

Subtheme S2.1: Transferability of Innovation Models and Systems

Key Words: cultural bridges, Poland, entrepreneurship, democracy

Title: Successfully Transferring Silicon Valley Innovation Approaches the Polish Way – “*Krok po Kroku*” (Step-by-Step)

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Introduction

Officials from around the world regularly visit Silicon Valley, California and seek the magic formula for doing the same in their countries, but have little success. Too often, these attempts are based on “Silicon Valley” (whether the one in California or similarly successful approaches elsewhere) being viewed as “a place” to be constructed or “a set of conditions” to be copied and decreed – by government fiat of the given country. Poland too seeks the magic of Silicon Valley, but its quest started from different premises and is driven by different forces.

Over the past 20 years, Poland’s ad hoc approach has led to progress “*krok po kroku*,” or step-by-step, by the activities of numerous individuals driving academia, government and industry in stimulating Polish intellectual capital and commercializing it through models innovatively adapted from Silicon Valley. Perhaps, the combined force of these individual actors could be seen, in the case of Poland, as a “fourth” critical component to the success of Triple Helix relationships. This could have possible application to other countries of Central and Eastern Europe and regions similarly-situated seeking to create their own “Silicon Valley mindsets.”

In 1989, Poland began its vast transformation to replace command economy structures with the institutional infrastructure needed to support a free market economy. To survive under Soviet Communism, Poles had to be entrepreneurial, and that spirit ignited the rebuilding of the Polish economy and society since 1989. The combined explosion of democracy and free market economy led to the drive for a more entrepreneurial society. Innovative initiatives from abroad, like the Polish-American Enterprise Fund (PAEF), conceived with U.S. public money to jump-start private sector businesses through equity and debt financing, were deployed by leading American investment professionals. In the process, they and their teams of Polish-Americans and indigenous Poles built Poland’s private equity industry and the ecosystem to support it. That, in turn, formed the foundation for Poland’s now growing high-tech Venture Capital industry.

Poland and countries of the entire former Communist Bloc had a critical foundation in highly respected universities with long traditions in science, engineering, medicine and other technologies. They were spewing out graduates seeking to capitalize, in light of the growth they witnessed of Western technology firms, on the opportunities of the emergent Polish market economy. New institutions followed, like the US-Polish Trade Council (USPTC),⁴ to assist Poland and these new Polish scientists, engineers and entrepreneurs in a better understanding of the workings of successful Silicon Valley models and best practices for creating similar such successful opportunities for innovation under conditions in the Polish environment. USPTC was established by individual Polish, Polish-American and American professionals working in Silicon Valley, who recognized that Silicon Valley was a “mindset” stemming from the entrepreneurial individuals who worked there – in great universities, in incubators, in management of individual tech firms, in the Venture Capital firms that funded innovation and in the enablers in the

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⁴ <http://www.usptc.org>

supporting ecosystem of lawyers, accountants and other specialists, facilitated by governmental institutions supporting R&D and a conducive system of laws and regulations.

After thousands of e-mails, dozens of conferences, workshops, seminars, and lectures in Silicon Valley and in Poland for leaders in the Polish Government and in academia, and among scientists, engineers, entrepreneurs and management of major US technology firms, there has been substantial progress. Thus, the impact of this extensive “cross-fertilization” effort driven by many individual actors in Silicon Valley and in Poland can now be assessed in terms of progress, thus far, in creating a similar “Silicon Valley mindset” in Poland.

However, despite progress, gaps do remain, but after all, creating a Polish Silicon Valley is “a step-by-step” process. For example, recently the Intellectual Property Management Institute of Poland (IPMI) was established. However, with the difference between the entitlement society of academic institutions and the consumer market-driven commercial entrepreneurs, substantial lack of communication between Polish academia and small Polish companies emerging since the early 1990s has persisted. Considering the almost opposite approach and expectations of the research/science and business communities towards fundamental work issues, underscores that in many respects, the thinking of these two very different cultures needs to be accommodated.

And other institutions have also been formed to bridge that academia-outside world gap, such as regional incubators, Innovativeness Contact Centers, and University Technology Transfer Offices in an effort like IPMI's^{5,6,7} to show both communities the mutual benefits of their joint efforts, and to teach the art of effective communications, which is critical for cooperative success. This process clearly has not been completed yet; in fact, there is still much to be done. But these new Polish institutions cooperating with entrepreneur- and scientist-visionaries have been showing evidence of outstanding creativity in introducing a “Silicon Valley mindset” within their respective environments. The results are astonishing, for example, when Gdańsk University of Technology's ICT Cluster becomes a key contributor of value to regional policy on the knowledge-based economy, when its fresh alumni form successful start-ups, and when leading Silicon Valley MNCs build their R&D centers and cooperative (not to be confused with outsourcing) relationships with intellectual clusters around Gdańsk, Kraków, Wrocław, and Poznań – major intellectual hubs of Poland.

Progress on all fronts continues. To fill the “equity gap” for SME emergent technology firms, the Polish Government replicated the concept behind the PAEF by creating *Krajowy Fundusz Kapitałowy* (KFK – the Polish National Capital Fund)⁸ now a ~\$300 million fund-of-funds, capitalized with public-sourced money but managed by private sector investment professionals capitalizing new high-tech VC funds to finance innovative SMEs in Poland. Leaders in USPTC are involved in advising KFK and have contributed to spawning other complementary new institutions in Poland to fill other gaps in creating a Polish “Silicon Valley mindset.” These include routine collaboration with, for example, Poland's Intellectual Property Management Institute, comprised of a consortium of leading universities (with direct active involvement of their Rectors) and business associations working together to establish an effective IP rights regime for Poland – this is likewise helping to bring academia and business views into sync. Similar engagement has contributed to the thinking and processes of the Polish National Center for Research and Development, which seeks to rationalize R&D spending and improve the potential for commercialization; as well as with senior Polish officials including the President and several prime ministers as well as the ministers active in promoting science and technology, innovation, education and economic growth.

These disparate individual and institutional efforts come full circle back to Silicon Valley with active involvement of the Poles and their American counterparts in assuring Poland's participation in the annual Global Technology Symposium in Silicon Valley,⁹ which brings together tech entrepreneurs, primarily from Central and Eastern Europe but also from BRIC and Africa countries, with Venture Capitalists and

⁵ IP MANAGEMENT – Zarządzanie własnością intelektualną, edited by Bogusław Węgliński, ISBN 978-83-931-897-79, IP Management Poland, Warszawa-Józefowo 2010

⁶ IP Law – Ochrona prawna własności intelektualnej, edited by Bogusław Węgliński, ISBN 978-83-931-897-62, IP Management Poland, Warszawa-Józefowo 2011

⁷ Pol-Nord Bridge – no borders for innovation, , edited by Bogusław Węgliński, ISBN 978-83-931-897-86, IP Management Poland, Warszawa 2011

⁸ See www.kfk.org.pl

⁹ <http://www.globaltechsymposium.com>

other technology leaders in Silicon Valley and global markets, as well as through other forums, seminars and conferences in Poland and locations around the world.

