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CREATING AND DEVELOPING INNOVATION CENTERS: GUIDE
TECHNOLOGIES AND KEY PRINCIPLES

INTRODUCTION

On ambitions. We would never have dared to prepare a document in such an ambitious genre as a guide on our own, but for one peculiar circumstance. We believe that people, who have achieved the greatest success in creating innovation centers and an innovative environment, can be rightly considered the co-authors of this book. Moreover, it seems that they are the only people entitled to have weighty opinions on how innovation centers are created and developed. They have created the environment for the innovative business to grow, and today this business generates annual sales of over $2.5 trillion. Among their fosterlings, we can name such companies as Intel, Nokia Group and DuPont. Their innovative technologies include Bluetooth, cloud programming, and the EPROM memory chip.

This guide is the fruit of numerous conversations with the founding fathers of leading innovation centers and their colleagues, meetings with employees of innovation companies and their partners. We should admit that the picture we had obtained was rather different from conventional technopark presentations. In part, this was due to the inevitable difference between theory and real life. On the other hand, this happened because we were doing this work while reflecting on the post-recession changes that have depreciated some laws that we thought were inviolable.

On the most important things. The history of every innovation center is a unique story. Historical peculiarities, business patterns, the education level of the country, the state of national industry, and government policies have influenced their development. There were thousands of factors. Even if they used seemingly identical and common set of concepts and terminology (business incubators, technoparks, grants, business angels, open innovations and so on and so forth), the real course of their development implied the application of very different mechanisms and processes. Sometimes it makes researchers think that building up a creative environment is a kind of art in itself. If that is the case, then there is no need to generalize from facts – it should be more important to learn by example of one or two congenial masters.

Yet, nevertheless, they all have something in common.

First and foremost, all innovation center projects appeared as a result of severe crises and the subsequent understanding of the fact that innovations can help in overcoming these difficulties. For example, the emergence of Ideon Research Park in the Swedish province of Skone was the reaction to the 1970s decline of the country’s shipyards, the base of local industry, under pressure from South Korean rivals. The Technopolis network of technoparks began in the Finnish “backwater district”, the town of Oulu, the population of which started to decrease quickly after it had lost its position as the largest Swedish port on the Baltic Sea.

In this aspect, Russia obviously belongs to the mainstream.

In the second place, there is a certain number of common problems that virtually all innovation centers had to deal with. Correspondingly, technologies have been developed to solve them. The basic technologies of innovative management are the following:

- business incubation;
- project funding;
- horizontal ties between participants of the innovation center;
- technopark infrastructure;
- building up public relations and business reputation;
- management.
CREATING AND DEVELOPING INNOVATION CENTERS: GUIDE
TECHNOLOGIES AND KEY PRINCIPLES

In its turn, every technology includes a set of simpler technologies. Almost all more or less successful innovation centers are the outcome of the combination of these elementary “building blocks.”

Finally, the third item. All innovation centers develop following a rigorously defined sequence of events:

1. **Concentration of resources** (this stage is characterized by building the scientific and research potential of the region and forming a favorable entrepreneurial climate, primarily for start-up and small companies where the innovation center is formed, and overcoming the “Great Wall of China” in relations between research centers and industry);

2. **Formation of the innovative ecosystem** (i.e. a symbiosis of technological start-ups, small businesses, and large hi-tech companies; formation of stable clusters of science-intensive companies; regional authorities begin the policy of active support for innovative entrepreneurship and creation of the required infrastructure; large-scale promotion and PR campaigns are organized to shape a new brand of the region as an innovation center);

3. **Breakthrough** (the rapid growth in sales volumes of large (anchor) companies and their transformation into global players; a considerable growth in the number of technologic start-ups; formation of the venture investment market and the mechanism of risk distribution for venture investors (for example, within the pattern of public private partnerships);

4. **Mature development** (the infrastructure created to support innovative enterprises is working effectively, it becomes more and more “technological” and scalable; the innovation center’s own brand is being developed; creation of new processing chains based on international cooperation and integration into already existing processing chains).

Any attempts to disregard the abovementioned sequence, large amount of resources applied to solve problems at the next stage, which is still ready for implementation (or even attempts to skip a stage) may result, at best, in stagnation and failure to achieve the desired result. This can be illustrated by the example of the Texas-based Austin, where organizers decided to skip the first two stages, and concentrated on attracting research and advanced development divisions of leading companies, to the detriment of smaller innovative companies. As a result, it took this innovation center much time and effort to make the ecosystem they had already created, to be more favorable for start-up creation and development.

There are certain specific characteristics in development of a number of Asian centers (these are mostly related to the specific role of the state and the weakness of domestic fundamental science), but even the most radical examples do not break the abovementioned sequence.

There is one more thing: it is very important to realize that broad publicity and unchallenged successes of an innovation center do not mean that it has already passed all stages of its development. Without understanding that, we can neither analyze its activities properly nor evaluate its results.

**On how this book should be read.** In presenting the material, we tried to be extremely concise and specific. Yet this conciseness does not mean the absence of arguments, or the subsequent and more detailed layer (or, to be more exact, layers) of information on the issues discussed. Should any particular need arise, we can prepare an extended reference on any element of the present work.

