculty and researchers to own equity & be personally involved in start-ups formed around their technology, e.g., the University of Utah permits this, Columbia University limits).

     The Contractor organized meetings with three members from this group; Columbia, the Universities of Michigan & Utah.

3. Economic Development Criteria
   - Our intent was to research business formation in states with economic environments that have analogs in and with Russia, e.g., Michigan and Russia have much in common since the majority of tax revenues come from one industrial source, i.e., automotive in Michigan, oil/gas in Russia. When these industries/prices are depressed, their effects ripple exponentially through the economy in terms of high unemployment, large budget deficits, growing social unrest, etc.

[2] AUTM Annual Report, 2007

Some business formation teams have the challenge of starting companies in communities without the complement of start-up resources that exist around the ecosystem of Stanford & MIT, e.g., Michigan & Colorado. Consequently these US universities are forced to be creative, innovative and proactive in technology commercialization and their learning curve lessons are valuable to Rusnano and its network of Nanotechnology Centers.

Recruiting talent to start-ups is one example, i.e., hiring CEOs to university technology start-ups in Michigan & Colorado from the Silicon Valley/MIT communities. Colorado for instance is not a technology innovator like Michigan is, but it's easier to attract management, e.g., Boulder has the highest % of Ph.Ds per capita/city in the USA, is a great place to raise a family with its fresh air and outdoor sports like skiing, mountain climbing, hunting, fishing, etc.: but who wants to move to Michigan with 15+% unemployment, crime and its decaying US automotive industry?

The project team deemed it essential to visit TTOs with success stories in attracting CEOs and serial entrepreneurs, whether or not they were in the top 10 universities in # of start-ups created. Such learning curve lessons have a broad and strategic impact beyond Rusnano & Nanocenters; learning curve lessons can be applied to the task that Vekselberg and his team have to attracting tech developers, business professionals and VC investors to the Skolkovo hi-tech city project.

List of Universities Selected

1. University of Michigan, Ann Arbor, Michigan
2. Columbia University, New York City, New York
3. University of Colorado, Boulder, Colorado
4. University of Washington, Seattle, Washington
5. University of Utah, Salt Lake City, Utah

See information on each universities business formation activities, Appendix, beginning on page 25.

MIT and Stanford, the benchmarks for SME creation were not visited for multiple reasons; Rusnano knows them well through past visits and is familiar with their successes. Most importantly MIT and Stanford do not have business formation teams in their TTOs since this activity is performed in and by the private sector. No new knowledge would have been learned by including them in our research.

We did not visit other universities in the list of the top 10 since some work in economic environments similar to those visited. Purdue and Carnegie Mellon are in the Midwest and share the challenges that Michigan faces; Brigham Young University shares the challenges that the University of Utah is solving.

Meeting Schedule

The project team conducted meetings of universities beginning Sunday 16 May 2010 through Friday 21 May 2010, with discussions held on Monday 24 May 2010 between the Contractor and representatives of the World Bank, Washington D.C: discuss the possibility of cooperation, Rusnano & the World Bank.

PROJECT FINDINGS, CONCLUSIONS & RECOMMENDATIONS TO RUSNANO

General Conclusions on Business Formation at Universities in the USA

Business Formation Units of US Universities Execute Common Business Models in the Market

Commonality #1: Business formation (and licensing) is managed ***as a business*** to:

- Generate licensing income + equity ROI for the TTOs of US universities
- Market their products (university technology) to current customers and develop future customers (licensees) to sell their products to
- Help TTOs to be masters of their own destiny, minimize the funding swings that plague universities due to economic ups and downs in funding from State Governments and research grants from the US Government

Interviewees stated that it will take five+ (5) years from start-up for Nanotechnology Centers to be profitable although some may get lucky and become cash flow positive in three (3) years. Success in generating cash quickly is a function of the commercial readiness of Russian nanotech, experience/maturity of the business formation team, efforts in-place to develop Russian buyers (and their receptivity to license nanotech) and agreement to the licensing policies and procedures of Nanocenters, specifically conflict-of-interest with developers and researchers.

Commonality #2: The business formation strategies of US universities Colorado, Michigan, Utah & Washington operate to a common business model, policies & procedures to intervene and overcome shortcomings in the market; universities like Purdue, Wisconsin, Pennsylvania & Northwestern are like-minded too. Where the programs diverge from one another is:

- # of internal staff dedicated to business formation, e.g., Columbia & Washington has direct staffing of two (2) whereas Michigan employs six (6)
- # of direct funding programs in proof-of-concept through prototype development and seed investment

The amount and nature of intervention in the market by TTOs is a direct reflection of the presence or lack of business development services and financing programs available in the private sector, i.e., less is required in the Columbia ecosystem, more needed in Michigan, less needed in Colorado, more in Utah. As a general rule, the more that a TTO has to do itself, the more progressive and liberal it is in the creation of products, services and funding programs for start-up creation, including flexibility in governance & conflict-of-interest with faculty, i.e., allowing its developers to own substantial amounts of equity in start-ups. These TTOs are also more active in engaging university resources, e.g., engineering and MBA graduate students (schools) for interns in start-up ventures, prodding government and private sector resources for start-up assistance.

The services and funding mechanisms for creating technology start-ups in Russia are missing, not comprehensive, inefficient or poorly executed within the ecosystem where Nanotechnology Centers are located. Rusnano must intervene and lead its networks (centers + regional/city governments) to fund grant programs, herd Russian corporations and SMEs into its business model as evaluators & acquirers of technology, recruit Russian professionals to its family of Nanocenters, engage foreigners as 'soldiers of fortune' & members–Boards of Directors in Rusnano projects, all to support the creation, deployment and financing of start-ups as universities in America do.

Commonality #3: While business formation is a core strategy of TTOs, the # of staff & $ resources invested in licensing activities far exceeds the budget and staffing for SME formation. The # of staff dedicated to licensing (+ administrative & support personnel) in universities ranges from 32 to 47, while in SME formation, staffing varies from 2 to 6, ratios of 8:1-23:1, licensing to business formation.

The licensing of technology to existing corporations is more important to the growth and operation of licensing offices in US universities vs. the royalties and equity gains from business formation; income from licensing to existing corporations far exceeds revenues (royalties and equity) from SME formation. The reason is that most technologies are incremental without the value-creation that's required to start & finance a new company with the risks associated with it.

Licensing is the guarantee to generate income for Nanotechnology Centers thereby satisfying the financial & economic development objectives of Rusnano. Recognize that licensees are recruited, encouraged or developed, and success requires a full complement of staff and support personnel with the skills to execute; licensing income is delayed the more the team has to acquire the skills in selling technology to the market. Licensing is premeditated and deliberate, with many months for complicated negotiations although transactions are consummated more quickly with repeat licensees.

