Abstract

The GoForward Plan to Scaling Up Innovation[1]

By Thomas D. Nastas

Innovation, SMEs, entrepreneurship and venture capital (VC) are ingredients in knowledge based economies; witness the successes of Silicon Valley in the US and replicated in France, Germany and elsewhere. Small countries like Israel and Singapore with little domestic demand for technology developed unique approaches to knowledge creation with excellent outcomes.

Emerging country governments see these successes and they encourage their SMEs to attack world markets. Much energy is directed at replicating the strategies that made Israeli, Singaporean and other SMEs so successful -- creation of disruptive solutions (superior performance or cost reduction features) for global markets with governments financing innovation and VC.

Such strategies are high risk - high cost, with highly uncertain outcomes. Once an SME competes in tech markets, it positions itself against global competitors, many with closer and deeper access to customers and a marketing orientation that buyers expect from vendors and suppliers.

Success in attacking international markets requires disruptive technologies to overcome the purchasing habits of customers and penetrate established supply chains. However such GameChanging business models are far and few between as they frequently result from coincidence and timing vs. planned innovation.

SMEs and governments cite the low absorption rate of domestic users as the reason to pursue a GameChanging strategy for private sector development. Yet every country has industries that are knowledge based; some are clusters around a particular industry while others exist from hydrocarbons, minerals and other natural resources.

This article presents a seven point GoForward plan to building technology platforms in and around strategic assets vs. diversifying resources away from natural advantages; to catalyze a chain reaction in more domestic tech absorption.

Once this base is established, governments can invest resources to assist/support their SMEs to take a seat at the table of global tech development.

[1] This article is abridged and translated from the published work of Thomas Nastas in the Harvard Business Review, Russian and Hungarian language editions, 2007. The original articles in Russian and Hungarian can be downloaded at www.IVIpe.com

The GoForward Plan to Scaling Up Innovation©[1]

By Thomas D. Nastas[2]

Innovation, small & medium size enterprises (SMEs), entrepreneurship and venture capital (VC) are ingredients in knowledge economies; witness the success of Silicon Valley in the US and replicated in France, Japan and elsewhere. Small countries like Israel and Singapore with little domestic demand for technology developed unique approaches of exporting knowledge creation with excellent outcomes.

Emerging country SMEs with government planners and foreign investors are creating technology capacity to ensure their future in a knowledge world. Much energy is directed at replicating the strategies that made SMEs in Ireland, Korea and others so successful -- tech development for global markets with governments financing innovation and VC.

Are these the best strategies with the greatest chances of success? Do alternatives exist, to build from technical needs for the local market instead, and help position a few for entry into world markets? If yes, how can governments support such a strategy to generate new wealth, especially those with economies dominated by natural resources?

In this article I present a GoForward plan to scale up the innovation ecosystem and the investment needed for execution. I draw upon my experiences in transacting seed and early stage VC investments in technology for the oil/gas, IT, biotech and medical industries from Africa, Central & East Europe (CEE), the CIS (countries of the former Soviet Union), West Europe and the USA.

The Leverage of Venture Capital

US companies that raised VC from 1970-2005 created 10 million new jobs and more than $2.1 trillion in revenue in 2005[3], 10 million new jobs is 9% of the total US private workforce and 16.6% of GDP, an increase from 8.7 million jobs and $1.5 trillion in revenues in 2000. Over the past thirty years, some of the most famous brands were financed with VC (Table 1).

Table 1[4]

Company	Venture Investor
Microsoft	August Capital
Intel & Apple	Venrock
United Healthcare	Warburg Pincus
Cisco & Yahoo	Sequoia
Hotmail	Draper, Fisher & Jurvetson
Genentech, Amazon.com, AOL, Intuit & Netscape	Kleiner Perkins
eBay	Benchmark
Google	Kleiner Perkins & Sequoia
Skype	Draper, Fisher & Jurvetson, Index Ventures & Others

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3 National Venture Capital Association, Arlington, Va., (www.nvca.org) & Global Insight Inc., Waltham, MA., (www.globalinsight.com)

4 Venture Economics, Boston, MA, (http://www.thomson.com/solutions/financial/privateequity), National Venture Capital Association, Arlington, VA., (www.nvca.org), ThinkEquity Partners (http://www.thinkequity.com) & CapitalIQ (http://www.capitaliq.com)

Before Hotmail, people communicated by telephone, telex, fax and letter; no big deal. Once Hotmail was launched, communication was turned upside down as users realized huge gains in productivity, simplicity and convenience by accessing e-mail over the Web, 24/7, from any computer, anywhere in the world; with such benefits it's easy to see why new industries formed around this solution.

Before eBay, people bought and sold collectables at auctions for centuries; no big innovation here either. But eBay created an innovative trading platform that combined live auctions, the Internet and collectables that became the biggest online marketplace and seeded the creation of entire industries based on online trading.