While the definition of what is Silicon Valley is not sufficiently formalized to prepare a programmatic approach of universal applicability, many countries and regions are trying to implement their own understanding of how to get to the desired end-result – i.e., to become a leader in innovativeness, technological savvy, and the business of implementation/commercialization of science and new technologies. Poland has been taking an approach which is not driven by “top-down” policy decisions, but has been evolving from the “bottom-up” and driven largely by individuals acting in a free market of ideas. This is what primarily has been contributing to the development of an operative Polish “Silicon Valley mindset” and the attendant ecosystem to support that vision.

While individual initiatives have contributed to stimulating a “Silicon Valley mindset” in Poland, the success of those efforts still requires the support of a democratic government (which too must be prepared to be innovative!) as well as the rule of law and a respect for intellectual property. Poland has made a great deal of progress in all these areas, and the economic success of Poland as a result of the new mindset is part of the tangible results that will be presented in the paper. Should there have been different approaches tried? Should the exchanges, workshops, conferences, seminars, official delegations, etc., be structured somewhat differently to be more effective in bringing Poland closer to being the successful home for a “Silicon Valley mindset?” The authors will present their active, hands-on experiences contributing to this process over a 20-year period, and candidly present their analysis of the above and other questions.

1. Poland’s Historical Foundation for Innovation and Entrepreneurism

With a population of nearly 40 million and GDP of approximately \$721 billion in 2010,¹⁰ Poland is clearly one of the largest and most dynamic economies in Europe and ranks among the top 25¹¹ economies globally. The vitality of Poland’s transformation from an oppressed Soviet satellite State dominated by the Communist Party and operating as a command economy in 1989 to a pluralistic democracy with a free market economy today is indeed impressive. This success is illustrated by the fact that Poland was the only country in Europe to achieve positive growth rates (ca. 1.5%) in 2009,¹² and is back to 4% annual GDP growth in 2011.¹³ Astonishingly in 2010, Poland made an unprecedented transfer of political power in the wake of the April 10, 2010 plane crash in Smolensk, Russia killing all the 97 persons aboard: Polish President Lech Kaczyński and his wife, his staff and the leadership of his Party as well as the heads of Polish military services, and many political and intellectual personalities of the country.

The rise of the Solidarity trade union and continuous Polish resistance to Soviet domination was a critical catalyst in the 1989 collapse of Central and Eastern Europe’s (CEE) Communist regimes and centrally-planned economies. Since then, there have been numerous changes in government, but the Polish economy has registered impressive growth from 1992 to the present, as illustrated by Figure 1 and the above discussion of the current GDP growth.

Following the first free elections in the CEE region in 1989, the new Polish Government’s “Shock Therapy” program conceived by Finance Minister Leszek Balcerowicz practically overnight created the foundation for Poland’s vibrant market economy. By 1992, Poland became the first country in the former Communist Bloc of the CEE to achieve positive growth rates, and thereafter was for a time Europe’s fastest growing economy. The next year, the Warsaw Stock Exchange’s astounding 700% growth precipitated a “wake-up call” to both strategic and financial investors. The 1996-2010 average GDP growth in Poland was 4% with a peak of 7.1% in 2007.¹⁴

¹⁰ <https://www.cia.gov/library/publications/the-world-factbook/geos/pl.html>, \$721 bln. by Purchasing Power Parity count or \$468 bln. by official exchange rate

¹¹ Ibid

¹² Ibid

¹³ <http://www.tradingeconomics.com/poland/gdp-growth-annual>

¹⁴ http://www.paiz.gov.pl/poland_in_figures

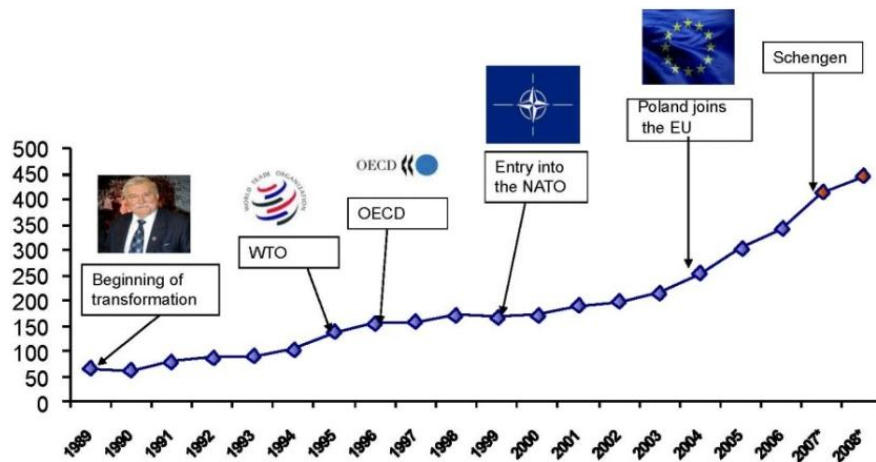


Figure 1. History of Stable and Fast Growth in Poland's GDP (in bln USD) from 1989 "Round Table Talks" on political transition in Poland to the 2008 global financial crisis.¹⁵

Since 1989, Poland has been a leader in attracting foreign direct investment (FDI) among the countries of the CEE region,¹⁶ reaching a cumulative FDI of approximately 130 bln. Euro between 1994-2010 (Figure 2).

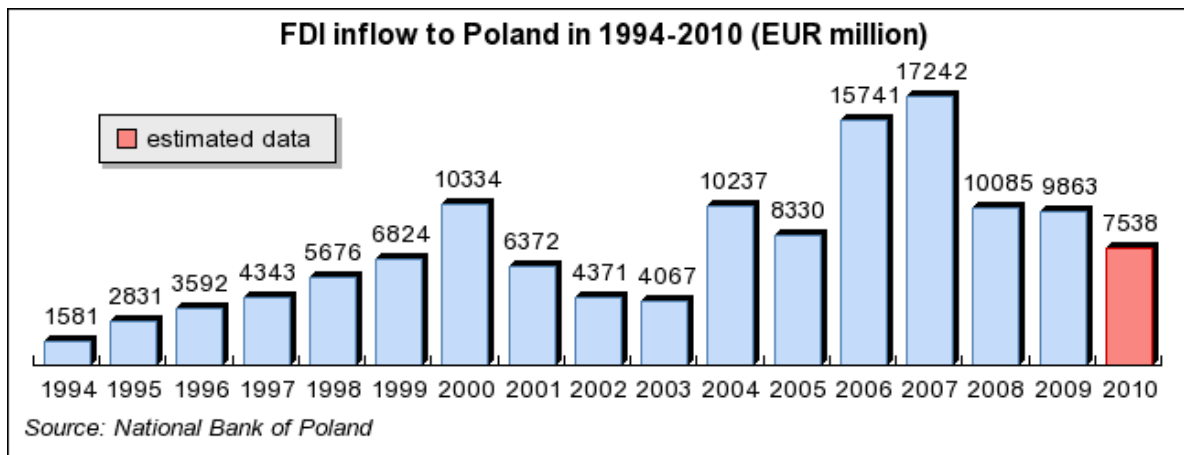


Figure 2. Foreign Direct Investment in Poland 1994-2010.