Success Requires Interlinked Networks in Innovation, Technology Creation & Entrepreneurship

1. Universities in the USA employ a variety of co-developers and collaborators from other universities, industry, networks and partnerships to create and drive innovation into the market like:
   - Engineering Research Centers (ERCs) with $ from internal sources, the National Science Foundation (NSF) and American companies (big & small)
   - Joint R&D programs with other US and foreign universities/companies, success which required the political will to spend taxpayer $ in and with foreign universities
   - Industry sponsored research with American and foreign corporations

   Rusnano must initiate and drive leadership in the market to foster co-development and co-funding partnerships between Nanotechnology Centers & foreign entities, whether they are Americans, Asians or Europeans. Like US university managers and leaders, execution by Rusnano will require the political will to accomplish as some will criticize Rusnano for spending Russian taxpayer $ abroad, but this opposition only reflects their ignorance and naivety of how markets develop and the role of Government in catalyzing STI.

2. A family of Nanotechnology Centers is not the 'single' factor in the creation of a nanotechnology industry in Russia. There are multiple enabling factors required for sustainability; networks that include a cadre of technology buyers and licensees (SMEs & large corporations), suppliers & enablers. Other ingredients required for success include an ecosystem that embraces risk taking, ambiguity, uncertainty and failure in the uptake and commercialization of nanotechnology, along with the culture and 'soft skills' to drive entrepreneurship into the market. Initiatives without these enabling conditions (either before or after scheme execution) fail.

   Policies to create a nanotechnology industry must be broader than just Nanocenters and include international partners, including funding programs with foreign entities and the political courage to execute. From 1970-1990 Israel funded joint R&D programs between Israeli and American corporations (the BIRD Foundation, later included UK, Germany and Australia companies), proof-of-concept grant programs and seed funds to build deal flow so VC investors had SMEs to invest in when Yozma was created in the 1990's. The unlikely and unplanned creation of entrepreneurs through military training in the '8-200' intelligence unit developed the skills that managers needed for success in commercializing technology to domestic customers and world markets.[3]

[3] Source: http://www.ifise.unipv.it/Convegno/Evolution%20of%20th%20-%20Kaufman.ppt, for a review of the Israeli technology development program

3. Nanotech success is more a function of growing markets, access to customers and entrepreneurs vs. its geographic location. This explains why China achieved more R&D & product development vs. Singapore more quickly even though Singapore financed tech creation earlier than China.[4]

Business Formation is Cumulative

1. The success of Nanotechnology Centers is crucial to the uptake of nanotech in Russia since the private sector and investors will look at the Government's investment to validate that Russian nanotech actually creates wealth. Early and multiple successes develop cumulativeness since it creates the reputation effects that enable Nanotechnology Centers to raise new money for their continuing operation (a 'survivor' center) after the 1st tranche of Rusnano $ is spent; success begets success to attract buyers, sellers, developers, investors, entrepreneurs & enablers to Russia.

2. Nanocenter creation requires experimentation & failure, welcome them, but learn from them. Expect a 'pre-emergence' period when Nanotechnology Centers fail to achieve as quickly as Rusnano expects; learning curve lessons and experiences are the building blocks for 'unsatisfied demand' to emerge from the market.

3. Collective learning and reputation effects are essential for the growth of Nanotechnology Center staff: its managers, scientists & administrators. Encourage Nanotechnology Centers to learn from one another, yet fight each other for buyers and resources; in competition, they build the talent pool and the learning experiences for a nanotechnology industry to succeed in Russia.

Summary Comments

Business formation is as much as about creating customers, a culture of entrepreneurship and risk-taking as it is about having research $, world class facilities, equipment & infrastructure as Ohio State University learned.

Ohio State is reorganizing their TTO to turn discoveries into $. "While among the top 10 schools (in the USA) for research spending, at $716 million this year, Ohio State is at the bottom of the Big Ten and trails many smaller Ohio public and private schools for its licensing income from patents, at $1.7 million in 2009. The school has attributed that to both state law restrictions and a long-standing culture that had discouraged entrepreneurial efforts."[5]

The biggest challenge for Rusnano and Nanotechnology Center management is internalizing the 'soft skills' for success in SME formation. Licensees are recruited, encouraged or developed, and this process is loaded with rejection; success is dependent not just on the quality of the technology, but also the personalities and experiences of the team, their perseverance and their willingness to reach out to strangers in the Russian and international business community, to build a stable of customers for STI and CEOs to operate start-ups.

Solutions in business formation are presented in the remainder of this report.

[4] Source: Telephone conversation with Kelvin Chan, formerly senior director in the Technology Investment Fund, Singapore
[5] Source: http://columbus.bizjournals.com/columbus/stories/2010/05/31/daily18.html

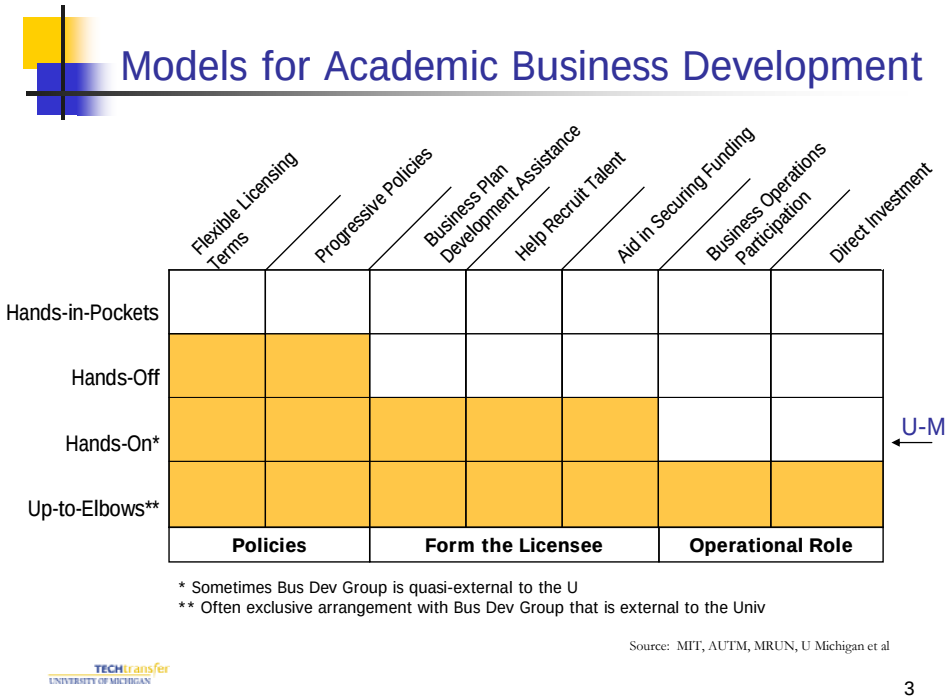
Recommendation #1: Execute the US Business Formation Model in Nanotechnology Centers

The Contractor recommends that Rusnano establish a business formation scheme in Nanotechnology Centers. Business formation by Nanotechnology Centers is one solution to achieve multiple objectives: develop an active buyer and seller market for nanotechnology, increase the number of experts with entrepreneurial talent in commercializing STI, drive entrepreneurial thinking (and its culture into the Russian market) and improve the quality and quantity of deal flow from Russian innovators.