Retailing and delivery existed for centuries too. Amazon innovated in the graphical interface to make product ordering simple and combined it with efficiencies in warehousing and distribution to make the user experience pleasant.

What these successes have in common is that each created an innovative business model, mostly around a GameChanging technology; disruptive technology with superior performance or high cost reduction features. GameChanging solutions make products and services accessible to global customers.

Each of these tech and business model platforms spawned business ecosystems of new suppliers and partners. It's estimated for example, that for every $1.00 of revenue that Microsoft earns in Chile, another $11.00 is made by partners, suppliers, system integrators and the like in the Microsoft Chilean ecosystem.[5] Such leverage demonstrates the economic value generated by integrating new ideas, innovation, technologies and VC.

5 Blog, Dan'l Lewin, 'Innovation vs. Invention,' 16 November 2005. Dan is VP, Net Business Development, Microsoft

The Allure of Global Technology Markets

Large opportunities attract the best scientific minds, entrepreneurs and investors: cures for human health problems in aging and disease, needs for security in an increasing violent world and energy alternatives as natural resources deplete. In solving global needs, new wealth and prosperity results as the reward for industrial creation.

Emerging country governments see the successes of SMEs solving global needs. They encourage enterprises to attack world markets with aid like VC to support this strategy.

Actions of the Hungarian and Russian Governments illustrate the commitments that governments execute to jump into the global technology, commercialization and VC game. The Hungarian Government implemented a number of schemes to catalyze more investment, VC and tech development such as the Development and Innovation Program, Microcredit Program for SMEs and Enterprise Promotion. The Administration expanded its intervention to support innovation, investment, trade, and SME development in other ways too through the R&D division of the Ministry of Education and the Hungarian Investment & Trade Development Company.

The Putin Administration is spending billions of petrodollars to diversify the Russian economy away from its reliance on oil, a prudent and worthwhile strategy. It is investing state money in infrastructure like enterprise zones, technoparks and incubators, a 'build it and they will come' strategy.

Especially ambitious is the creation of the Russian Venture Company, a US$500 million fund-of-funds modeled after Israeli's Yozma fund-of-fund scheme (**text box, page 3: What is Yozma All About?**). This PPP (public-private partnership) mandate is to co-invest with the private sector and create up to twenty new Russian tech VC funds with a total capitalization of $1 billion, half from the Russian Government with the matching $500 million from the private sector. All these

initiatives are developed with the intention of taking a seat at the table of global technology development.

The private sector is active in the CEE and CIS too. Global powerhouses in multiple industries – Intel, Ford, TI, Nokia, Siemens, Motorola, Microsoft, Boeing, IBM, United Technologies, Samsung**,** Cadence and Sun – established R&D centers and selectively incorporated CEE and CIS technology into their products. A few international VC funds invested in Hungarian and Russian innovation.

Yet with all this capital and horsepower invested and to-be-invested, something is amiss in the CEE and CIS. A critical mass of seed and early stage SME investment opportunities do not exist for domestic or foreign VCs. This is not due to a lack of money as these economies are awash with capital and investors looking for opportunities. And they have advantages not enjoyed by other developing countries; scientific accomplishments that fed the Soviet military machine, leading universities and world class researchers.

What is Yozma All About?

In the 1990's the Israeli Government created the 'Yozma' investment scheme. This fund-of-funds was capitalized with $100 million, $80 million to finance new VC funds with $20 million for direct investment into Israeli tech SMEs. Yozma invested $8 million into a private VC fund. A minimum of $12 million/fund was invested by Israeli and foreign venture capitalists. Yozma gave fund managers the option to 'buy-out' the government's equity after five years.

In the first three years of operation, Yozma catalyzed ten VC funds with a total capitalization exceeding $200 million.

'Yozma' fund-of-fund schemes are terrific solutions when a country has a capital markets problem like Israel had in the early 1990s; proven technology but little access to capital for commercialization and SME creation. Much of the early Israeli tech came from the military, released to the private sector. Other success factors include an Israeli industrial policy that funded R&D to create deal flow and the unplanned creation of entrepreneurs through military training in the '8-200' intelligence unit.

Fund-of-fund approaches are not solutions to a deal flow problem; when the quality and quantity of opportunities are just too low to meet the requirements of financial VC investors. Chile has experienced disappointment with its fund-of-funds program; few investments transacted due to the low and poor quality of the deal flow, not a lack of money.

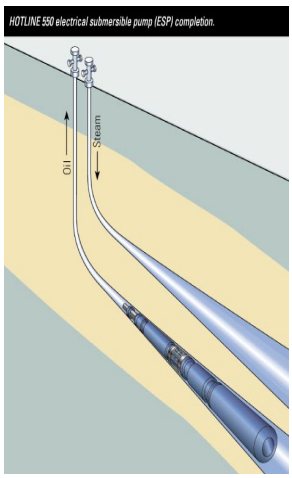
Poor quality or low deal flow is not confined to just the performance of a technology, but also the availability of good managers and specialists to operate enterprises. In Russia for example, it's a challenge to attract good entrepreneurs and managers to tech SMEs. They have employment alternatives with better career opportunities, higher salaries and the potential to get rich quickly through an IPO in non tech like construction, retailing, branded consumer goods and transportation as examples.