The document itself can be literally broken into three parts; you can also read each of them individually (as well as each separate chapters).

1. The introductory chapters (Chapters 1, 2), which provide a glimpse of what innovation centers of the world are doing (including ratings of centers and experts). They also present the main principles of innovation center development.

2. Basic technologies of developing innovation centers are, in fact, the systemic presentation of the essential “building blocks”, which one can use to “put together” an innovation center.
3. Magazine versions of interviews with leading experts in the field of creating innovation centers (see the Annex) provide a humanized account of the problems and solutions; though not always systematic, this provides one with a better idea of the essence of this material.

Acknowledgements. This work has become possible thanks to the initiative and support of the Skolkovo Foundation, as its specialists constantly participated in the research work. The project also received support from the Systema JSFC and its specialists. We are also very grateful to specialists from over 50 innovation centers who participated in questionnaire surveys, provided necessary information, and shared their valuable advice.

We also wish to specially thank the leaders of innovation centers who agreed to host research groups and enabled them to analyze how innovation centers work, and who displayed endless patience in satisfying our requests and answering our questions. Among them, there were such people as:

- Herbert Chen, TusPark (Tsinghua University Research Park), Beijing, China;
- Gilbert Pastor, vice president for economic development of Montpellier Agglomeration, France;
- Mervi Kaki, a partner and managing director and chief advisor at InnoPraxis International Ltd. The creator and CEO of Technopolis Capital Region, Helsinki, Finland;
- Pertti Huuskonen, co-founder and chairman of the board of directors at Technopolis, Finland;
- Peter Dobson, founder and academic director of Begbroke Science Park, Oxford University, Great Britain;
- Sven-Thore Holm, CEO of Lundavision AB, founder of Ideon Research Park, Lund, Sweden;
- Se-Jung Oh, President of the National Research Foundation of Korea, the Republic of Korea;
- Jae Goo Lee, president of the Korean Innovation Cluster Foundation, head of Daedeok Innopolis, Daejeon, the Republic of Korea;
- Thomas Moller, CEO of Ideon Center AB;
- William Miller, co-director of Stanford Programme on Regions of Innovation and Entrepreneurship, professor of public and private management at Stanford University, ex-provost of Stanford University, ex-member of the board of directors at Joint Venture Silicon Valley Network;
- Philip Yeo, former chief of the government agency A*STAR, the creator and first chairman of the National Computer Board (1980-1987), the initiator of the Biopolis Technopark project, chairman of the board of directors of the government agency SPRING, Singapore;
- Anthony Tan, CEO of the Hong Kong Science and Technology Parks Corporation, Hong Kong, China.
CHAPTER 1

SOURCES OF EXPERIENCE

The number of world’s innovation centers and technoparks, i.e. places where innovation business is concentrated, is approaching the one thousand mark. This number will continue to grow, because the path out of the present-day global economic crisis is widely considered to be connected with a new wave of technology. In order to catch that wave, we need to have at least the infrastructure to promote the emergence, formation, and expanded reproduction of innovation companies. That is why the interest in places where such infrastructure, or using the professional slang of the industry – ecosystem, has been built successfully is quite easy to understand.

1.1. Largest innovation centers of the world. The rating of innovation centers

Out of that almost one thousand existing innovation centers and technoparks, only a few have been able to prove their effectiveness. One-time or short-lived success may be a result of a favorable coincidence. On the other hand, a steady success is irrefutable evidence to prove the high quality of the innovation center’s ecosystem: one time is pure luck, two times is a coincidence, but three-time success means the presence of objective main principles. That is why progressive advance (even when it is influenced by certain flows and tides) has become the first criterion for an innovation center’s effectiveness rating, laying the basis for the present guide (See Table 1 and Chart 1).

Along with this criterion, the rating takes into account other factors as well, such as the contribution of a particular innovation center to the development of the economy, renown and references, the level and significance of companies working in the center; the scope of the innovation center, availability of venture capital, availability of information (given the tougher and tougher competition in search of talents, secrecy in attracting best innovators is clearly a disadvantage).

In this rating, innovation centers are not listed from the most to least effective: it just does not make sense, because initial conditions of their creation and the tasks they are facing are different and non-comparable. Neither special characteristics in funding their current activities, nor their scope, should be regarded as criteria to evaluate IC’s effectiveness. In this connection, the presented rating evaluates IC effectiveness regardless of relative size, as well as form of organization or financial self-sufficiency.