The rich investment opportunities generally present in the Polish market have been obvious to many leading industrial and financial services firms. In addition to substantial strategic investment from major international corporations (in 2009, over 800 companies with US capital were operating in Poland¹⁷), Poland has also attracted foreign investment specifically in R&D. Among the most prominent among the major foreign technology firms conducting their R&D in Poland are Intel Corporation's software and hardware research center in Gdańsk focused on communications technology for networking products,¹⁸ Alcatel-Lucent's research and development center in Bydgoszcz,¹⁹ Motorola's software development

¹⁵International Monetary Fund, World Economic Outlook Database, Oct 2007

¹⁶http://www.paiz.gov.pl/poland_in_figures/foreign_direct_investment

¹⁷ Ibid

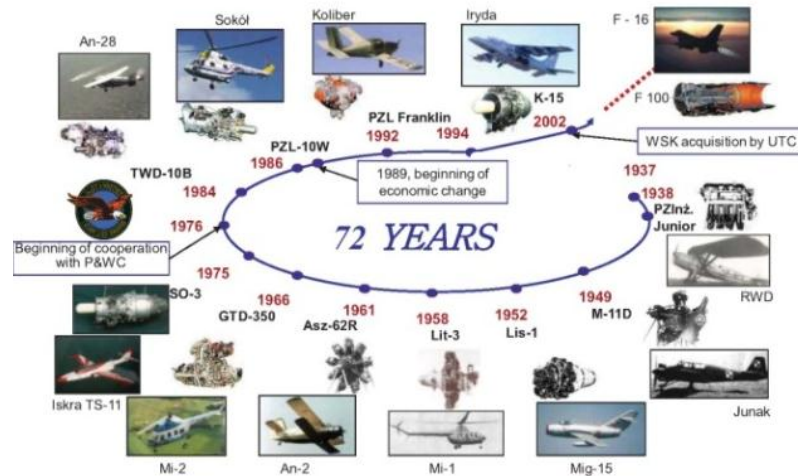
¹⁸ <http://www.intel.com/jobs/poland/sites/gdansk.htm>

¹⁹ <http://www.alcatel-lucent.com>

http://www.alcatel-lucent.com/wps/portal/country?LMSG_CABINET=Corporate&LMSG_CONTENT_FILE=Country_Content/Poland/Country.xml&lu_lang_code=pl_PL#

center with more than 800 engineers in Kraków conducting R&D for remote devices, telecommunication systems, communication systems for public safety and internet,²⁰ Nokia Siemens Networks employing 1600 in its Wrocław Technology Center,²¹ and Delphi Automotive at its Kraków Technical Center for research in vehicle suspension and developing software for electronic systems.²² ABB, Beijing West Industries, Samsung R, LG Electronics, CapGemini, Oracle, IBM, American Management System, etc., also conduct their own R&D in Poland.²³ Others are subcontracting with Polish firms for R&D.

One of the most notable impacts from association with US industry can be observed in the so-called “Aviation Valley,” for years a depressed region in the East-South corner of Poland, which before WWII was the center of a booming Polish aviation industry, which was suppressed and abandoned for political reasons during the Soviet dominance era, but rejuvenated through dynamic cooperation with US aviation companies. The process is illustrated in Figure 3.



WSK strategy

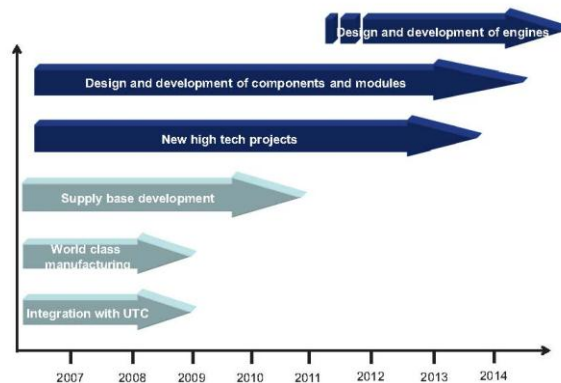


Figure 3. The history and evolution of Polish Aviation Valley, and its leading company, WSK Rzeszów, upon integration with UTC, a US corporation.²⁴

²⁰ http://www.diversity.pl/index.php?option=com_content&task=view&id=18&Itemid=72&lang=en

²¹ <http://www.nokiasiemensnetworks.com/about-us/careers/local-recruitment/recruitment-in-poland>

²² http://www.paiz.gov.pl/nawosci/?id_news=219

²³ <http://en.poland.gov.pl/R&D,centre,7475.html>

²⁴ Darecki, Marek, President of Pratt & Whitney Poland, “The change, Polish modernization, role of leadership,” Rzeszów, Poland, June 2010

Poland, like most other countries of the former Soviet Bloc, offers a solid foundation for new technology development as a consequence of its especially long traditions in mathematics, sciences and engineering and an extensive system of higher education. Yet, there appear to be significant qualitative differences in Polish technology investment opportunities that stem from the country's history of scientific research and discovery and the size and composition of its economy.

Clearly, Poland's historical antecedents have a significant influence on the opportunities it offers today for technology investment. Among these are Nicolas Copernicus who "stopped the Sun" with his heliocentric view of the Solar System, the astronomer Hevelius with his 16th Century moon mapping, 18th Century pioneering work by Poles on probability theory, and demonstration of the first arithmetic calculating machine, prepared Poland for modern scientific and technology research – e.g., Maria Curie-Skłodowska with her two Nobel prizes for pioneering work in radioactivity; Tadeusz Sendzimir with his impact on modern steel treatment around the world; discovery of the first hormone, adrenalin; identification of the relationship between red blood cell decline and health; new kinds of matter and structures of atomic nuclei; "Polish Notation" and "new triple logic" in mathematics; liquefaction of nitrogen and oxygen; initiating fusion in the Hydrogen Bomb; and the "Monte-Carlo Method," widely used in formulating mathematical software. The role of Polish mathematicians in breaking Germany's Enigma encryption codes prior to WWII is well known.

Thus, with these few examples one can see why so many international high technology and scientific research firms are developing their contacts with Poland today. One could indeed think Poland is about to become an extension of Silicon Valley. As discussed in this paper though, the process is complex and requires much more than smart, well-educated people, who enthusiastically embrace technology and the free market economy. National innovativeness is an amorphous dream of most countries in today's world; Poland is no exception.

When one considers the range of Polish scientific and technology achievements, it is clear that Poland has been strong in "basic research," with special proclivity in mathematics, physics, chemistry and medicine, but Polish innovators have been less active historically in the commercial application of their R&D. To an extent, this remains true today, but is changing as a result of the "step-by-step" efforts to reform the practices of university and research institutes and introduce the concept of end-game consideration in any applied research. To instigate that change, new institutions have been formed – e.g., the Intellectual Property Management Institute of Poland, with the significant impact of Stanford University on its initiation; Krajowy Fundusz Kapitałowy (KFK), the \$300 million fund-of-funds created to finance new VC funds investing in innovative SMEs, providing a catalytic impact on venture capital being pumped into the Polish economy; an expanding network of university and regional science and technology incubators supporting small innovator-entrepreneurs; national information centers providing a vastly improved access to information and markets, to mention a few. The strict acceptance of intellectual property ownership and rights is one of the attractive parts of today's Polish investment environment.