The Business Model of SME Formation: Revenue Generation in Nanocenters

The matrix for academic business development is shown in Figure 1, with business formation defined as 'hands-on,' as executed by the team at the University of Michigan (U-M).

Figure 1: Models for Academic Business Development



Nanocenters must develop flexible licensing terms and progressive policies. Once agreed upon, management then turns its attention to selecting projects as candidates for SME creation; researching and creating the business plan, recruiting CEOs and key personnel to the start-up and raising $ for SME operation. Since the business formation strategies of universities interviewed are similar, the Contractor recommends that Nanotechnology Centers emulate the University of Michigan's program.

The revenue model for business formation includes royalty payments made by the start-up (after some period of time, negotiable), a reduced royalty for technology enhancements made by the SME and equity ownership in the SME, usually 10% or less, with anti-dilution rights included in the investment agreement. Board representation is not essential.

Royalties received are deposited into the account of the Nanotech Center. Management of the equity and the decision when to exit the investment is determined by managers of the Nanotechnology Center, not the Board; the logic behind this recommendation is that Board members are political appointees, and potentially risk adverse to liquidate for fear of criticism, e.g., sell too early, too late.

Plan Creation & the Business Development Process for SME Creation in Nanocenters

In-house new business development (NBD) specialists are Nanocenter business formation consultants to the inventor, giving assistance to access the Center and outside resources. The 1st contact for an inventor is the Nanocenter licensing specialist; a NBD specialist joins the team when the opportunity appears appropriate for a potential start-up.

Figure 2 details U-M's decision process and the Contractor recommends that Nanocenters adopt this model. It shows the point when the SME formation team gets involved in deciding on the business start-up as the commercial strategy. ***The main criteria used to determine if the technology qualifies as a start-up is if it is a platform technology that will generate a family of products and services and the inventor's willingness to be actively involved in the start-up and the start-up process***. Single product technologies are licensed to existing companies. Figure 3 shows the business development process which the team implements in business formation. Figure 4 details the research done for business formation and the inputs for writing of the business plan.