1 See a detailed description of the rating methodology in Annex B on page 135.
### Table 1. Effectiveness rating for innovation development centers

<table>
<thead>
<tr>
<th>№</th>
<th>Name of the innovation center</th>
<th>Country</th>
<th>Year of foundation</th>
<th>Scope</th>
<th>Efficiency</th>
<th>Self-sufficiency*</th>
<th>Dynamics of development</th>
<th>Assigned rating</th>
<th>Staffing level together with companies</th>
<th>Number of registered companies</th>
<th>Overall volume of investments / Annual aggregate income of residents USD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>India Silicon Valley, Bangalore</td>
<td>India</td>
<td>1990s</td>
<td>0.905</td>
<td>0.74</td>
<td>N .mkt</td>
<td>Positive</td>
<td>G.mkt5</td>
<td>20 000 +</td>
<td>130</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Ideon Research Park</td>
<td>Sweden</td>
<td>1983</td>
<td>0.955</td>
<td>0.8525</td>
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<td>3 000</td>
<td>260</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Yokosuka Research Park</td>
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<td>1.135</td>
<td>0.925</td>
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<td>G.mkt5</td>
<td>154</td>
<td></td>
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</tr>
<tr>
<td>4</td>
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<td>Positive</td>
<td>G.mkt5</td>
<td>250 +</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Kendall Square, Massachusetts</td>
<td>USA</td>
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<td>0.91</td>
<td>0.725</td>
<td>N .mkt</td>
<td>Positive</td>
<td>G.mkt5</td>
<td>450 +</td>
<td>1 2 00</td>
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<td>6</td>
<td>Hsinchu Science and Industrial Park</td>
<td>Taiwan</td>
<td>1980</td>
<td>1.225</td>
<td>1</td>
<td>G .mkt</td>
<td>Positive</td>
<td>G.mkt5</td>
<td>139 416</td>
<td>440</td>
<td>38 455 / 301*</td>
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<td>Berlin Adlershof Technological Park</td>
<td>Germany</td>
<td>1991-1992</td>
<td>1</td>
<td>0.925</td>
<td>G .gov</td>
<td>Positive</td>
<td>G.gov5</td>
<td>7 268</td>
<td>471</td>
<td>94 / 770 *</td>
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<td>8</td>
<td>Technopolis Oulu</td>
<td>Finland</td>
<td>1982</td>
<td>0.86</td>
<td>0.7325</td>
<td>N .mkt</td>
<td>Positive</td>
<td>G.mkt5</td>
<td>4 500</td>
<td>215</td>
<td></td>
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<td>Silicon Valley Palo Alto, San Diego, St. San Francisco</td>
<td>USA</td>
<td>1950s</td>
<td>1.225</td>
<td>0.72</td>
<td>N .mkt</td>
<td>Stable</td>
<td>G.mkt4</td>
<td>250 000 +</td>
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<td>Silicon Wadi, Israel</td>
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<td>0.8225</td>
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<td>G.org3</td>
<td>170</td>
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<td>Austin Silicon Hills (Texas)</td>
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<td>1980s</td>
<td>1.135</td>
<td>0.7625</td>
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<td>5 000</td>
<td>445</td>
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<td>0.505</td>
<td>0.7375</td>
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<td>0.775</td>
<td>0.72</td>
<td>N .org</td>
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<td>N.org5</td>
<td>3 100</td>
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<td>Techno Park Campinas</td>
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<td>0.725</td>
<td>0.7875</td>
<td>N .mkt</td>
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<td>N.mkt5</td>
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<td>Scope</td>
<td>Effectiveness</td>
<td>Scale – scope*</td>
<td>Self-sufficiency**</td>
<td>Dynamics of development</td>
<td>Assigned rating</td>
<td>Staffing level together with companies</td>
<td>Number of registered companies</td>
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<td>N .gov4</td>
<td>5 000</td>
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<td>0.5675</td>
<td>N .mkt</td>
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<td>N .mkt4</td>
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<td>1986</td>
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<td>0.56</td>
<td>N .mkt</td>
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<td>N .mkt4</td>
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<td>Zhongguancun Science Park</td>
<td>China</td>
<td>1988</td>
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<td>R .mkt</td>
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<td>N .mkt4</td>
<td>950 000</td>
<td>22 000</td>
<td>124 000*</td>
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<td>10 000 +</td>
<td>320</td>
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<td></td>
</tr>
<tr>
<td>30</td>
<td>METU-Technopolis</td>
<td>Turkey</td>
<td>1991</td>
<td>0.5</td>
<td>0.475</td>
<td>N .gov</td>
<td>Stable</td>
<td>N .gov3</td>
<td>3 300</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Madrid Science Park</td>
<td>Spain</td>
<td>2001</td>
<td>0.5</td>
<td>0.45</td>
<td>N .gov</td>
<td>Stable</td>
<td>N .gov3</td>
<td>250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>National Technology Park</td>
<td>Ireland</td>
<td>1984</td>
<td>0.635</td>
<td>0.52</td>
<td>N .gov</td>
<td>Negative</td>
<td>N .gov2</td>
<td>3 000 +</td>
<td>80</td>
<td>7</td>
</tr>
<tr>
<td>33</td>
<td>Oxford University Begbroke Science Park</td>
<td>Great Britain</td>
<td>1990s</td>
<td>0.37</td>
<td>0.7</td>
<td>N .mkt</td>
<td>Positive</td>
<td>R .mkt4</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>Daedeok Innopolis</td>
<td>Korea</td>
<td>1992</td>
<td>0.28</td>
<td>0.3925</td>
<td>R .gov</td>
<td>Positive</td>
<td>R .gov4</td>
<td>40 338</td>
<td>1006</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>Tomsk science and technology park</td>
<td>Russia</td>
<td>1990</td>
<td>0.365</td>
<td>0.3075</td>
<td>R .gov</td>
<td>Stable</td>
<td>R .gov3</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Innovation centre of international scale**
- **Innovation centre of national scale**
- **Innovation centre of regional scale**

* By scale, innovation centers are divided into groups: "R" index, "regional" – regional; "N" index, "national" – national; "G" index, "global" – international.