This brief historical background and overview of the Polish marketplace provides fundamental perspective on Polish achievements in creating a "Silicon Valley mindset" and ecosystem for innovation and new technology development. As such, it serves as a basis for understanding the approach being taken in Poland – and the technology opportunities Poland holds in qualitative terms as a result – as well as for exploring how other similarly-situated countries could benefit from the Polish experience.

2. Conditions Ripe for Innovation in Poland

Poland and the countries of the CEE region are at different stages of development and offer varying opportunities for the creation of new and innovative technologies as well as for the introduction of proven technologies that can be enhanced. While quantity and quality will vary from country-to-country, the CEE region generally and Poland specifically offers good potential in innovation and development of new technology businesses for the following reasons:

- **Strong Educational Traditions:** Poland offers substantial strength in new technologies as a result of its strong educational tradition in mathematics, natural sciences and engineering.
- **Legacy of Soviet Emphasis on Science:** The Soviet system concentrated resources in technology development spawning a cadre of highly skilled and innovative technology professionals, who because of COCOM restrictions, were forced to "think out of the box." Strong

indigenous capabilities remain in most such countries; however, Poland has had to build capabilities that the Soviet Union denied the country out latent distrust of the Poles.

- **New Influences Stemming from Market Economy:** The advent of a vibrant market economy in Poland provides a climate conducive to development of new technologies with commercial application for a global marketplace. Market demand helps Polish innovator-entrepreneurs more easily envision applications, and creativity is stimulated by travel, access to new ideas, and the ability to observe demand on a broader scale.
- **Replication of Conditions Similar to Post-Cold War Silicon Valley:** Dislocations caused by vast economic transformation forced many technology professionals in Poland to build their own technology-based businesses, rather than seek what were previously cushy and secure positions in State-owned enterprises and institutes. This is not unlike the downturn in the US defense and space industry at the end of the Cold War, which helped spawn entrepreneurship among Silicon Valley's many highly-skilled technical professionals.²⁵
- **Convergence with European Union:** EU enlargement has brought enhanced potential for Polish technology firms both in terms of external markets and consolidation with larger firms, as well as improved opportunities for inward introduction of proven technologies to Poland, and thence, across the CEE region. And Poland serves as "stepping-stone" linking less-developed markets in the region with those in the West.
- **High Global Interest and High Leverage:** Given development costs in more advanced economies, there is consistent interest among Western firms in real, cutting-edge technologies that offer value, efficiencies and long-term growth potential.

3. "Krok po Kroku" – Step-by-Step Approach to Establishing Silicon Valley Models for Innovation in Poland: The "Building Blocks" in Poland

Since Poland's transformation began, a variety of actors among policy-makers, public and private institutions, government officials, academic institutes, scientists, researchers, entrepreneurs, investors, non-governmental organizations like the Silicon Valley-based US-Polish Trade Council and a host of others acting independently and in concert through a variety of exchanges and support have helped shape the landscape in Poland incrementally fomenting fundamental ingredients for a "Silicon Valley" ecosystem. While there is much to be done, Poland is increasingly in position to capitalize on its potential in developing and commercializing new technologies.

3.1. Encouraging Innovation in Polish Universities and Educational System

It is clear that Poland has had a critical foundation in highly-respected universities with long traditions in science, engineering, medicine, and technologies. However, while well-educated in their professional field, Polish graduates have been receiving very little, if any, practical preparation in innovatively applying their skills and knowledge towards economic success. It became clear that institution of fundamental reforms in the educational system were needed. Poland's academic and political leaders understood the challenge nearly from the beginning, but striking the proper balance in radical reform and cultural evolution has been elusive – that process is ongoing.

The free market economy of post-1989 Poland has moved the country in a rapid swing from one based on production and products to one based on knowledge, services and capital. The message to aspiring young people was clear – professional success, job security, societal status are all linked to academic education. The number of students in Polish institutions of higher learning has followed the trend and tripled the number of such institutions. Quantity did not always mean quality, as a new, previously unknown industry in Poland has sprouted – private colleges, universities, institutes focused primarily on one goal: selling the knowledge of their staff educators to academic diploma hungry young people. Of course, many notable exceptions could be cited of schools where quality of education and its value to the student and society remains paramount. Today, Poland has 132 public institutions of academic learning: and over 300 private colleges and institutions of higher education²⁶ have been formed throughout the

²⁵ As large multinational and local corporations focus their R&D on the core fields of their business during economic downturn, entrepreneurial opportunities for spin-offs of peripheral R&D can arise

²⁶ <http://www.nauka.gov.pl/szkolnictwo-wyzsze/dane-statystyczne-o-szkolnictwie-wyzszym/>

country. The problem of finding qualified educators for those institutions created a new phenomenon of the “multi-university professor” – creating yet another challenge for accrediting authorities.

With the “westernization” of the Polish economy also came demographic changes in fewer children per couple and young people starting families latter; thus, the initially overcrowded public and new private universities are now being forced to compete for top quality students, and many of them, simply for students. The graphs below clearly illustrate this process of increased demand for higher education in Poland.

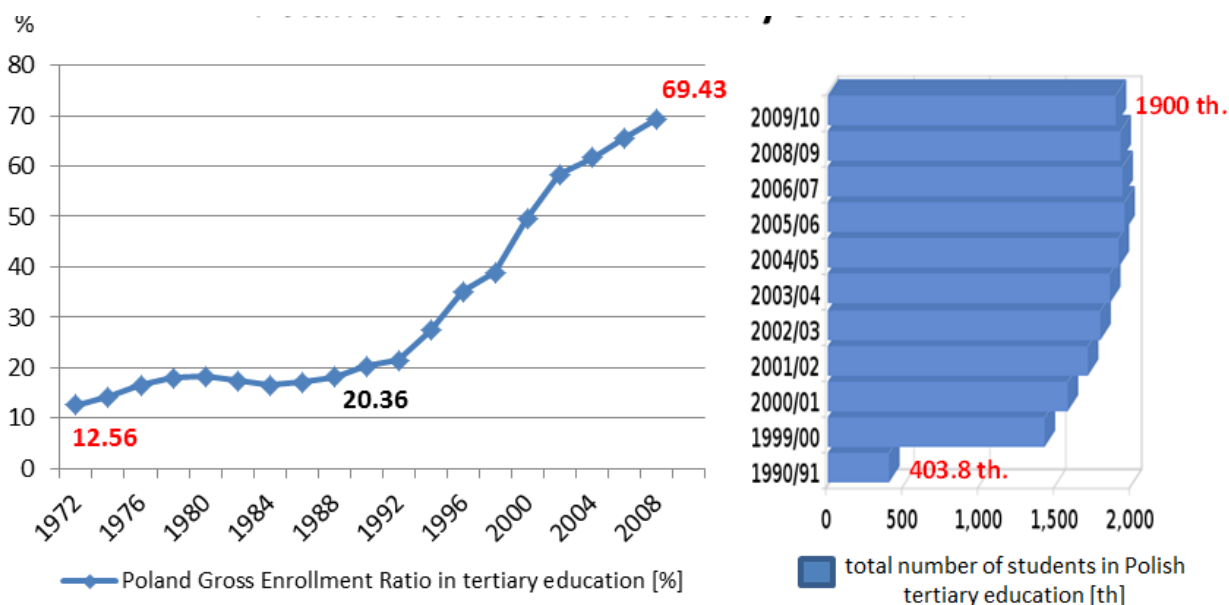


Figure 4. Ratio of enrollment within 5-years after high school graduation and total number of students.²⁷

The sharp increase in the gross enrollment ratio for tertiary education in Poland after 1990 from a stable 20% to nearly 70%, demonstrates the eagerness of young Poles to enhance their competences, and creates a strong foundation for a knowledge-based economy in Poland. Polish universities, however, have for years operated in accordance with the established “Humboldt ideology,” making it difficult to overcome administrative and cultural barriers for beneficial cooperation between academic science and business. To introduce modern approaches characterized by the Triple-Helix concept and epitomized by Stanford University in the heart of Silicon Valley, USPTC has hosted delegations of leading Polish University Rectors and Vice-Rectors, sponsored workshops for Polish professors and deans and attracted similar such academicians groups to participate in the annual Global Technology Symposium. Through this approach, scores of Polish academic leaders were introduced to the important role universities have played in Silicon Valley and the close ties they have developed with local technology businesses.