Figure 2: The Technology Transfer Process

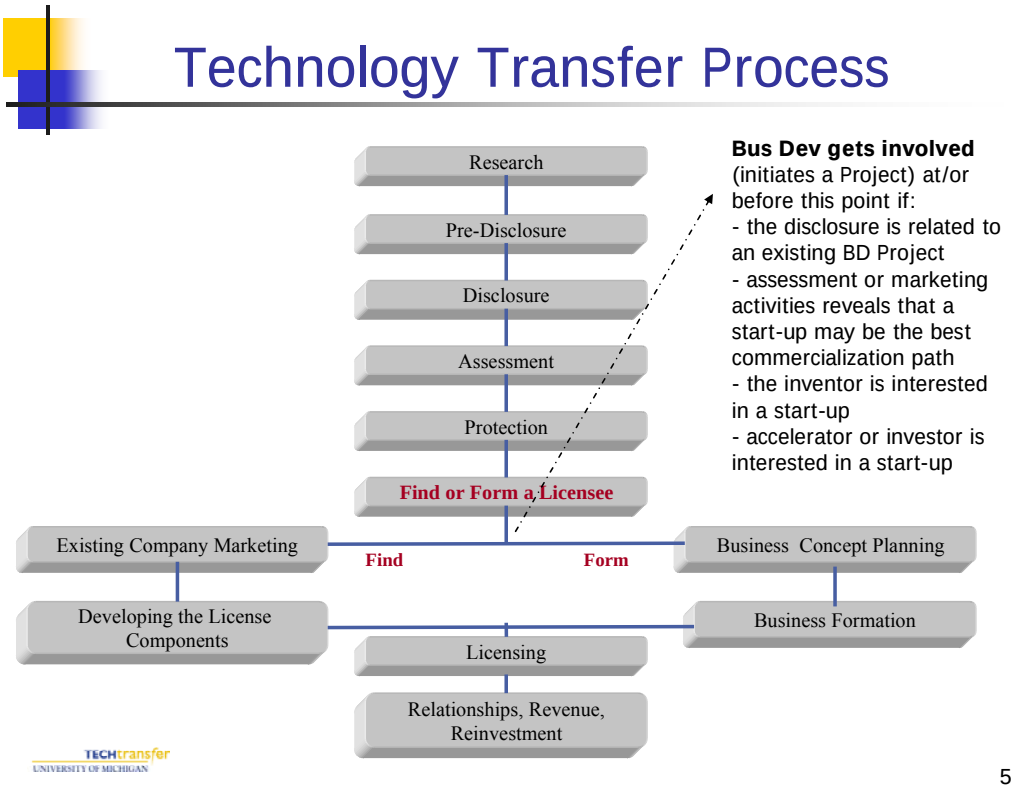


Figure 3

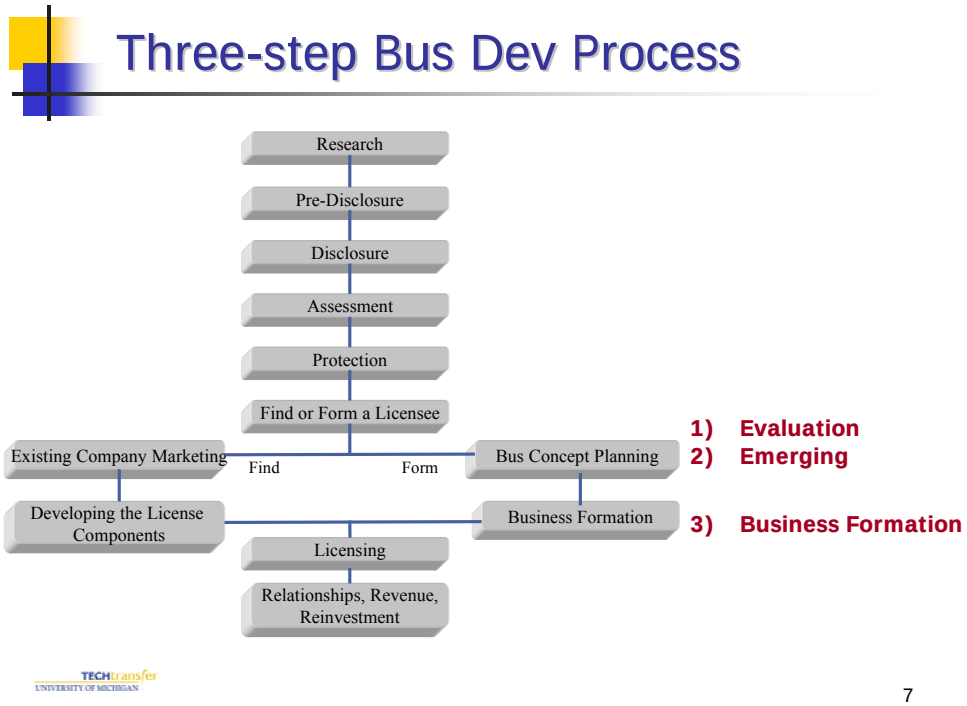
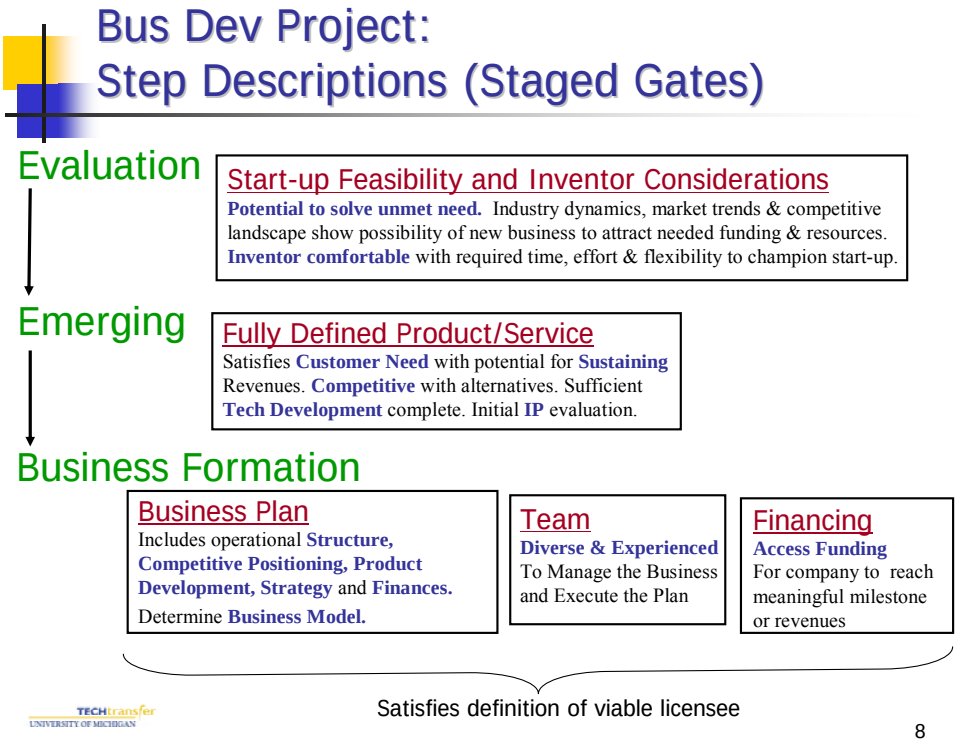


Figure 4



NBD Specialists[6] work with the inventor(s) through the following stages:

1. Evaluation - Examine the feasibility of a start-up and inventor considerations. Examine industry dynamics, market trends and competitive advantages. Evaluate whether potential exists for a sustainable business that can attract funding and resources.
   - Inventor Considerations - Starting a company requires significant time and effort. Until the start-up team is identified and engaged, the faculty member must champion the formation effort, e.g., U-M faculty typically serves as technology consultants, advisors or work in other technical development roles at the start-up.

2. Emerging - Select and define the product or service that satisfies an unmet need with a significant competitive advantage. Verify sufficient IP availability and demonstrated technology feasibility.
   - Demonstrate solution to customer problem - Define the customer need and how the product or service will competitively address it. Strategically select the lead product and pipeline from available alternatives.
   - Frame the product development plan - Verify technical feasibility, create detailed product specs, and generate the critical path development milestones. Approximate needed resources.
   - Estimate financial potential and ways to generate early and reoccurring revenues. Examine start-up resource needs relative to the requirements of potential funding sources.
   - Assess IP position - Relative to the defined product/service, protection and access for other IP.

3. Business Formation - Put the plan, talent and funding together to initiate business operations. A viable business stands on 'three legs.'
   - Business concept/plan - define the business model for revenue generation, operational structure, competitive positioning, product development plan, strategy, resource needs and financials.
   - Team - an (experienced) team to manage the business and begin execution of the plan (usually combining business and technical talent)
   - Financing - access funding for company to reach meaningful milestones or revenues

Recruiting Talent to Start-ups of Nanocenters

CEOs and serial entrepreneurs must be available to manage start-ups. Unfortunately the number of such candidates is thin in Russia and its creation will take a generation to create on its own. But we can't wait that long and neither can Russia. Rusnano and Nanocenters can implement several initiatives to find candidates for general director positions, and build the cadre of CEOs and senior management for operating start-ups:

1. Network with investors and local VCs, to solicit suggestions on candidates for start-ups. If the candidate accepts the position, there's an excellent chance that the investor will finance the start-up since investors frequently invest in past entrepreneurs they've worked with. Provide 'dating' or 'bait' money (consulting contracts) to several candidates for CEO positions, to have them perform work ***and*** learn which ones get 'excited' about the project and its merit.

2. Establish Entrepreneurial-in-Residence[7] (EIR) programs for Nanotechnology centers, to build a talent pool of potential candidates to manage SMEs. EIRs are experienced entrepreneurs, employed by Nanocenters and 'embedded' within the team as part-time employees. These individuals expand

[6] This section from U-M's business development process, See Appendix for details
[7] See these sites to learn more about EIR programs: http://www.startable.com/2009/04/08/venture-capital-entrepreneur-in-residence-part-1/, http://bostonvcblog.typepad.com/vc/2009/09/serving-as-an-entrepreneur-in-residence-at-hbs.html, http://www.rmit.org.au/browse;ID=vezl7jzcrkxq & http://www.foundationcapital.com/people/entrepreneurs-residence.php

the business formation capabilities by providing technology and marketing assessments, and function as extensions to business formation staff to mentor faculty and develop venture concepts into start-ups. The EIR performs one of three primary functions:

- Launch a new venture
- Assist in the evaluation of potential investments where the entrepreneur has a particular expertise
- Provide operating expertise to assist with existing investments (SMEs) in the portfolio of Nanocenters

3. Establish a Catalyst Resource Network that consists of alumni of local universities in the geographic region of Nanocenters, e.g., Tomsk/Novosibirsk for the Siberia Nanocenter; Moscow/Moscow Oblasts for Zelenograd; Tatarstan for Idea in Kazan, etc. Implement an outreach program to communicate with them, share news about the Nanocenter, its activities, technologies under development and application in business, etc. Over time this database of resources will span the globe of advisors, volunteers, consultants, managers and student interns for the talent needs of Nanotechnology Centers & their start-up ventures.