** By grade of their financial self-sufficiency, innovation centers are divided into groups: .org Index – innovation centers having significant financial dependence on support of third organizations; .gov Index – innovation centers having significant financial dependence on support of institutions of state and municipal authorities; .mkt Index – financially self-sufficient and self-supporting innovation centers.

*** Asterisk specifies the index of aggregate incomes of residents of an innovation center for the accounting period.
Chart 1. Distribution of innovation centers by self-sufficiency/effectiveness and dynamics

The size of the circle is proportionate to the scope of IC activities according to the rating

1. Zhongguancun Science Park
2. Shanghai Zhangjiang Hi-Tech Park
3. Hong Kong Science and Technology Park
4. Biopolis (One North)
5. Hsinchu Science and Industrial Park
6. Daedeok Innopolis
7. India Silicon Valley Bangalore
8. Silicon Wadi, Israel
9. Technopolis Oulu (Finland)
10. Otaniemi Science Park (Finland)
11. Montpellier Agglomeration
12. CIRST Technopark, Grenoble
13. Sophia Antipolis
14. Technopark Campinas
15. Digital Port (Brazil)
16. Tsukuba Science City
17. Kyoto Research Park
18. Berlin Adlershof Technology Park
19. Cambridge Science Park
20. Oxford University Begbroke Science Park
21. Ideon Research Park
22. Technoparc Montréal
23. Innovation Place Research Park
24. Leiden Bio Science Park
25. Silicon valley (USA)
26. Research Triangle Park North Carolina
27. Austin Silicon Hills
28. Kendall Square (Massachusetts)
29. National Technology Park
30. Technology Park Bentley
31. Madrid Science Park
32. Symbion Science Park
33. Yokosuka Research Park
34. METU-Technopolis
35. Tomsk science and technology park (Russia)
1.2. Top-30 innovative managers in the world

Everyone knows names like Bill Gates or Steve Jobs, but their stories of success are unique and cannot be replicated. However things are different when it comes to people who managed to create an environment, where the future Gates and Jobs could realize their potential. Names of these people – leading managers, scientists and officials, who achieved the greatest success in creating favorable conditions for implementation of innovations in various countries of the world are less known to the public. It was their advice that formed the basis of the present work.

The criteria of getting into this list of innovation gurus (see Table 2, in the alphabetical order) are simple: references in leading business and scientific periodicals of the world, evaluations of leading experts and journalists, the present-day demand for the candidate (participation in significant government and corporate advisory bodies for innovation infrastructure development), presence of personal scientific and business experience as well as being the recipient of significant awards and prizes.

An important role in forming the list belongs to the contribution they made into transformation of the regional economy (or even the whole country’s economy). For example, Tony Tan and Philip Yeo have created Singapore innovation infrastructure from the scratch, diversified the country’s economy so that now it occupies leading positions in global ratings of innovative-developed regions. Another prime example is the ordinary province of Skone in the south of Sweden, where thanks to the efforts of Sven-Thore Holm, who had created a well-developed innovation environment in this region, the government managed to overcome the economic recession and virtually solved the unemployment problem.

Table 2. Top-30 innovative managers in the world

<table>
<thead>
<tr>
<th>Person (Name)</th>
<th>Countries where projects have been realized</th>
<th>Merits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paulo Arruda</td>
<td>Brazil</td>
<td>Famous Brazilian innovative researcher and entrepreneur, pioneer in genomics, Coordinated the establishment of Centre of Molecular Biology and Genetic Engineering in Unicamp, Brazil (University and Research Center in Campinas)</td>
</tr>
<tr>
<td>Wang Yangyuan</td>
<td>PRC</td>
<td>Head of a number of research centers in the PRC, architect of innovation policies in microelectronics. The person who founded and continues to develop the microelectronic industry of the PRC. More than 40 years of experience in the semiconductor industry. Director of the Microelectronics Research Center, Beijing University.</td>
</tr>
<tr>
<td>Joseph Vardi</td>
<td>Israel</td>
<td>The most successful venture investor in Israel, one of the chief innovative managers of the Israeli hi-tech industry, one of Israel’s most prominent innovation entrepreneurs and venture capitalists.</td>
</tr>
<tr>
<td>Peter Dobson</td>
<td>Great Britain</td>
<td>Initiator and director of Begbroke Science Park (Oxford), National advisor on nanotechnology to the Research Councils, the UK</td>
</tr>
<tr>
<td>Kazuo Inamori</td>
<td>Japan</td>
<td>Founder of Kyocera, Kansai Cellular Telephone Co., KDDI Corporation and several venture companies</td>
</tr>
<tr>
<td>Philip Yeo</td>
<td>Singapore</td>
<td>Coordinator of Singapore government policy in the field of innovation development. Chairman of the board of directors of SPRINGS, Council for Standards, Improved Efficiency and Innovations.</td>
</tr>
<tr>
<td>John Kao</td>
<td>The USA, Finland, Singapore, Ireland, United Arab Emirates</td>
<td>International advisor BASF, Nike, Intel, Nissan, PricewaterhouseCoopers and others, as well as for governments of Finland, Singapore, Ireland, United Arab Emirates and the USA.</td>
</tr>
<tr>
<td>Mervi Kaki</td>
<td>Finland, Poland, Cyprus, New Zealand, Russia</td>
<td>A partner, managing director and chief advisor at InnoPraxis International Ltd. Former CEO of Technopolis Capital RegionFormer Member of the Board of Technopolis Ventures Business IncubatorPreviously held managing positions at Technopolis PLC.</td>
</tr>
<tr>
<td>Mei Meng</td>
<td>PRC</td>
<td>Founder and President of Tsinghua University Science Park (TsuPark), Director of TsuPark Development CentreChairman of TsuPark Co. Ltd. Permanent Board Member of the Chinese Association of University-based Science Parks.</td>
</tr>
<tr>
<td>William Miller</td>
<td>The USA, Singapore, Malaysia, South Korea, Japan</td>
<td>One of the founding fathers of the Silicon Valley, advisor on innovation policy in South Korea, Singapore, Malaysia and Japan, co-director of Stanford Programme on Regions of Innovation and Entrepreneurship.</td>
</tr>
</tbody>
</table>