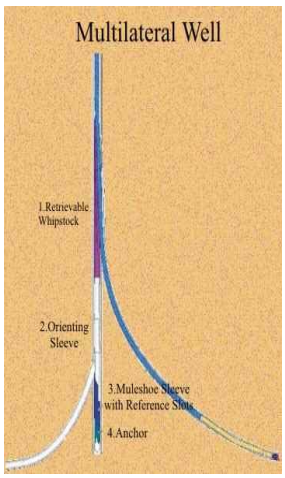
Innovators in Technology

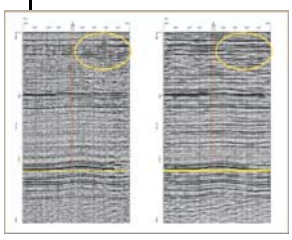
Hungary-born American software developer Charles Simony led the development of Microsoft Excel and Word, products that revolutionized financial analysis and word processing to create billions of dollars of new wealth for his employer and himself.

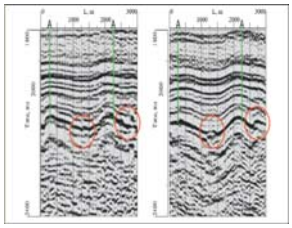
Soviet scientists pioneered GameChanging technology in several industries, the oil business being one. In 1917, Russian scientist Armais Arutunov developed the first electrical submergible pump (left, **Picture 1**), an

Picture 1









innovation that boosted hydrocarbon extraction.

In the 1950s, 43 horizontal wells were drilled in the Soviet Union, one of the most ambitious drilling efforts for the untested technology. Building on this work and that of U.S. scientist Lester C. Uren, Alexander Grigoryan put theory into practice by branching the oil wellbore, and in doing so, he became the father of multilateral drilling (**center, Picture 1, page 3**).

In 1953, the Soviets drilled in Bashkiria (Bashkortostan today) with nine laterals and a horizontal reach of 136m (446ft). Although the cost was 1½ times more expensive than other oil wells, it penetrated the reservoir 5½ times better and generated 17 times more oil per day. During the next 20+ years, the Soviets drilled 110 multilateral wells with Grigoryan drilling more than 30 wells.[6]

Other Russian technologies widely used in E&P (exploration & production) include *in-situ* combustion and vertical seismic profiling (VSP), invented in 1957 by geophysicist Evsei Galperin, Soviet Institute of Earth Physics. His VSP profiles (**right, Picture 1, page 3**) showed the structure of seismic wave fields, which generated productivity gains in locating hydrocarbons more accurately. After 50 years of improvements by Western developers (led by Bob Hardage of Phillips Petroleum), VSP is used throughout the world.

With such tech successes in the petroleum industry and others in aerospace, IT and space exploration, investors and technology customers naturally look to the CEE and CIS for innovation in other spheres.

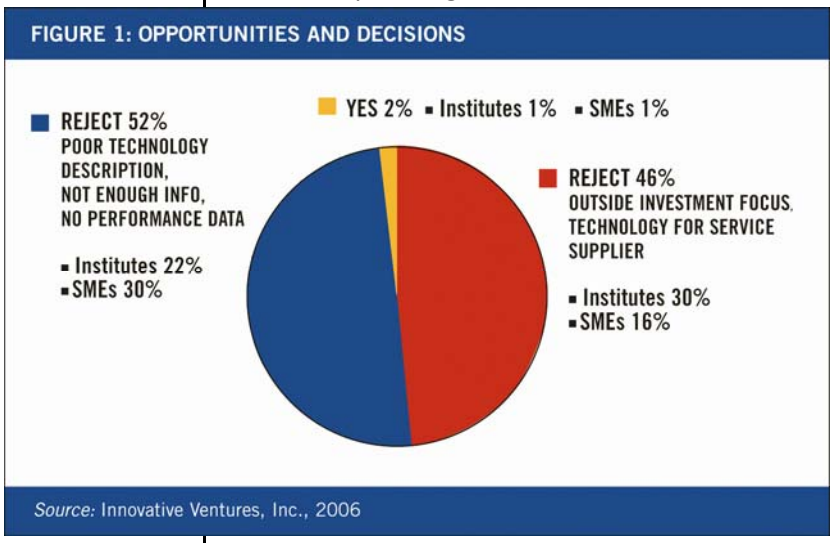
6 Source: Society of Petroleum Engineers Web site (www.spe.org), Oil & Gas Basics

Few GameChanging Technologies

Over the last seven years, Innovative Ventures Inc., or IVI, and other VC investors evaluated hundreds of Russian and CIS technology deals in IT, telecoms, biotech, medical and others; yet collectively we have invested in only twenty-five or so. Specifically, over the past three years, we've looked at oil E&P technologies for investment. Our findings provide a microcosm and a reflection of why so few investments in technology are made in Russia. Leveraging the Soviet science and scientific foundation into an active knowledge-based economy is a real challenge.