To stimulate commercialization of academic research, Poland is undertaking reorganization of its higher education system to promote *inter alia* academic science-business cooperation and vertical technology transfer. Accordingly, a package of five laws on higher education reform have been enacted, of which the “Act on Financing Higher Education” in force October 2010 and the “Act on Higher Education” entering into force October 2011, provide the most important changes to the system. The first focuses on distribution of grant support to strategic area projects and the means to engage private business capital in R&D funding.²⁸

The Act on Higher Education encourages advanced degree path increasing financial support for PhD students, placing higher importance on scientific achievements than on fulfilling administrative norms, and

²⁷Source: The World Bank, World dataBank; <http://databank.worldbank.org/ddp/home.do?Step=3&id=4>; (12.06.2011)

²⁸ http://www.bip.nauka.gov.pl/_gAllery/95/07/9507/20100430_ustawa_o_zasadach_finansowania_nauki.pdf

granting beginning researchers with a minimum of 20% of the funding allocated to basic research by the NCN. At the same time, the series of Acts increase autonomy of Polish universities and stimulates closer relationship with industry through joint creation of teaching programs, mandatory implementation of IP protection regulations, formalization of commercialization processes at the universities, compulsory monitoring of graduates' employment, and finally, regulating the practice of multi-university employment by the faculty.²⁹

Facing these changes, many Polish universities are struggling with internal organizational problems. Some have already established technology transfer offices (TTOs), however their commercialization processes are not efficient, and their platforms facilitating communication between the business community and academic science are inadequate. While there is an overall increased awareness of the need for universities to meet their societal responsibilities, insufficient experience in Poland requires they reach out to find best practices abroad. USPTC has helped build Polish relations with Stanford's OTL and University of California Berkeley's (UCB) Office of Intellectual Property and Industry Research Alliances. The Poles are recognizing that the main factors contributing to commercialization of science in Silicon Valley have developed over time, and that these and other successful TTO models cannot be merely copied, develop approaches to be adopted to the needs, conditions and objectives of the Polish environment.

The most important lessons, particularly those from Stanford University (SU) and its OTL, are the emphasis on the importance of technology commercialization as much to the university as to the developers. SU culture is open widely to internal and external entrepreneurs, which use and give priceless advice on creation of start-ups by academic researchers and on results-oriented career planning. To be successful in commercializing academic research, Polish universities must appreciate fully how at SU, academic researchers are expected to generate funding for the University, and in doing so the successful implementation of their research is highly rewarded and personally profitable financially as well. Success in research and its commercialization can become then a core value in university strategy. At Stanford, the Poles are seeing that a large investment in research goes hand-in-hand with support for the university's relations with business through the Stanford Alumni Association, the OTL, and the promotion of and openness to the external environment. Thus through this exercise, Polish universities can appreciate that successful, efficient commercialization processes can be learned from what works in the world's most successful incubator of innovation, and institute their own long-term strategic planning to achieve similar successes.

3.2 Support from Government R&D Centers and Institutes Fueling Research

The Polish system of supporting research by academic institutions of higher education has traditionally been based on an entitlement system controlled by a ministry, an integral part of the government; and hence, an entity by its nature driven by politics. Astute Polish policy-makers recognized that financial support of research in basic and in applied science and technology cannot be dependent on politically-motivated decisions, but must be independently designed to meet Poland's long-term national strategic needs and objectives. Thus, the Polish Parliament approved the separation of academic research and R&D financing from the government by creation of two "foundation-like" institutions: in 2007, the National Center for Research and Development (NCBiR),³⁰ and in 2010, the National Center for Science (NCN).³¹ NCN is dealing with the financing of basic research, while NCBiR allocates national R&D funds among R&D institutions and companies, with obligatory private business participation in the R&D process.

Both Centers have developed investment guidance regarding areas of strategic investment to guide their decision-making. Although NCN has been operating for only a year, and NCBiR is better established after four years of operations, their role in steering funding to the Polish research community is already becoming recognizably strategic. Notwithstanding, the basic question may never be resolved in Poland as to whether investment in basic sciences is more attune to long-term national interests in building a knowledge-based-economy or investment into R&D with faster and possibly higher ROI would be more effective. Nevertheless, taking the initiative to support development of truly "disruptive technologies" is the role of government, as the private sector is unlikely to assume alone the risks of such investment often involving long lead times and a great deal of uncertainty.

²⁹ http://www.premier.gov.pl/dzialania_rzadu/nauka_i_szkolnictwo_wyzsze/

³⁰ http://www.ncbir.pl/www/images/o_centrum/status_prawny_aktualny/20100430_ustawa_o_ncbir.pdf

³¹ <http://www.ncn.gov.pl/download/pdf/ustawy/ustawa%20o%20narodowym%20centrum%20nauki.pdf>

3.3 Technology Parks, Incubators and Multinational Corporate R&D

Polish government policy initiatives and public sector support have spawned numerous technology transfer centers, technology parks and business incubators. Private developers of incubators and technology parks stimulated by availability of EU structural support funds have also been active in this arena. By now there are approximately 735 institutions supporting entrepreneurship and innovation, among which 45 are technology parks, 128 incubators and pre-incubators and 90 private and public technology transfer centers. As shown in Figure 5, Poland's step-by-step process of growth is also apparent: institutions supporting entrepreneurship and innovation have flourished – stimulating and receiving increasing interest of Polish society. In addition to training and advisory centers that developed as a result of post-Communism demand for Western entrepreneurial culture and knowledge, other emerging institutions are being modeled on Western patterns. This continuous effort of increasing awareness has its pay-back by increasing the number of Polish regional leaders creating “Silicon Valleys” in their own vision in their home cities and regions.