See a detailed description of the methodology for making up the list of world’s leading innovative managers in Annex B on page 133.
## Countries where projects have been realized

<table>
<thead>
<tr>
<th>Person (Name)</th>
<th>Countries where projects have been realized</th>
<th>Mentes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nagavara Murthy</td>
<td>India</td>
<td>One of the founding fathers of the IT cluster in Bangalore, prominent Indian innovative entrepreneur and software engineer;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>founder and current CEO and Chief Mentor of Infosys, Bangalore, India.</td>
</tr>
<tr>
<td>Shiv Nadar</td>
<td>India</td>
<td>One of the founding fathers of the IT industry in India, founder and chairman of HCL Technologies, founder and chairman of the Shiv Nadar Foundation, founder of the Shiv Nadar University.</td>
</tr>
<tr>
<td>Nandan Nilekani</td>
<td>India</td>
<td>Prominent Indian entrepreneur, head of the Government of India’s technology committee, TAGUP-Cofounder and former Chairman and CEO of Infosys technologies, a global IT services company; Co-founder of India’s National Association of Software and Service Companies (NASSCOM) and the Bangalore Chapter of The IndUS Entrepreneurs.</td>
</tr>
<tr>
<td>Se-Jung Oh</td>
<td>South Korea</td>
<td>President of the National Research Foundation of Korea, advisor to the Government of Korea on science and technology policies, Member of the Korean Academy of Science &amp; Technology and the Presidential Advisory Council on Education, Science and Technology, Republic of Korea.</td>
</tr>
<tr>
<td>Gilbert Pastor</td>
<td>France</td>
<td>Vice-president for Economy and Innovation at Montpellier Agglomeration, business and innovation center which is the first French business incubator and the 2007 Best Business Incubate that has created more than 470 companies, President, Delegate to Economic Development and Employment, Montpellier, France.</td>
</tr>
<tr>
<td>Carlota Perez</td>
<td>Venezuela, PRC, Brazil, Netherlands, Spain</td>
<td>Venezuelan economist and expert on technology and socio-economic development, International consultant in innovation development, to multilateral organizations, including the OECD, the UN Conference on Trade and Development, UNESCO, UN Industrial Development Organization, the UN Development Programme and the World Bank as well as to private companies.</td>
</tr>
<tr>
<td>Fernando de Castro</td>
<td>Brazil</td>
<td>One of the founders of the biotechnology industry in Brazil, a well-known researcher and entrepreneur in biotechnologies and genetics; Famous venture capitalist. Has coordinated a great number of research groups and labs.</td>
</tr>
<tr>
<td>Tony Tan</td>
<td>Singapore</td>
<td>Former Deputy Chairman of the Research, Innovation and Enterprise Council, Former Chairman of the National Research Foundation (2006-2011), Former Minister for Education, Minister-in-charge for NUS and Nanyang Technological Institute, Author of one of the One-North innovation business park, President of Singapore since 2011.</td>
</tr>
<tr>
<td>Anthony Tan</td>
<td>Hong Kong</td>
<td>CEO of Hong Kong Science and Technology Parks Corporation, About 40 years of experience managing and building large organizations in Asia-Pacific and globally for DuPont, covering product lines from chemicals to synthetic fabric and fibers like Tyvek and Lycra; Used to work in R&amp;D and production for DuPont in the US as well as to be involved in the development of new products/businesses in electronic imaging and medical products.</td>
</tr>
<tr>
<td>Dov Frohman</td>
<td>Israel</td>
<td>Founding father of Israel’s high-tech, significantly influenced the computer memory industry, developer of EPROM. Founder, former Vice-President and first general manager of Intel Israel.</td>
</tr>
<tr>
<td>Julian Webb</td>
<td>Australia, New Zealand, PRC</td>
<td>Managing Director of CREEDA Projects Pty Ltd., a network of entrepreneurship, innovation and SME development consultants in Australia and internationally. Leader in the small business development and business incubation industries since the 1980s. Has established a big number of business incubators in Australia and internationally. Asia Region Facilitator for the World Bank’s InfoDev Incubator Initiative.</td>
</tr>
<tr>
<td>Chang-Gyu Hwang</td>
<td>South Korea</td>
<td>National Chief Technology Officer and the Secretary General, the head of Office of Strategic R&amp;D Planning in Korea. Former advisor to Samsung Electronics on R&amp;D of Samsung Electronics’ future technologies; Former technical consultant at Intel and Hewlett Packard.</td>
</tr>
<tr>
<td>John Hennessy</td>
<td>The USA</td>
<td>President of Stanford University, pioneer in computer architecture, RISC (Reduced Instruction Set Computer) technology, member of executive bodies and a top manager for a number of internationally renowned hi-tech corporations (Google Inc. and other).</td>
</tr>
<tr>
<td>Sven-Thore Holm</td>
<td>Sweden, Russia, PRC</td>
<td>General Director of Lundavision AB, founder of Ideon Research Park in the city of Lund (Sweden) where over 10,000 jobs have been created since 1984.</td>
</tr>
<tr>
<td>Pertti Huuskonen</td>
<td>Finland, Poland, Cyprus, New Zealand, Russia</td>
<td>One of the ideologues of Finland’s innovation policy and the country’s first techparks. One of the founders and chairman of the board of directors at Technopolis PLC.</td>
</tr>
<tr>
<td>Russell Hancock</td>
<td>The USA, PRC, Taiwan, Great Britain, Spain</td>
<td>One of the founders, chairman and CEO of analytic center Joint Venture: Silicon Valley Network, international advisor on regional development, consultant to high tech companies; Former member of the Board of Directors of New California Network.</td>
</tr>
<tr>
<td>Herbert Chen</td>
<td>PRC</td>
<td>Vice President of Tsinghua University Research Park (TusPark, Beijing), Deputy Director of the Tsinghua University Science Park Development Centre in Beijing, President of The Asian Pacific Division of the International Association of Science Park.</td>
</tr>
</tbody>
</table>
1.3. Success factors in creating innovation center