4. Build a community of student interns for volunteer and/or part-time employment in Nanocenters and start-ups created from Nanocenter technology. Organize a summer intern program for engineering & graduate business school students, to provide them an educational experience, 'cheap' business development resources for Nanocenter projects, and create regional employment after graduation.

   Specifically target programmers and biologists in the local community since nanotechnology are IT & biology intensive for molecular analysis, manipulation & construction; students with science majors may be unaware of the business and employment opportunities in the nano industry.

Establish a 'Job Bank' of Employment Opportunities for Expat CEOs & Senior Managers

Russia, Rusnano and Nanocenters need experienced expat managers to operate technology SMEs in the country. While high salaries with the thrill & excitement to create new start-ups in Russia appeals to some foreigners, moving to Russia & 'uprooting' the family to a new country is just too high of a risk for most expats, given the high failure rate of SMEs. Once an expat is in-Russia, future employment opportunities available to him in his own country through networking disappear, and jobs on the local market are not readily available to foreigners. This fact is the reason that all multinationals repatriate Country & senior managers back home once their assignment is finished in Russia (or other countries).

The U-M TTO recruited a CEO from California, to manage a start-up in Michigan. He moved his family from Silicon Valley and took-up his new position. One year later the start-up ceased operations, through no fault of his.

Because the CEO was in Michigan, far away from the geographic action of technology, it took him nine (9) months to find a new job, not in Michigan, but in Boston. This lack of employment opportunities in tech in Michigan creates a disincentive for senior managers to take the risk of moving to Michigan and this risk is what Michigan must overcome to attract sufficient numbers of senior managers to their technology startups; this problem exists for those attempting to create innovation centers in other states too, those that need experienced managers from Silicon Valley and Boston.

The Universities of Utah, Washington, Idaho, Arizona, Wyoming and others in the West are attacking this problem by pooling job opportunities in their start-ups and SMEs into a centralized 'job bank,' to create career options for senior managers. This set of employment opportunities gives CEOs and others the confidence that if their start-up should fail for reasons outside their control, other occupational possibilities exist in the city/state that they can access to maintain their income, security and family well-being. Such a

solution reduces the 'friction' of a senior manager moving from Silicon Valley, Boston, etc., to one of these Western states, and makes these States more competitive and attractive to Silicon Valley and Boston.

Rusnano might consider duplicating this idea, create a 'safety net' of future employment opportunities in the family of Nanocenter start-ups, to reduce the risk for an expat moving to Russia and make the country more attractive for long-term employment. Such a solution will have a broad and strategic impact beyond Rusnano & Nanocenters; learning curve lessons can be applied to the task that Vekselberg and his team have to attracting foreign tech developers, scientists, CEOs and senior managers to the Skolkovo hi-tech city project.

Engage Multinationals for Nanocenter Ecosystem Development

1. Organize R&D & supply chain competitions for users of technology[8]
   Business plan competitions that present young technology SMEs to venture capitalists contribute to ecosystem development in the US, Europe, China, India and Canada. Such events were conducted in Russia too; IVI's Russian Technology Investment Forum™, the European Tech Tour's Russian Tech Tour™, and the Russian Venture Capital Association's annual Technology Fair.

   R&D competitions present technology, to generate interaction between tech developers and the R&D staff from corporations. The audience is corporate R&D staff and corporate venture capitalists, not financial VC investors.

   Attracting large corporations to R&D competitions (organized by Rusnano and Nanocenters) has many benefits. They are able to invest in promising technologies, guide its development with customer feedback, speed commercialization and help access opportunities in the supply chain. Most multinationals hunt for technologies no matter where they come from, and they are able to benchmark technologies from Russia to another, to help developers identify strengths and weaknesses of their technology to global competitors. Others have a strategic priority to integrate technology into the corporation as supply chain linkages, thereby stimulating innovation, growth and job creation in ways such as:

   - Be the technology platform that helps model technology and scale solutions in advance of customer demands
   - Reduce development time and get to market quickly
   - Lower investment risk and help SMEs secure funding
   - Jump-start and drive sales momentum
   - Expand the market reach of SMEs by integrating them into corporate & international business ecosystems.[9]

   The venture capital arms of multinationals are especially helpful. Corporate venture capitalists Siemens, Nokia, Sony, Dow, DuPont, Shell, Chevron, Norsk Hydro, Cisco, Intel, Sun, Oracle, Motorola, SAP, Schlumberger, IBM, etc., invest into nanotechnology just like VC investors do. But they add-value in ways that financial venture capitalist can't.

   They take technology risks by investing corporate VC $ in the R&D of young SMEs, and invest directly in IP with technology right-of-use, a structure that accelerates the diffusion of technology to

[8] Source: 'The GoFoward Plan to Scaling Up Innovation,' by Thomas D. Nastas, Russian edition, Harvard Business Review, August-September 2007, http://www.ivipe.com/ivi/pages/Nastas_HBR_Article_in_Russian.pdf
[9] From the Blog posting of Dan'l Lewin titled 'The Magic of Start-ups: How One Thing Leads to Another,' Dan is VP, Net Business Development, Microsoft

markets and customers. Corporate VCs also provide access to corporate R&D budgets for the funding of technologies at their early stages of development, before financial VCs are able or willing to invest.

Corporations are one set of buyers that can help Nanocenters apply their technology to customer needs. As Esther Dyson, an investor in Russian and Eastern European startups once remarked: "One thing that the Russian market requires is a more demanding customer base. They need to become better buyers and users. They have all the necessary technical skills, but they don't have the business experience to apply the technology as well as they should."

Raising Capital for SME Start-up in Nanocenters

Technology opportunities require additional development to demonstrate the performance that's required to attract licensees, from proof-of-concept through prototype development. All universities researched have a variety of 'gap' funding programs. The success/failure of a TTO and its technology/business formation activity is a function of the availability of this money to fund the progression of technology from the lab to the point where its value can be demonstrated to licensing partners and VC investors.