In Russia for example, only 2% of the E&P innovations evaluated (**Figure 1**) have performance characteristics that one can classify as disruptive, with superior performance or cost reduction features. Such GameChanging benefits are required to attract international customers and investors and compete in global markets.

FIGURE 1: OPPORTUNITIES AND DECISIONS



Source: Innovative Ventures, Inc., 2006

Even though the technologies had interesting features, they are not ready for customers or VC. They are R&D stage concepts and require money and time for testing and development, to get them market ready, customer ready and advanced enough for VC investment. Contrary to conventional wisdom, VC rarely invests in R&D (**text box, page 9: What Does VC Invest In?**).

These findings disprove the notion that Russian institutes and SMEs have great technologies, but investors are blind to the potential. No, what institutes & SMEs have

are great ideas, but customers buy products not concepts, and investors invest in deals, not ideas.

Returning to Figure 1, 52% of the technologies were rejected due to poor descriptions of their value, inconclusive performance data and competitive benchmarking. Many ideas appear interesting if only reliable performance data was available. Rejection was not due to lack of intellectual property (IP), business plans, management or capital markets, typical reasons given as why so few VC tech investments are made in Russia, the CEE, Ukraine and the Baltics.

Good test data is essential to prove a technology's benefits. Once an SME competes in tech markets, it positions itself against global competitors, many with closer and deeper access to customers and a market orientation that buyers expect from vendors and suppliers.

Even with good performance data, attacking international markets requires disruptive technologies to overcome the purchasing habits of customers and penetrate established supply chains. However GameChanging technologies are far and few between as they frequently result from coincidence and timing vs. planned innovation (**text box, page 10: Moving Up the Innovation Value Chain)**.

If the chances of creating disruptive solutions are so slim, what can a country, its scientists, universities and SMEs do to get into the technology and commercialization business?

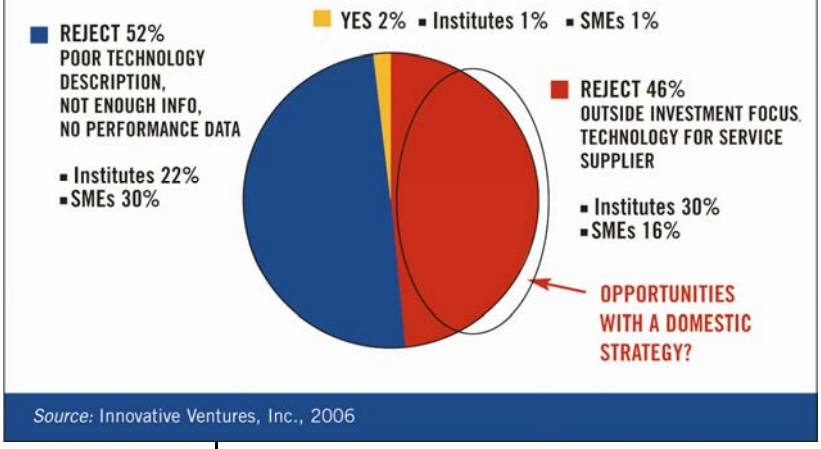
Given that so few GameChanging technologies exist in oil E&P, IT, biotech, etc., what can Argentina, Brazil, Russia, Estonia, Hungary and others, with lots of money and talent, but only ideas, do to build their place in the knowledge world? And what actions can other developing countries like Vietnam, South Africa and India adopt when they lack the intellectual base and petrodollars that Russia and Kazakhstan enjoy?

Let's return to Russia to see what an alternative strategy might be and its learning curve lessons to move up the innovation chain.

Overlooked Opportunities in the Domestic Sector

While few Russian innovations have GameChanging qualities for international buyers, others (**Figure 2**) have value in domestic E&P. These are low cost solutions that give customers (both Russian and international oil companies) almost world class performance, but at lower prices to Western competitors. Low cost technologies attract price sensitive customers.

FIGURE 2: OPPORTUNITIES AND DECISIONS



Source: Innovative Ventures, Inc., 2006

What makes these opportunities exciting is that they represent an alternative to pursuing a GameChanging strategy. Instead of trying to outperform international competitors, one can build a locally competitive SME technology sector for domestic needs. Once this base is established, invest new resources to develop the international capabilities of SMEs for global marketing.

Given higher probabilities of growing a local technology sector, a GoForward strategy exists ***to build*** technology platforms in and around strategic assets vs. diversifying resources ***away*** from natural advantages. And if potential exists in tech for the hydrocarbon

business, do overlooked sectors exist in other industries to 'jump-start' more tech creation and deployment?