The third element in the basis of the present work (along with the effectiveness ratings of innovation centers and the list of gurus who created them) is the polling of the most competent innovative managers on the secrets of success and mistakes in their work. This polling was open by its nature, i.e. its respondents did not have a prearranged set of answers to choose from. They evaluated significance of every factor on a five-point scale. The distribution of answers we received is shown in Charts 2 and 3.

**Chart 2. Success factors of innovation centers**

<table>
<thead>
<tr>
<th>Factor significance</th>
<th>Percentage in the total number of answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**Figures in the scheme represent the following factors:**

1. Proximity of a university, high research potential of the region
2. Creation of communities, horizontal and network ties between IC participants
3. Involvement of multinational corporations as an element of the environment, and anchor investors
4. Good PR support and strong IC brand
5. Political will and continued long-term government strategy for IC development
6. Individual adjustment of IC services to suit the needs of every customer
7. Independence of the management company from the founders (government, university, private investors) in the decision-making process
8. Ability of the management company to generate income (steady business model), permanent ownership group
9. Determining its competitive niche with regard to other ICs
10. Accommodation of university laboratories, concentration of research resources in the IC
11. Availability of a system for grants and share financing, and conditionally repayable loans at early stages of project development
12. Setting correct priorities for technological development, taking into account local conditions and advantages
13. Willingness of innovation system participants for cooperation and self-organization
14. Permanent growth and extension of the IC, steady increase in the number of participating companies
15. Balance between private and state investments into the IC, availability of private co-owners of the infrastructure and management company of the IC, participation of private investors in IC creation, development, and ownership structure
16. Using advantages of the IC as a point of market entry
17. Flexile labor laws
18. Good transport accessibility
19. Tolerant attitude to start-up bankruptcies
The distribution of answers to the first question (What factors do you think can determine the success of an innovation center?) allows us to make certain conclusions and observations.

First of all, it becomes noticeable how scattered are the key success factors of innovation centers suggested by the experts we have polled. None of the factors scored more than 10% of the total number of answers received. This means that every expert specified his own unique set of factors that other respondents did not repeat. This is just another proof of the fact that there is no universal recipe on how to create a successful innovation center.

Nevertheless, we may point out several components of success that most respondents have indicated. For example, 7 out of 10 respondents spoke about the importance of territorial proximity of universities and research centers, as well as of the significance in forming horizontal ties between participants of an innovation system. In addition, we can single out a number of factors that respondents believed to be significant for IC success:

• effective PR support, a strong brand of the innovation center;
• political will and availability of a long-term innovation center development strategy, which the government (or local authorities) are willing to realize regularly (the so-called “patient government”);
• stable business model of the management company, the ability of the management company to ensure financial self-sufficiency and generate income;
• independence of the management company from innovation center founders (government, university) in the decision-making process, formation of innovation center executive bodies from professionals with sufficient business experience;
• correct determination of the innovation center’s competitive niche, with regard to other innovation centers;
• involvement of large hi-tech corporation as an element of the innovation ecosystem and anchor investors;
• correct determination of top-priority lines of activity (top-priority fields of technological development), with taking into account of local advantages and conditions.
1.4. Common errors in creating IC

Answering the question on mistakes made, the experts were more unanimous (See Chart 3).