The Contractor recommends that Rusnano establish funding programs in Nanocenters to solve 'gap' financing issues, thereby speeding technology to market.

Financing is matched to the commercialization path with tranches of capital linked to development path milestones. It is critical that the needs of the start-up and the requirements of the investor match as the objectives of financial grants or equity from investors (friends/family, angel and early stage VCs) differ from one another. The NBD in the business formation team determines uses of capital, tied to milestones (accomplishments) and the limits on spending of money from different sources.

The Contractor recommends the creation of gap financing programs in Nanocenters for specific purposes:

1. Technology development
   - Capitalize a 'Prove of Concept Grants Fund.' Commercialization of new technology starts with R&D and product development to demonstrate 'proof of concept' and the value of novel ideas. NBD specialists are only able to approach potential customers when they clearly present technology strengths and weaknesses, conducted to a comprehensive analysis under different user conditions. A proof of concept fund finances the costs of testing a technology and benchmarking it to direct competitors, alternatives or substitutes. To invest capital wisely, mandate that developers benchmark the technology early and often to products/services that buyers have available from competitors, whether they are domestic or international companies.[10] Size of grant from $10k-$50k.
   - Establish an 'Engineering Technology Development Fund.' Provides funding for later-stage research activities, for technology refinement.[11] Size of grant up to $10k.
   - Establish a 'Micro Grant Fund' modeled to an initiative at the University of Utah, which supports researchers' needs to purchase components or hire programming services to demonstrate experimentation results. Size of grant, up to $5k.

[10] Source: The GoFoward Plan to Scaling Up Innovation,' by Thomas D. Nastas, Russian edition, Harvard Business Review, August-September 2007, http://www.ivipe.com/ivi/pages/Nastas_HBR_Article_in_Russian.pdf
[11] Source: http://techtransfer.umich.edu/assets/forms/etdfgap.pdf

2. Funding for Business Development[12]
   - Provide 'Mini Grants' to document business opportunities for proposed technologies. A mini-grant of $3k-$10k is not intended to fund an entire business plan, but a 3-4 page document detailing the technology's potential.
   - Establish a 'Prototype Creation Grant Fund' for the building of prototypes for customer and investor demonstration. Size of grant up to $50k.
   - Establish a revolving IP (intellectual property) fund that pays the legal costs of filing domestic or international patents with costs reimbursed through revenues generated from licensing. Such repayments replenish the facility so it becomes a revolving fund with a one-time investment from Rusnano.

     The University of Utah stated that research shows that foreign start-ups and SMEs with patents in the USA (in addition to their home country) raised more $ from VC investors (local and foreign) vs. those with just patents in their home country. The explanation is simple; start-ups and SMEs with US patents have more protection and revenue opportunities when their IP is protected in US and foreign jurisdictions.

Team Skills in Business Formation, Motivation & Incentives in Nanocenters

The success or fail of SME formation achieving its mission and objectives is a function of the quality and experience of the men and women that staff the business formation team and the resources devoted to it (salaries, bonuses, development monies, patent/legal budget).

Teams in business formation should include a mix from academia and business, with a preference for entrepreneurs and staff from start-ups and early stage companies since they have the experience needed in creating seed stage enterprises from Nanocenter technology. A team composed of entrepreneurs can provide several types of assistance to inventors:

- Project planning and management
- Manage the communication 'hub,' the vehicle for communicating within (and among) Nanocenters and the local community
- Serve as coaches or mentors
- Provide planning assistance
- Identify, locate and link to needed resources in the community
- Help create and execute a funding strategy (including introductions)
- Facilitate engagement in community of start-up assistance programs

Compensation packages for SME formation teams include salaries and fringe benefits (health insurance, vacation, etc.), but one issue that Rusnano must resolve is the trigger for performance incentives like bonuses. In US TTOs, staff is paid a good salary (≈$90-$110k/year) with a bonus as a %, usually up to 10% of salary).

Superior performance by Nanocenter staff must be rewarded. The dilemma for Rusnano is how to structure the right motivation and incentives, yet not create a cutthroat organization with staff working for their individual gain vs. the growth of the Nanocenter. Since there are a limited number of quality technologies in Russia, business formation professionals might undermine and steal deals from others in the Center, and commandeer shared administration support from others. Not only would such actions destroy morale and teamwork, calls for assistance that develop the Nanocenter & grow the ecosystem would be ignored since

[12] Source: The GoFoward Plan to Scaling Up Innovation,' by Thomas D. Nastas, Russian edition, Harvard Business Review, August-September 2007, http://www.ivipe.com/ivi/pages/Nastas_HBR_Article_in_Russian.pdf

they generate no immediate reward; such occurrences defeat Rusnano development objectives and we must think forward to mitigate these risks.

One solution to circumvent this issue is to organize the business team into groups that includes administrative support, managed by the team leader. The group works to consummate deals and create future deals so ecosystem development is better achieved. The entire team is compensated on results and competition is developed across teams rather than individuals.

A 2nd issue for discussion is the need to attract/keep key employees. There will always be competitors that will offer more $$ to steal employees once they are trained in the details of nanotech, licensing and business formation. Certainly having competitive salaries, bonus and benefits package is essential to keeping employees. But that is not enough in a competitive market as Russian compensation packages emulate practices in the West.

A solution to retaining key staff is to establish an equity or royalty pool as long-term compensation, so key managers participate in the rewards of wealth creation. Properly structured compensation pools make it too expensive for key managers to leave, thereby creating what we call 'golden handcuffs,' i.e., there is both the reward in staying and too much wealth to lose from leaving.

For discussion: Is Rusnano willing to consider an equity or royalty pool as long-term incentive for key managers in Nanocenters, to minimize recognized weaknesses in compensation and eliminate a business threat? Would Rusnano consider creating an equity or licensing income pool across its family of Nanocenters, to diversify risk for the team by sharing some of the upside in the entire pool of licensing income or equity in SMEs created, i.e., not having all of your wealth tied up in one company or one Nanocenter activity?

A 3rd issue with team creation and execution is % of performance bonus. US universities limit it to 10% to maintain salary parity with personnel across the entire university, but also as a way to attract the 'right' kind of people to the team. The interviewees stated that working in the TTO is the best job on campus, for its variety of assignments, to work in cutting edge STI that changes the world, and see new start-ups formed. Too high of a bonus as a % of salary will attract 'sales guys' that look good on paper (i.e., resume, the 'right' background, etc.), but with a mercenary, short-term focus, lacking the interest and commitment to invest in infrastructure development initiatives.