The GoForward Plan in Technology and Knowledge Creation

Action Item #1: Target Domestic Users First
SMEs and governments cite the low absorption rate of domestic users as the reason to pursue a GameChanging strategy. Yet every country has industries that are knowledge based; some are clusters around a particular industry while others exist from natural advantages.

The automobile industry is a tech cluster with excellent growth in the CEE and the CIS as Ford, General Motors, Toyota, VW, Peugeot and others increase production in the Czech Republic, Hungary, Russia and Slovakia to meet customer demand. These auto multinationals need to build the domestic auto component supply chain to a Western equivalent to meet their business plans just as Shell, Chevron, LUKoil, KazMunaiGaz and others seek more and better oil field service suppliers in the CIS.

Both industries struggle to localize more purchasing and satisfy local content commitments. "The local car industry 'is handicapped by the quality of local suppliers, who are far below world standards,' said Carl Hahn, chairman emeritus of Volkswagen. 'That's the most challenging part for our team' Skoda chairman Detlef Wittig said."[7]

Yet the GoForward plans of CEE and CIS governments are to build knowledge based sectors like IT, bio & nanotech, etc., but not tech investment for domestic needs in auto components, oil field services and mineral extraction/processing; sectors with immediate payoffs to catalyze a chain reaction in domestic tech absorption (**text box, page 11: What's the Role of Governments in Tech Creation?**).

Israel is a powerhouse of GameChanging technologies for global markets. What are less known are its innovations for Israeli citizens, e.g., solutions for clean and pure water. Israel could have had a water shortage as its population surged from less than one million in 1948 to more than seven million in 2006.[8] But it didn't due to actions of government planners.

To provide the fresh water needed for life, the Israeli Government sponsored R&D in low pressure irrigation systems (for agriculture), rain harvesting, wastewater treatment and desalination. The private sector built on these foundations to innovate water security/management, on-site biological treatment of solid waste, medical waste and biologically contaminated materials to name a few. While the focus was on domestic demand, pure water needs from global customers stimulated an Israeli export sector for clean water tech that exceeds $800 million/year.

With a proposed new government investment of $160 million over the next five years, Israeli firms are projected to increase exports of clean water tech to $2 billion by 2010, $5 billion by 2015 and $10 billion by 2020 in a world water market estimated at $400 billion a year with growth of 7%/year.[9] With citizens of Planet Earth forecasted to have a 35% water shortfall over the next 15 years, luck (opportunity + preparation) and timing again work to the favor of Israeli SMEs and their VC investors.

Other development approaches are possible to build tech sectors for domestic needs, when single technology hubs are less obvious, e.g., in logistics, where multiple technologies intersect. Latvia sits on the Baltic Sea with new technologies required in IT, warehousing and transportation to grow a nascent logistics platform into a regional distribution powerhouse.

7 'A Lot of Car Plants but not Enough Parts,' by Anna Smolchenko, Moscow Times, 30 March 2007, page 1

8 'Innovations in Water Solutions: Where Israeli Companies are Making Waves,' Israeli Venture Capital Journal, May 2007

9 Ibid, Israeli Venture Capital Journal

Russian and international corporations are establishing back office administrative centers in Siberia, Budapest, Tallinn and other cities to escape high cost Moscow thereby stimulating new clusters and VC investment opportunities. The city of Kirov, a small Russian regional city 1,200 kilometers from Moscow is funding bio-clusters to manufacture creams, lotions and emollients used in the domestic production of everyday cosmetics.

Action Item #2: Provide 'Mini Grants' to Document Business Opportunities

Once domestic tech hubs are identified, fund a 'mini-grant' program to define the business opportunity for technologies. A mini-grant of $3,000-$10,000 is not intended to fund an entire business plan, but a 3-4 page document detailing the technology's potential.

Action Item #3: Capitalize a 'Proof of Concept' Fund

Commercialization of new technology starts with R&D and product development to demonstrate 'proof of concept' and the performance of novel ideas. SMEs can sell only when they present technology strengths (and weaknesses) to customers, conducted to a comprehensive analysis under different user conditions.

A 'proof of concept' fund finances the testing of a technology and benchmarking it to direct competitors and alternatives. To invest capital wisely, mandate that developers benchmark technology early and often.

Action Item #4: Inventory SME/Institute Technologies and Publish as a Database

Publish information that customers and investors need to consider technology from your country as an Internet database searchable by keywords like technology or market:

1. SMEs/institutes organized by technology, product and market segment, with full contact information
2. Benefits of the technology, cost and performance benchmarked to domestic and international competitors with data generated to international testing standards
3. Stage of development, i.e., R&D, product development, alpha/beta testing, ready-to-go, etc
4. Plan with timetable and milestone inflection points, line item budgets
5. Patents issued or filed, by country, date, number and competing technologies similar in form or function

Action Item #5: Establish an IP Facility to Protect Your Country's Intellectual Assets

The IP Facility pays legal costs of filing domestic or international patents with costs reimbursed through royalties generated from sales. Such repayments replenish the Facility so it becomes a revolving fund with a one-time investment.