**Chart 3. Typical mistakes in innovation center building**

Figures in the chart represent the following factors:

1. Excessive attention paid to material infrastructure to the detriment of non-material services, attracting efficient staff and projects
2. Insufficient qualifications of specialists employed at management companies and support institutions. Employment of former government agency officers and academic institution members who do not have the experience of working for private business
3. Insufficient attention to PR
4. Lack of attention to business training of research workers and students (failure to involve science and university centers in business activities)
5. Adherence to the strategy of “pushing” technologies into the market, concentration of resources for projects, which do not help consumers to solve specific problems and do not have much demand in the market
6. Excessively strong influence of the government and universities in IC management
7. Incorrect determination of IC specialization
8. Founders of IC infrastructure based this work on their own forecasts, instead of real business needs
9. Exaggerated role of large companies, lack of start-ups and international investment banks
10. Wrong attitude of the society and the business environment towards risk and failure (fear and intolerance of bankruptcy)
11. Strict labor laws

Therefore, experts have noted the following factors among those preventing successful formation and development of innovation centers (they are outlined within the dashed line in Chart 3):

- Excessive attention paid to material infrastructure to the detriment of non-material services, attracting efficient staff and projects.
- Insufficient qualifications of specialists employed in management companies. Our respondents believe that the worst negative consequences result from attracting former government agency officials and academic institutions members who lack the experience of working in a business environment.
- Insufficient attention to PR and formation of a strong innovation center brand.
- Lack of attention to business training of research workers and students (failure to involve science and university centers in business activities).
• Adherence to the strategy of “pushing” technologies into the market, concentration of resources for projects, which do not help consumers to solve specific problems. Excessive attention paid to development of technologies and research to the detriment of business development of resident companies and development of the corresponding business environment.

• Mistakes in determining specialization and priorities of the innovation center.

• Creation of innovation infrastructure based on abstract forecasts instead of real needs of the existing and potential resident companies of the innovation center, low adaptability of the infrastructure to a specific company’s requirements.

• Excessively strong influence of the government (local authorities), universities (usually state universities) and academic institutions on management of the innovation center.

1.5. Innovation center typology (based on the studied innovation centers)

Finally, to make our analysis of the experience of successful innovation centers complete, this work presents managerial know-hows of the three types of such centers that exist nowadays.

In the first place, these are large technoparks with participation of private capital, that have financial self-sufficiency and yield profits. As a rule, such innovation centers have been created on the government or municipal authority’s initiative as an institution of regional development. However, in the course of time they have become the property of private investors and currently combine functions of development institutions (points of access to governmental, social and state and private programs for support of innovation entrepreneurship) and private development projects. We may qualify Ideon Research Park in Lund (Sweden), as well as the network of technoparks managed by the Finnish company Technopolis Oy, including the oldest technopark of Finland in Oulu as centers belonging to this group.

In the second place, these are the state innovation centers. Such centers have been created on the initiative of the state and mostly thanks to state investments, their current activities are subsidized by the government, and they actually perform functions of state institutions for development. At the same time, the influence of state authorities on operational management of such centers can be different as to its extent. For example, all elements of the innovation infrastructure of Montpellier Agglomeration (France), including Business Innovation Center (business incubator) and technoparks, belong to the municipality, and their employees are municipal officials. Meanwhile, the state innovation center of Hong Kong is managed by a foundation which is independent from the state. Besides the innovation centers we have mentioned, this group also includes Biopolis Technopark (Singapore) and Daedeok Innopolis (South Korea).

In the third place, these are technoparks which are university profit centers. The goal of such innovation centers is not only commercialization of university developments, but also sales of various services that the university may offer to science-intensive companies (research infrastructure, joint research and advanced development, contacts), as well as effective management of a part of the real estate property of the parent university (in most cases, this is the land where the technopark is situated). Out of the innovation centers that we have studied in the present work, Oxford University Begbroke Science Park, as well as Tsinghua University Research Park (TusPark) may be classified as belonging to this group.

Each of the innovation centers, the experience of which has been studied in this work, has been formed under its own unique circumstances and was designed to solve a set of unique problems, inherent to a specific region in a specific country; all of them have a unique management structure and model of business processes. Very often their practices are as incompatible as oil and water.
For example, the Oxford University Science Park was meant to overcome the gap between the isolated research system of the university, which ranks among the world’s best, and the industry, and to create mechanisms for commercialization of numerous breakthrough developments that emerged in Oxford. They had to develop these mechanisms without any support from the state, and from the very beginning the main condition of the technopark’s work was its complete self-sufficiency, and in the long-term prospect – the ability to yield profit for the university. On the contrary, the main problem of the newly founded biotechnology science park in Singapore was almost a total absence of the national scientific school, talented and competitive researchers, and promising developments, which could become the basis for new technological enterprises. We may continue this list of differences for a long time.