Marketing Russian Nano STI to the Private Sector: Implications for Nanocenter Staffing

In 2007 in the US, licensing by TTOs to SMEs dominated total licensing with 49.9% of all licensing activity while licensing to large companies was 33.5% with 16.5% to start-ups (see Table 1).

Table 1[13]: Licensees & Options Executed by US Respondents in 2007 by Type of Company

FY2007	# of Respondents	Total Executed	Start-ups	% of Total	SMEs	% of Total	Large Companies	% of Total
US Universities	161	4,419	764	17.8%	2,150	50%	1,383	32.2%
US Hospitals Research Institutions	32	676	59	8.8%	337	50.4%	272	40.7%
Tech Invest Firms	1	14	–	–	–	–	14	–
All Respondents	194	5,109	823	16.5%	2,487	49.9%	1,669	33.5%

[13] Source: AUTU 2007 Annual Report, page 35

It is intuitive for Nanotechnology centers to staff-up the organization for licensing to existing companies (SMEs & large companies, as is done by TTOs in the USA) since this commercialization path is a quicker path for generating income since most technologies are incremental vs. gamechanging, the criteria for business formation.

The Contractor recommends that Nanocenters and Rusnano re-think this business model for Russia, and place equal or perhaps even more emphasis on SME creation.

The logic for this recommendation by the Contractor.

Originally the infrastructure for hi-tech R&D in the Soviet Union was built upon domestic demand, mainly from the military, security and space industries. During these times Soviet institutes functioned as 'in-house' technology developers for state-owned enterprises (SOEs) that completed development themselves and deployed the solutions into the market.

After the collapse of the Soviet economy, technology demand, funding and purchasing practices of this integrated supply chain was disrupted. Domestic tech buyers/users were unable to finance the budgets of institutes to the levels of the past for technology and embraced the Western model of purchasing ready-made products, with final development shifted to sellers from buyers. This preference to purchase ready-made solutions creates complications for Nanocenters in the business of licensing technology in Russia.

Licensing requires licensees to invest resources to further develop technology and integrate it into their products/services; a business practice and culture broken with the fall of the Soviet Union. Russian buyers purchase market-ready solutions, not technology requiring additional development, a characteristic of licensing.

The Contractor recommends that the Nanocenter team invest resources into SME creation, even when ROI may be less than expected. Working to create new start-ups increases the number of SMEs that can be sold licenses in the future, so SME formation ensures that a market of buyers will exist for Nanocenter tech. But that is not the only reason.

Issue for Discussion: Licensees are recruited, encouraged or developed, and success in selling builds the skills in the team to convince buyers of the merits to purchase technology that requires further development; such skills will help change the attitudes of Russian managers to consider licensing technology as a strategy to augment existing purchasing practices. Additionally Rusnano might invest a 2nd tranche of $ with this capital for final product development by Nanocenters, to create the ready-made products that Russian buyers are accustomed to buying now. Over time, transition them to licensing technology that requires additional development as done by American, Asian and European licensees.

Establish Metrics that Integrate Nanocenters into the Ecosystem & Drive their Performance

1. Inventory technologies under development (and for licensing) and publish as a database,[14] searchable on the Internet, by keywords like technology, market and application. Provide an Organizational Service (OS) in business formation that gives users, customers and investors the information needed to consider nanotechnology from Nanocenters:
   - Technology, product and market segment, with full contact information of research team
   - Benefits of the technology, cost and performance

[14] Source: 'The GoFoward Plan to Scaling Up Innovation,' by Thomas D. Nastas, Russian edition, Harvard Business Review, August-September 2007, http://www.ivipe.com/ivi/pages/Nastas_HBR_Article_in_Russian.pdf

- Performance and cost benchmarked against domestic and international competitors with data generated to international testing standards
- Stage of development, meaning R&D, product development, alpha or beta testing
- Product development plan with timetable and milestone inflection points, line item budgets
- Patents issued or filed, by country, date and number, and competing technologies similar in form or function

2. Promote technology in the Market
   TTOs maintain a database of companies that license technology from universities, and they proactively build relationships with these companies to develop them into future licensees. Building these relationships means personnel interaction, picking up the phone to call acquaintances and making 'cold calls' to potential buyers of technology. There is no substitute for one-on-one, face-to-face communication.

   Approximately 40% of the licensees granted in the US are sourced from industry contacts of the inventor or faculty, and this asset must be developed in the Nanocenter infrastructure. To create this resource, establish performance benchmarks for Russian developers & scientists to present papers at domestic and international industry conferences as deliverables for a calendar year, with salary reduced by 10% if the targets are not satisfied.

   Invitations are typically received when a faculty or researcher is doing work that is deemed innovative or creative and invited to present their work to peers; benchmarks for invitations is a vehicle to stimulate them to publish and 'push' them to experiment with new methods and ideas in their drive for peer recognition. The Contractor recommends that Rusnano and Nanocenters fund up to $5k for publications when production costs are unusually high due to artwork, maps, photographs, and other special production elements.

Recommendation #2: Establish Co-Operative Relationships with TTOs in the USA

The Universities of Colorado, Michigan and Utah expressed real interest in working with Rusnano, even suggesting proposals. While the ideas for cooperation are preliminary as of the date of this report, the project team is moving on the GoForward plan with them. One issue to overcome in most of these proposals is the spending of Russian taxpayer $ abroad; the project team believes this issue is solvable with the right structure, i.e., rights-of-use of technology developed with Rusnano $.

Collaborate in Joint Research & Development Initiatives

U-M and Shanghai Jiao Tong University, China, established a $6 million 'fund' with $3 million from each party. This fund issues tenders that faculty and researchers respond to; joint research proposals from both universities and proposals from one nationality.

The structure of this initiative encourages new thinking, cooperation and technology development as the teams fight one another to write the most innovative proposals; when joint R&D is financed, the amount of funding is divided to the % of the work done at U-M vs. Shanghai Jiao Tong University or vice-versa.

For example a $1 million dollar project with 60% of the work done at U-M is funded from U-M's contribution with 40% funded by the Chinese. This structure solves the political issue of Michigan taxpayer $ funding the Chinese; in this case, Michigan $ is spent in Michigan. When Michigan money is spent for technology development in China, U-M has an exclusive right to the technology in its home territory. This is a win-win for Michigan as it leverages the technology of others for its gain, and neutralizes political opposition to the program.

This model can be applied to Rusnano with Colorado, Michigan and Utah expressing interest in this idea, and 1st discussions will start on a GoFoward Plan in June/July 2010. A conference call between the project team and Colorado was conducted Friday 18 June 2010 at 18:00 Moscow time with proposals discussed and now being followed up by the project team.