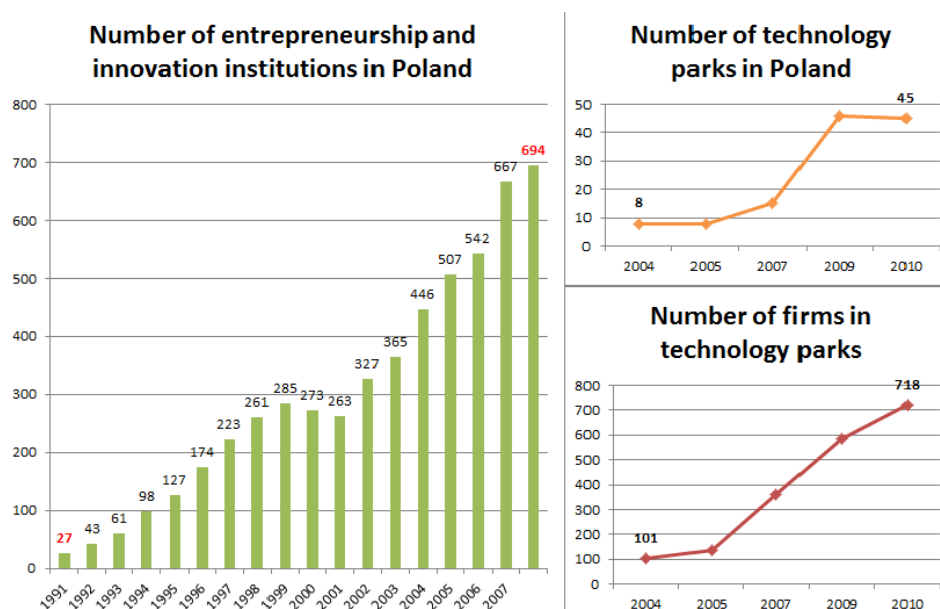


Figure 5. Growth in the number of entrepreneurship and innovation institutions in Poland since 1990.

For many Poles, Stanford University Research Park was the ‘kindergarten’ from which Silicon Valley grew.³² Having that in mind, Poles have been working to develop a more conducive environment for innovative start-ups in their technology parks. Established in 1995, the technology park connected with the Poznań University was Poland’s first.³³ The Wrocław Technology Park and the Pomeranian Technology Park, for example, are two that offer particular potential for development of new technologies with commercial viability. Wrocław Technology Park offers a wide range of training and services, especially in commercialization issues, which has led to high awareness among its innovator-entrepreneurs of IP rights and attendant increase in the number of patents and protected trademarks. Pomeranian Technology Park focuses on internal and external collaboration and promotion – *i.e.*, its Knowledge Center ‘Experiment’ promotes science through entertainment. Both technology parks show outstanding performance on employment ratios and increased interest of beginning entrepreneurs far beyond their apparent capabilities.³⁴ On the other hand, the efforts of others to establish technology parks with their real estate development focus have turned out to be less satisfactory. In these cases, a retrospective review shows what could be done better, and serves as a reminder that Silicon Valley is not a phenomenon that can be merely “copied,” but should be used as an inspiration and a guide.

³² http://www.sooipp.org.pl/pliki/biblioteka/raport_2010.pdf

³³ *Ibid*

³⁴ Benchmarking of technological parks in Poland - Report for 2008, Polish Agency for Enterprise and Development, 2008; <http://www.parp.gov.pl/files/74/81/194/1472.pdf>

One successful example of Silicon Valley inspiration is Euro-Centrum, a technology and industry park in Katowice coordinating cooperation within a Cluster of Energy-Saving Technologies. EuroCentrum executives have regularly participated in the annual Global Technology Symposium and other events in Silicon Valley and hosted leadership of USPTC in Katowice, providing physical facility for USPTC office in Katowice, and hosting a major conference on entrepreneurial innovation in energy technologies, attracting the now-Chairman of the EU Parliament, Jerzy Buzek, and USPTC's Chairman as panelists.

Poland's active participation in the development of energy policy of the European Union is strongly influenced by the insights and vision of EU Parliament Chairman, Jerzy Buzek, who in turn brings deep understanding of EU policies and strategy to Poland through his tireless, active participation in conferences, seminars, and debates in Poland (e.g., European Economy Congress in Katowice, Innovation Conference in Łódź, leadership in the Poland Economy Chamber of Advanced Technologies with its Advanced Technology Symposium in Rzeszów, Intellectual Property Management Institute's (IPMI) International Forum at Warsaw Stock Exchange and a host of others). Such linkages are critical, as in the second half of 2011 Poland will hold the Presidency of the European Union. The key strategic point in the Polish program is energy technologies and energy security of the EU and the innovative products of Polish technology parks, like EuroCentrum, drawing inspiration from and building connections with Silicon Valley will prove instrumental.

The surprising and impressive impact of an individual leader is a well known phenomenon in the Silicon Valley world. In recent years, Poland is experiencing such excitements as well, e.g. the individual young entrepreneur from Gdańsk, who beginning as a student, established an open-source software start-up keeping track on thematic Internet Forums, where the big players were from Silicon Valley. As a result of his creativity, he received an invitation to visit Google's headquarters in California, and now, as a regional coordinator of Tcl/Tk Google Summer of Code (Tcl GSoC), he inspires young people to participate in this mind-expanding event. In 2010, the students of Gdańsk University of Technology were the 10th largest group among all participating universities, and in this way, cooperation with Google is contributing to the creativity and work-ethic of numerous young Poles.

As illustrated in Figure 6, Gdańsk, Warsaw, Łódź, Kraków, Wrocław, Poznań, and Katowice serve as major intellectual hubs of Poland, attracting numerous major technology MNCs to tap Polish intellectual capital, and others are establishing presence in even smaller Polish cities. In fact, there are some 40 significant R&D centers of foreign MNCs, employing several thousand Polish professionals. These companies' business models, work culture, advanced technologies and R&D spending visibly contribute to developing a new Polish perspective of the nation's road to excellence. Thus, the "added-value" of these MNCs goes beyond the tangible impacts to the regional and national economy, and also contributes mightily to the creation of a "Silicon Valley mindset," so sought after by Poland and other countries.