Action Item #6: Offer Targeted Business Development Support

Innovations too often sit on the shelf since scientists lack the knowledge to make the business case for the technology, the energy and drive to move them into the market. Many scientists and (some) SMEs lack the skills to transition from R&D to commercialization.

To overcome this problem, establish a business development office which 'scouts' for opportunities in SMEs and academia. This office develops projects for financing by the 'mini-grant' and 'proof of concept' initiatives, and helps sell innovations from academia/SMEs to customers.

One responsibility of the business development office is to identify IP early and assist legal council to protect it. Researchers and businessmen are rightfully proud when they create new innovations. Yet they sometimes announce their solutions prematurely before protecting them and inadvertently weaken their legal rights. Business developers must educate scientists and SME management to IP, what can and can't be said in public.

Action Item #7: Organize R&D & Supply Chain Competitions for Users of Technology

R&D competitions are used in combination with VC forums or a substitute when deal flow is too scarce to attract VC investors. R&D competitions present technology, to generate interaction between tech developers and the R&D staff from corporations. R&D competitions are organized in areas like nanotechnology, alternative energy, greentech, engineered materials, biotechnology, hydrocarbon E&P and so on. The audience is corporations and corporate venture capitalists, not financial VC investors.

Attracting large corporations to R&D competitions 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 your country to another, to help developers identify strengths and weaknesses of their technology to global competitors. Others (**text box, page 12: Integrating Multinationals into the Innovation Ecosystem**) 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:

1. Be the technology platform that helps SMEs model and scale their solutions in advance of customer demands
2. Reduce development time and get to market quickly
3. Lower investment risk and help SMEs secure funding
4. Jump-start sales
5. Expand the market reach of SMEs by integrating them into corporate & international business ecosystems.[10]

10 Blog, Dan'l Lewin, 'The Magic of Start-ups: How One Thing Leads to Another,' (http://alwayson.goingon.com/permalink/post/6908).

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

They take technology risks by investing in R&D and IP with right-of-use, to accelerate tech diffusion to markets and customers. Corporate VCs provide access to R&D budgets for tech funding at their earliest stage, before financial VCs are able or willing to invest.

Corporations help SMEs apply their technology to customer needs. As Esther Dyson, an investor in Russian and Eastern European startups remarked: "One thing that the 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."

Concluding Remarks

Strange as it may seem, New Zealand is a fitting model of success. While it is not a developing country, it is small and remote from global demand. Its transition strategy from low-to-high tech is illustrative of how a domestic focus created technology SME industries.

In the mid 1990s, New Zealand government planners invested in biotech R&D to create more flavorful and different varieties of wine, cows and lamb with more meat and less fat. Their focus was on new solutions for domestic needs in agriculture and animal husbandry, not global biotech where New Zealand had little comparative advantage. Five years later, government initiatives yielded results and VC investors financed the commercialization of SME innovations.

Today New Zealand meat and wine are found in supermarkets and wine shops throughout the world. Their SMEs sell tech products and services to Australian, European, Japanese,

Russian, S. African and US wine producers and animal growers, truly a win-win for all.

Build the deal flow; customers and investors will follow.

What Does VC Invest In?

Money, innovation and hard work are the forces that drive entrepreneurship. Witness the super profits earned by the founders and investors in Skype, the VoIP telephony company that began operations in 2003; eBay acquired the (unprofitable) company in 2005 for $2.5 billion+, an astronomical return on $20 million invested by Skype investors.

Contrary to myth, venture capitalists fund only a fraction of innovation vs. the investments in R&D by governments ($100+ billion) and corporations ($200+ billion). In clean tech in 2006 for example, corporations invested $22 billion in R&D, governments $24 billion, and VC investors just $2 billion worldwide. *(Source: 'Global Spending on Cleantech R&D to Rise,' by Andrew Quong, Red Herring , 31 May 2007 Red Herring)*

The niche for VC exists because of historical practices and inefficiencies in the capital markets. Technology is IP and banks don't lend unless tangible assets exist for collateral; the risks of start-ups require a higher interest rate than what banks can charge due to usury laws, or what SMEs can afford to pay.

Historically an SME needs sales of $10+ million, several years of operating history (best with profits) and a balance sheet of several million dollars to access public markets. In the US for example only 4%-5% of corporations meet those criteria, so new SMEs are squeezed into a high risk, but high financial return niche for a particular type of investor, the venture capitalist.

VCs raise money from pension funds, insurance companies and foundations. VC invests in growing industries; it's more profitable and easier to invest in growth than a slow growth market. While some exceptions do exist (e.g., biotechnology), VC's job is to invest in the right industry, take the market risk and management's ability to execute, not the technology risk.