Co-Create Engineering Research Centers[15]

National Science Foundation (NSF)-sponsored Engineering Research Centers (ERCs) are located at universities across the US, working with industrial partners to stimulate STI creation and commercialization. With funding from the NSF, universities and industrial partners, the Center develops R&D to the needs of industry in a specific technology fields like nano, biotech, clean energy, etc.[16]

For execution with Nanocenters and US partners (U-M, Colorado, Utah & the NSF), the logical industry partner is the US subsidiary of a large Russian enterprise like Gazprom, Lukoil, Rosneft, etc., industrial firms that seek strategic innovation from nanotechnology, and those that Rusnano can influence. Of course the specific targets of nano STI need to be defined with deliverables, etc.

Fund 'Proof of Concept' Programs

US universities have funding shortfalls for development and prototyping due to the financial crisis and budget cuts; they welcome ideas to supplement their budgets with money, and are more flexible than they might have been in the past in structuring relationships.

One solution is to carve out 'proof-of-concept' grant initiatives in nanotech with Michigan, Utah and Colorado, with exclusive royalty-free rights to transfer Rusnano financed-US developed technology in Russia, and the US universities retaining rights to license the technology to other geographic regions. Commit up to $5 million/grant scheme.

As a 'sweetener' to consummate a deal, propose a structure to receive a small % of the income that US universities receive from licenses sold to US companies from Rusnano funded technology. Such structures eliminate political opposition from Rusnano Advisory/Board members, Russian taxpayers or the media. Target a nano initiative in technologies where Russia is weak and the selected US universities are strong, to build new technical competencies in Nanocenters (and Russia) and justify Russian taxpayer $ invested abroad. Transfer to Russian nano or enabling technologies to US universities that require the skills of American developers, i.e., talents missing in Russia, for development and prototyping, and then re-import final solutions to Russia for commercialization.

Russian born and educated Nikita Kotov (Ph.D from Moscow State) manages the nanocenter at the U-M. The Contractor met with him to discuss his operation; Nik and his team is a candidate for both co-development and proof of concept initiatives with Rusnano and Russian Nanocenters.

Finance the Creation of Seed VC Funds, Aligned to the TTOs of US Universities in Nanotech

Invest in seed funds, with Rusnano as the lead LP; invest up to $5 million in new nano-seed funds, in the local communities of Colorado, Michigan and Utah. A variant is to invest as an LP in existing seed funds with an asset allocation to nano, in the targeted regions, again with technology right-of-use in Russia.

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[15] Source: http://commercialization-handbook.wikispaces.com/Public+Research+Organizations.com
[16] Ibid

Consider these funding initiatives as 'tickets' to gain entry into the US market, to build a working relationship between Rusnano & American TTOs, to establish the confidence & proof that Rusnano is a creditable player in the market.

'Embed' Russian Staff in TTOs: for Skill Transfer, Leverage Results & Make Partnerships Work

Strategies to access technology, co-development, funding and partnerships are all fine and good, but they require one other ingredient for execution; embed Russians into the staff of TTOs at Colorado and Utah (discussion pending with U-M). The intent of this suggestion is to ***train Russians in the details of licensing and SME formation from the experts***. TTOs are receptive to this idea as they have open positions in their operation, yet are unable to fill these positions due to hiring freezes (budget cuts from their State Legislatures).

To make this recommendation acceptable to US counterparts, Russian staff (trainees) take orders from the management of the TTO, are under their authority and control, with TTOs managing, developing, training and disciplining Russian trainees. Trainees' salary, cost of living, travel, etc., is paid by Rusnano and/or Nanocenters. Trainees' job is to learn the business and coordinate cross-border tech transfer between TTOs, Rusnano and Nanocenters and the import/export of American or Russian technology between the US and Russia. The project team believes an intern/trainee program is a win-win for all parties and a practical solution with long-term benefits accruing to everyone.

CONCLUDING COMMENTS & ADDITIONAL RECOMMENDATIONS

The financial crisis and market events in the USA have created an opening for Rusnano to establish a market beachhead in America with university TTOs; universities the project team met with have the interest and willingness to engage Rusnano. The Contractor makes two additional recommendations to leverage the opportunity created by the project team, and build other sources of additionality for Rusnano.

Build Cross-National Networks of Russians Living Abroad[17]

Create an Internet portal that informs Russian diaspora to the business, economic and financial opportunities in Russian nanotechnology.

- Target Russians whom immigrated to the US, Europe and Israel for inclusion in the database as they are potential 'transfer agents' of the entrepreneurial mind-set to Russia.
- Market the portal to Russians attending the MBA programs in US and European universities like Harvard, INSEAD, IMD, Wharton, MIT, Michigan, Duke, Chicago, etc., including alumni & Russians attending executive MBA programs. These students are well-educated, bilingual, high achievers with the international business experience/education needed in Russian nanotech.
- Model the portal to this EU initiative (http://cordis.europa.eu/eralink/about_en.html). It is a networking tool for European researchers; it provides information about research in Europe, opportunities for research funding, for international collaboration and for moving across borders.
- In the 1960's only 16% of Korean scientists and engineers with Ph.Ds from the US returned to South Korea. In the 1980s, the number had jumped to about two-thirds. Korea succeeded by integrating Korean diaspora into cross-national networks of professionals overseas and linking them with Korea business vs. simply trying to physically attract technical talent from abroad.

Establish a Rusnano Office in a US City[18]

Make this office the voice of Russia in the US, to share information, access technologies and promote Russian technologies to the market, for building the network with developers, entrepreneurs, Russian expats, VCs and investing in cross-border transactions. This office is a key ingredient for engaging international networks, to stimulate collective learning.

- Israel had a 20 year program of technology links with the US, Asia and Europe through the BIRD program and Israelis living in these countries. These links created access to markets, partners, investors, deal flow and staff to start new SMEs.

- This office seeks and encourages US-Russia cross-border investments in Russian SMEs/technologies, even when Russian money is available or local valuations are higher. The more international links Rusnano creates the better, as you become a stakeholder in the international tech development & commercialization community vs. simply being an observer and a promoter, to institutionalize Rusnano into global investment networks.

[17] Source: 'The GoForward Plan to Build the Venture Capital Industry in Russia,' report by Thomas D. Nastas, 17 January 2009
[18] Ibid

APPENDIX

Explanation, Contents of the Appendix: Documents Provided in this Order
AUTM Survey Results of TTOs in the USA
Technology Transfer & Business Formation at the University of Michigan
Technology Transfer & Business Formation Columbia University
Technology Transfer & Business Formation at the University of Colorado
Technology Transfer & Business Formation at the University of Washington
Technology Transfer & Business Formation at the University of Utah