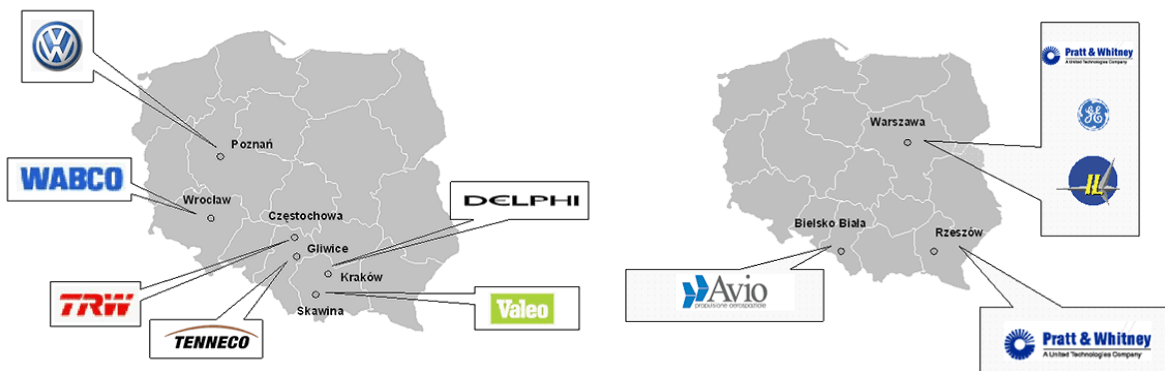
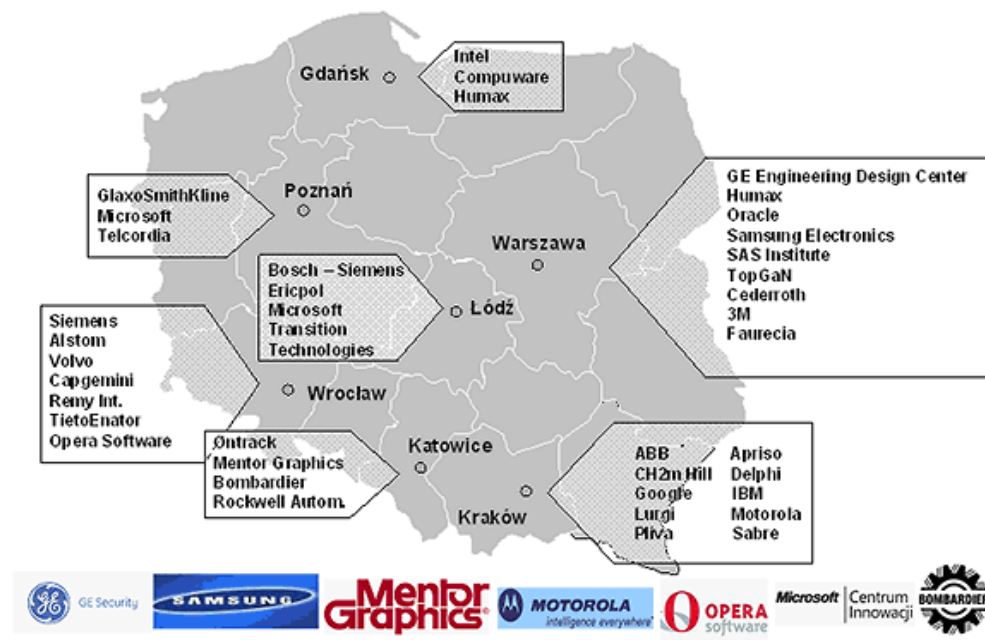


Figure 6. Foreign MNC's R&D Centers in Poland: automotive, aviation and BPO industries.³⁵

3.4 Entrepreneurs Building Businesses

Prior to 1989, Poles had to be entrepreneurial to survive under Soviet Communism, and the failure of the Communists to collectivize Polish agriculture resulted in every small farmer becoming “an entrepreneur.” The combined explosion of democracy and free market economy in 1989 led to the drive for a more entrepreneurial society. Innovative initiatives from abroad added “fuel” to the fire of freedom from the strictures of a command economy, and enthusiasm for the future.

Thus, entrepreneurship in Poland today is pervasive, and a particular source of strength in the Polish economy, which is comprised of a large number of small and medium sized private enterprises. The entrepreneurial preferences of Poles were confirmed in a 23 country survey, which found that more Poles would like to be self-employed (79.9%) than citizens of any other country. Comparative figures were, for example, 70.8% for the United States, 64% for Germany and 49.8% for Hungary.³⁶

Given this entrepreneurial spirit, the commercial perspective that understanding market demand can bring to R&D, and the strong predisposition among Poles for higher education (increasingly again in science and engineering), it is clear that Poland provides fertile ground for the development of new cutting-edge

³⁵ http://www.paiz.gov.pl/sektory/research_and_development

³⁶ “Measuring Latent Entrepreneurship Across Nations,” Blanchflower, D. (Dartmouth College) and Oswald, A. (Warwick University, UK), January 2000, involving 25,000 respondents in 23 countries.

technologies and a large dynamic market for the application of technology-based businesses. However, Poland is situated at the shockingly low 52nd position in the Global Innovation Index 2010.³⁷ Comparatively, the engagement of Polish business in R&D funding is still very low. In fact, the Polish private sectors' contribution is less than 30% of total R&D spending in Poland.³⁸ This percentage has been slowly decreasing over the past 15 years, as it is shown in the graph below. There are a few reasons that Polish companies are hindered in attempting cooperation with the science community, such as financial, legal, and cultural barriers. The current governmental and societal focus on this disturbing phenomenon is promising reversal in that trend.

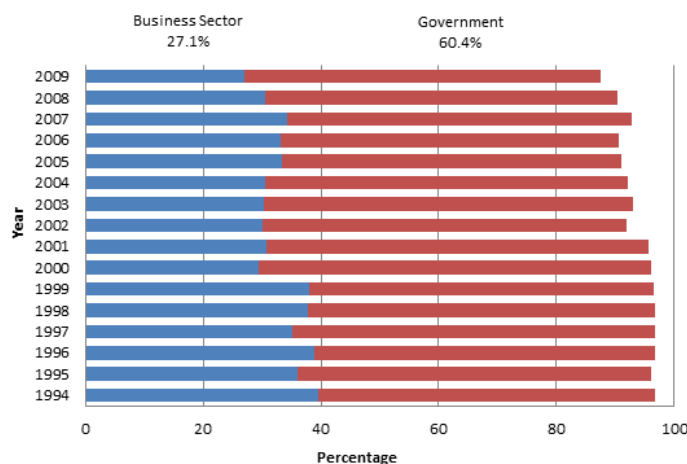


Figure 7. Business and governmental funding of Polish R&D over last 15 years.

The barriers most difficult for Poles to overcome are the lack of experience in cooperation, and the general lack of system-individual trust within Polish society stemming, some say, from the 45 years of Soviet influence. Polish entrepreneurs, who have visited and observed the miracle of Silicon Valley are struck by the highly-valued spirit of cooperation that unites and motivates employees of even competing companies engaged in a joint effort. Attempts to nurture this sort of cooperative spirit is being promoted by many Polish "cluster" initiatives, of which among the most mature and fast growing, as are the Aviation Valley, Pomeranian ICT Cluster, Cluster Nutribiomed and Boiler Cluster.³⁹

Within seven years of starting restructuring and privatization of the Polish aerospace industry, Aviation Valley has become a great success as one of the key European aerospace industrial centers. It was based mainly on the US investment funding (Pratt & Whitney) and considered as the major stimuli for regional development. In contrast, the successful Pomeranian ICT cluster arose from the active involvement of the Gdańsk University of Technology together with dozens of technology companies as a purely Polish grass-roots initiative. The recognition in the Pomeranian region of the need for encouraging cooperation to facilitate innovation and deal with globalization challenges of small and medium sized companies has been attributed by many regional officials and businesspeople to inspiring visits to Silicon Valley, which they considered as "the temple" for information and communication technologies start-ups.

Another effort of Polish individuals aiming to bring home a bit of Silicon Valley has resulted in creating the right "mindset" which in longer-run produces "step-by-step" more tangible results. One of such cultural innovations for the Poles was learning about "networking" that is a part of American business culture. In Poland, networking as we know it in Silicon Valley, emerged only about 5 years ago, and even now, a lack of effective platforms facilitating cooperation can be observed. In fact, there is still no Polish word for networking, which makes such an important contribution to creating a "Silicon Valley mindset"; yet at least, the concept is being grasped in Poland.