VC operates to the 2-6-2 rule of success; for every ten investments, two fail with all money lost, six generate a return equal to 1x or 2x of investment, and two are super winners (e.g., Skype) generating financial returns of 10x, 20x or even 100x of investment. The reason for such a low success rate is because so many things can go wrong in the growth of an SME.

Components of Business Success	**Probability of Success**
SME has enough money	80%
Capable management	80%
Product development is successful & to budget	80%
Production to cost, quality & volume targets	80%
Competitors perform as expected	80%
Customers buy at prices forecasted	80%
IP is received	80%
Budgets are achieved	80%
Combined Probability of Business Success	17%

The likelihood of success falls to <10% if just one component falls from 80% to 50%.

Sources: IVI & 'How Venture Capital Works,' by Bob Zider, Harvard Business Review, Nov.-Dec. 1998

Moving Up the Innovation Value Added Chain

Small countries are at a disadvantage to larger ones in creating knowledge based economies. Fewer tech customers results in developers and investors applying their energy, intellect and capital to problems and needs in big markets. Yet within all countries, whether small or big, pockets of opportunities exist for SMEs to move up in the innovation value chain as the following three examples illustrate.

Incremental Improvements

Import substitution is only one aspect to building a supply chain and increasing local content by domestic SMEs. Adding more technology to increase product functionality and user experience is another strategy to build more knowledge based SMEs.

Donnelly Mirrors (DMI, now Donnelly Mirrors Magna) was a small family-held supplier of inside and outside automotive mirrors to the Big Three (Chrysler, Ford & General Motors). With revenues of $10 million, they were in a low tech, low valued segment of the business vs. suppliers of high value power train components (engines, transmissions) and other parts. Moreover DMI was headquartered in Holland, Michigan, out-of-sight, out-of-mind and geographically distant from their customers.

In the 1980s, DMI developed new skills in photo-electronics, glass/plastic fabrication, coatings and plastic molding; engineering embarked on a program to add new product content to mirrors and cost reduce production. Technical staff incorporated interior lighting and informational content to the mirror (through electronic sensors and microprocessor technology) that displays vehicle direction and temperature, both inside the car and on the street.

Not satisfied with just increasing driver convenience, engineering innovated in other directions; electro-chromic glass that keeps exterior mirrors clear from ice, rain, snow and fog, a value-added convenience that improved road safety and security for all. Improvements in small motor performance resulted in exterior mirror assemblies so drivers could move the position of outside mirrors from inside the car.

Over a ten year period these and other innovations led to an increase in sales to over US$300 million for DMI even as US automobile unit sales slid to new lows as Japanese imports captured the hearts and pocketbooks of US consumers.

Entrepreneurial Resourcefulness

Backward thinking as a holdover of the Soviet legacy restricted growth in countries under their influence, even after the fall of the Berlin War, independence of the Baltics and freedom for East Europe. Where some saw only bureaucracy and limited choices, others saw opportunity.

Riga, Latvia based SAF Tehnika was founded in the early 1990s by an engineer frustrated with the six year wait for a telephone line from the local telephone monopoly. Using his engineering talents learned at a former Soviet institute, he invented a microwave link that bypassed the local teleco. He provided dial tone to his neighbors through his innovation and later raised money from them, friends and family to offer his solutions to others.

Go forward fifteen years and SAF Tehnika now sells its telecom equipment in over forty (40) countries with its equity publicly traded on Riga's stock exchange since 2004.

Make Solutions from Problems

New innovations provide a set of benefits for customers and users. Yet all technologies have problems or inconveniences that set the stage for the creation of new SMEs, for new and more innovation.

Dr. Alejandro Zaffaroni, from Montevideo, Uruguay, earned his Ph.D. in biochemistry at the University of Rochester in the US. Writing his dissertation on steroids, he started Syntex in Mexico City near a jungle where the plants grew for the raw material used in steroid production. The company grew rapidly as doctors and patents adopted their drugs for contraceptive and dermatological needs.

Pharmaceuticals at that time were delivered into the bloodstream by either inoculations or pills. While effective, their rapid release caused highs and lows of drug concentration in the bloodstream and steroids were no exception. Turning his attention to the side-effects of steroids, Dr. Zaffaroni developed new solutions to more slowly deliver drugs into the body through skin patches and time release pills. He launched Alza to manufacture and sell these products to market, innovations that spawned new thinking in drug delivery techniques.

What's the Role of Governments in Tech Creation?

While SME managers are responsible for innovation in their enterprises, the establishment of knowledge based economies can't happen without the political will and investment of federal and national governments. Knowledge creation touches on so many of their duties like education, basic and applied R&D, IP, policies in innovation, trade and investment and the enabling environment to name a few. Achieving political consensus on the mission and the funding to execute can be a challenge, so some governments take intermediate, smaller, but achievable steps to move toward more knowledge creation.