³⁷ http://www.globalinnovationindex.org/gii/main/reports/2009-10/FullReport_09-10.pdf

³⁸ http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

³⁹ "Benchmarking of clusters in Poland"; <http://www.pi.gov.pl/PARPFiles/file/PARP>, report by Deloitte Business Consulting S.A. for Polish Agency for Enterprise Development, Warsaw 2010

Operating in a knowledge-based economy clearly is beginning to force many Polish entrepreneurs to reach out to the external sources of innovation and business and development models. Now, they also will need to understand that their fuller involvement in financing and creating their own models for innovation will be needed for long-term success. Establishing relationships and connections in Silicon Valley is a critical step for Polish entrepreneurs seeking to achieve their potential.

3.5 Access to Capital Fueling Innovative Entrepreneurs -- Private Equity, Venture Capital, Fund-of-Funds and Capital Markets

In 1989 when Poland's transformation began, the economy was dominated by State-owned enterprises, and there was essentially no equity investing capability or ecosystem to support it. Innovative initiatives based on investment concepts that contributed to building Silicon Valley were introduced from abroad to fuel the growth of indigenous Polish entrepreneurs. In particular, the Polish-American Enterprise Fund (PAEF) conceived by US President Bush and the US Congress and capitalized with \$240 million in US public money led the way to changing the investment landscape in Poland. Authorized by the SEED Act of 1989,⁴⁰ the PAEF was designed to "jump-start" private sector businesses through equity and debt financing deployed by leading American investment professionals, who understood how to take business risks, and thereby as well, demonstrated the commercial opportunity Poland could offer.

PAEF and its management team, reconstituted as Enterprise Investors (EI), financed tens of thousands of businesses; contributed to building the ecosystem for equity investing and through PAEF's banks and financial intermediary subsidiaries, capabilities in micro and small business lending, from the bottom-up; raised over \$1.7 billion in private capital from institutional investors; and after 10 years of operations, returned the US taxpayers' money to the US Treasury; and created a foundation to continue the work of supporting entrepreneurship in Poland and the CEE region.⁴¹ In the process, PAEF and EI and their teams of Americans, Polish-Americans and indigenous Poles built Poland's private equity industry and the ecosystem to support it. As a result, other competing private equity funds attracted to Polish investment opportunities, now numbering 25⁴² have brought billions more of investment capital to Poland.

Since the Warsaw Stock Exchange (WSE) began operations in 1991, PAEF contributed to its development and vitality, as an anchor investor in a number of early IPOs, and EI continues to make frequent use of the WSE to secure exits. Today, the WSE has ~400 companies listed, and as of April 2011, a capitalization of 220 billion Euros.⁴³ To address the needs of small emergent companies with high growth potential, WSE established the alternative trading and financing platform of NewConnect in 2007. It is designed to provide Poland growing new technology and innovative small companies with a simpler and lower cost access to capital and a public listing.

Today, Poland's capital markets are vibrant, and the Polish private equity industry is strong and well-established, but there has been a gap in financing for small innovative technology companies, and Polish policy-makers recognized the strategic need to focus on building venture capital finance capacity.

During the technology bubble at the turn of the 21st Century, Polish innovator-entrepreneurs sought to emulate the successes they saw in Silicon Valley and Western markets, and a number built successful technology-based companies. Many of these entrepreneurs with their investment proceeds, in turn, have served as "Angel investors" and form the foundation for Poland's now emergent Venture Capital industry. Some Poles as well established investment firms to capitalize on the growth potential in IT and new technologies and continued to expand into substantial fund management companies. WSE-listed MCI Management, for example, established in 1999, now manages a series of specialized private equity and venture capital funds with assets under management in March 2011 of approximately \$250 million. International VC funds recognize the potential in the Polish technology sector and have been seeking to tap it. Intel Capital, for instance, has been active for some years and maintains a regional presence from its office in Poland.

⁴⁰ Support for Eastern European Democracy (SEED) Act of 1989, 101st Congress of the United States, November 1989

⁴¹ Skrobiszewski, Francis, "Rebuilding Haiti's Competitiveness and Private Sector," testimony before the House Financial Services Committee Subcommittee on International Monetary Policy and Trade, March 16, 2010

⁴² <http://www.ppea.org.pl/new/pliki/pdf/pevc2010.pdf>

⁴³ See www.wse.com.pl

Yet, a substantial “equity gap” has existed for small innovator-entrepreneur seeking to build innovative companies at the seed and early-stage levels of development, as until recently, there was little professionally-deployed capital available to such firms. In an effort to fill this need for emergent SME technology firms, the Polish Government innovatively established *Krajowy Fundusz Kapitałowy*⁴⁴ (KFK – the Polish National Capital Fund) as a fund-of-funds, which like PAEF, is initially capitalized with public-sourced money, and is managed by private sector investment professionals. Now, with a ~\$300 million pool of capital from the Polish Government, EU Structural Funds and Swiss capital, KFK is stimulating development of the Polish Venture Capital industry, by capitalizing new funds focused on financing high-tech innovative SMEs in Poland, whose maximum investment size is limited to 1.5 million Euros. KFK has made commitments of approximately \$150 million to 11 funds, 6 of which are operational. Because KFK will not commit more than 50% of total committed capital of a portfolio fund, its capital will leverage at least an equal amount from other sources and in coming years, and capital approaching \$600 million dollars will be available for investment in seed and early-stage innovative SMEs, as a result of KFK’s current funding.

4. The “Invisible Hand” – The Role of “Independent Actors” --

Over the past 20 years, Poland’s ad hoc approach has led to progress “*krok po kroku*” or step-by-step through the activities of numerous individuals driving academia, government and industry in stimulating Polish intellectual capital and commercializing it through models innovatively adapted from Silicon Valley. Perhaps, the combined force of these individual actors could be seen, in the case of Poland, as a “fourth” critical component to the success of Triple Helix relationships. This could have possible application to other countries of Central and Eastern Europe and regions similarly-situated seeking to create their own “Silicon Valley mindsets.”

New institutions emerged, like the US-Polish Trade Council (USPTC), to assist Poland and these new Polish scientists, engineers and entrepreneurs develop a better understanding of the workings of successful Silicon Valley models and what are best practices for creating similar such successful opportunities for innovation under conditions in the Polish environment.

Indeed, a multitude of Polish Diaspora professional organizations have been active in providing Poland with their closer-to-the-international market observations on the emerging strategic directions of R&D in the global economy. In a recent gathering of leaders of Polish engineers in the US, a proposal was made for the formation out of those organizations of a Poland Virtual Think Tank,⁴⁵ and implementation efforts are underway.

These disparate individual and institutional efforts come full circle back to Silicon Valley with active involvement of the Poles and their American counterparts in organizing Polish participation in the annual Global Technology Symposium of Silicon Valley, which brings together tech entrepreneurs from CEE, BRIC countries, and most recently also Africa, with Venture Capitalists and other technology leaders of Silicon Valley and global markets, as well as through other forums, seminars and conferences in Poland and locations around the world.

Through these various initiatives taken in Poland and in the US, the foundation for successfully transferring Silicon Valley approaches to innovation is clearly taking shape – on a “step-by-step” basis.

⁴⁴ See www.kfk.org.pl

⁴⁵ Moncarz, P., “American Scientific and Engineering Polonia as a virtual think-tank of Poland”, Polonia Technica, 70-Year Anniversary Symposium, New York, May 13, 2011