In 2005 CzechInvest, the Czech Republic's investment and business development agency and Cadence Design Systems, the US based electronic design house, formed a partnership called ChipInvest at the Brno University of Technology. The center provides engineering talent from the CEE to chip companies worldwide.

ChipInvest is focused on global needs for engineering skills in analog design, which converts temperature, light and sound into the 1s and 0s needed for digital processing. In the 1980's the digital revolution shifted thinking and manpower from analog to digital with analog work relegated to Europe due to its strength in automotive and telecom, main customers for mixed signal designs.

ChipInvest is making use of engineering skills learned under Soviet control, talents in short supply now. Soviet & Warsaw bloc universities emphasized analog skills as they were cut off from the global race to shrink circuits. With limited resources and money, engineers had to find ways to make due with what they had. That skill is in high demand now as cost pressures force work out of W. Europe and make ChipInvest into a microelectronics R&D magnet for global and domestic customers.

Governments have a variety of other tools to stimulate innovation, some within the financial, business and resource wherewithal of the private sector as these two examples illustrate.

Years ago the Israeli Government mandated that all Israeli homes have solar water heaters which resulted in an entire ecosystem of local manufacturers and suppliers. With the rapid adoption of alternative energy in the 21st century, dozens of new Israeli start-ups are leveraging this technical base and innovating in photovoltaic cells, solar power, heating and lighting for global needs.

Estonia is one of the most wired countries in the world, due to the rapid adoption of technology by citizens and proactive support from the Government. Legislators introduced a number of reforms to bring Estonia into the information age, which stimulated innovation and technology development from the private sector.

E-school is an early stage company that sells a software solution that almost all schools in Estonia have adopted. Teachers send grades and attendance records to parents' computer or mobile phone; they receive an SMS if their child is absent from school. As this product takes hold in Estonia, opportunities open for E-school to sell to regional and global markets since their value is validated by Estonian customers and users.

In the case of Israel, its Government legislated to save energy and reduce dependence on foreign hydrocarbons, to increase its security in an insecure region of the world. The Estonia Government acted to speed its integration into the global economy after decades of being a closed society under Soviet domination.

Initiatives of both Governments set the stage for knowledge creation by the private sector; new SMEs formed to satisfy market needs, more innovation and creativity with positive effects far beyond their original missions.

Integrating Multinationals into the Innovation Ecosystem

The CEE and CIS technology markets have not participated fully in the growth of their economies, driven by domestic consumer demand and a global hunger for natural resources. A few developers responded to market needs with new technologies in IT, but most others face extinction as a relic of their Soviet past.

This split stage of development shows itself in many OEM (original equipment manufacturers) industries & supplier segments in medical, chemicals, materials, automotive, energy, and machine tools as examples. In the oil industry for example, most Russian oil E&P technologies are old solutions developed under Soviet practices vs. international practices. These older and mature technologies offer little value-added when compared to the best from the West.

This duality in activity – obsolete vs. innovative technologies – is explainable. Many institutes and enterprises were focused on the Soviet defense sector, while others worked in closed Soviet markets.

Such isolation shut them off from technology developments in other countries. Denied the opportunity to learn from the successes of global players, East European and Russian application engineering, research and development lagged vs. innovation from the West and Asia. This situation is slowly improving as more SMEs integrate themselves into supply chains of international companies and as institutes compete for R&D contracts against Western and Asian universities.

Untapped potential exists in the CEE and CIS. So how might a multinational, a Western tech SME or an investor do business in these regions? Let me make two suggestions.

Mix and match domestic and foreign technology to create new business models—Western companies frequently learn that their solutions are better but too expensive when they sell to CEE and CIS buyers for domestic applications. Consequently their products are confined to niche applications with limited revenue potential.

To reduce cost, integrate domestic technology with complementary technology and people skills from the West. For the measurement of pressure and temperature in oil wells, the price of a distributed pressure/temperature system from a UK based VC financed SME was reduced 20% with a Russian SME innovation in fiber optics. This cost reduction expanded sales to oil companies operating in the CIS and abroad.

Linking these two companies generated other benefits. It accelerated commercialization for the Russian counterpart since it lacks the international sales, distribution and service networks of the foreign SME. This supply chain partnership builds their international reputation and demonstrates their dependability as the prelude to selling direct to end users in oil producing regions of the Middle East and North Africa.

Yes, invest capital but also provide Western system skills to domestic counterparties—CEE and CIS institutes and SMEs need customer direction such as:

1. Guidance in design and development, to focus developers and SMEs to customer requirements in product performance, quality and cost targets
2. Project management skills
3. Testing and technical service/support
4. Business development, marketing and sales

Most technologies have specific applications where they perform best and create the most value for customers. East Europeans and Russians need to better know the range of user characteristics, etc., to realize the value of their technology and to pinpoint its best applications.