Nevertheless, these differences are the things to emphasize the generality of a series of management approaches and decisions, which are reproduced, to a certain extent, in the majority of the innovation centers we have studied. We can also be certain that the similarity of managerial decisions in different innovation centers can be explained primarily by the general nature of a number of problems that these centers were meant to solve.
CHAPTER 2

MAIN PRINCIPLES OF INNOVATION CENTER DEVELOPMENT

Innovation centers are actually — or comparatively — young as places of concentration of companies connected to output of hi-tech products; the oldest of them are just over forty years old. Nevertheless, analyzing their history allows us to see four large stages in their development (See Table 3). They can be specified as follows:

- Stage of concentrating resources,
- Stage of transforming the economy of the region where the innovation center is located, and forming the innovation ecosystem,
- Stage of innovation and technological breakthrough
- Stage of innovation center maturity.

Certainly, such periodization is of a generalizing nature, and cannot be regarded as obligatory. Nevertheless, it can be useful as a kind of a system of reference for innovation center projects created under similar conditions, or at least conditions which do not differ drastically. Moreover, in all innovation centers that proved their effectiveness, every stage served to solve a strictly defined set of top-priority managerial problems, the successful solution of which was a necessary condition to enable working on the subsequent stages. Let us examine the contents of these stages in detail.

2.1. Concentration of resources

The contents of processes taking place in the first stage, which actually precedes the emergence of an innovation center, can be marked as “concentration of resources”. The economy of the region where the source for development of hi-tech industries will appear later, still keeps its traditional way of life at this stage. Hi-tech industries are represented by single companies, usually of small or medium-size, with their contribution to GRP and influence on the labor market being of little significance. Nevertheless, in all effectively working innovation centers, the technological boom was preceded by an increase in research potential of the region. This means both the development of already existing research and university centers of these regions, and the creation of new research and development centers.

In its turn, emergence of powerful research centers, conducting research and development work in the then most promising lines of technologic development, begins to attract attention of large hi-tech and industrial companies, which start opening their research and development departments there, and create science-intensive subsidiary enterprises.

As a rule, the attraction of new research centers, development of older centers, as well as attraction of large science-intensive corporations took place against the background of declining conventional industries of the regional economy. At this stage, development of research potential and attracting large hi-tech corporations as anchor investors were the main line of policies aimed at overcoming the consequences of the region’s loss of competitive advantage at the national level.

At the same time, connections between research and development centers and industry appear; the speed with which they come into existence depended largely on the special characteristics of the national higher education system and academic science (such connections were slower to appear where universities and research centers were state-funded institutions), as well as on special characteristics

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3 See information on peculiarities of innovation center formation in Asian countries, with the lack of their own well-developed fundamental science and engineering schools, in paragraph 2.5 on page 25.
of national laws on intellectual property protection. In the countries, where national legislation provided for the researcher’s priority in receiving benefits from the use of intellectual property he has created at the state’s expense, the technology transfer and involvement of university and academic scientists into joint projects with private companies, as well as in the creation of technological startups, took place at a higher rate than without such legislative provisions.

The result of this preliminary stage in the studied innovation centers was the formation of the rudiments of the innovation ecosystem – networks of personal contacts and joint projects of academic and university scientists, hi-tech corporation CEOs and regional authority leaders began to appear here and there. Putting things schematically, the breakthrough in development of hi-tech industries in the centers we have studied was preceded by the accretion of a critical mass of people engaged in research work in the most promising lines of technological development, as well as by the emergence of large consumers for such technologies.

Let us examine several examples. At the Montpellier Agglomeration, in the center of Languedoc-Roussillon agricultural province, higher education has been an important industry of the regional economy for many centuries; since the Middle Ages, there existed one of the most powerful natural science universities of France, and one of the country’s largest university clinics, which predetermined the significance of the city as the national research center for pharmaceutics, medical and bio technologies. Nevertheless, attraction of new scientific centers created within the framework of international, European, and national programs to Montpellier has become one of the top priority policies of the 1970s and 1980s for the municipal authorities; this activity was meant to diversify the regional economy. In this period, thanks to active lobbying of the Montpellier administration and personal participation of its irreplaceable mayor Georges Frêche, the city became home to such scientific centers as BRGM, CEMAGREF, CIRAD, CNRS, IFREMER INRA, INSERM, and IRO. Besides this, due to the warm business conditions created in the city by the efforts of its Socialist mayor (for many years, Montpellier was and still is one of the European leaders in terms of low costs in starting and operating a business, and the city is the national leader by the number of companies founded), and thanks to his personal guarantees, the city became home to R&D centers of such hi-tech giants as IBM, Dell, Sanofi, Veolia, Ubisoft, and Intel.

The transformation of Oulu into Finland’s and Northern Europe’s largest innovation center would be impossible without the university founded only in 1959. Foundation of the university was a reaction to the decline of the region that began after the war, losing the dominating position to the industrially developed southern part of Finland. The university’s electric engineering department, as well as the department of data processing, played an important role in the emergence of the “Oulu phenomenon”: it should suffice to say that graduates of the two departments are now founders or top managers for the majority of ICT companies operating in this region, including Nokia Mobile Phones (before 1989, known as Mobira), Nokia’s Network Business Group (today known as Nokia-Siemens Networks), CCC (today a member of Webmedia Group), and Ciberbit. The equally significant role belonged to the affiliate of VTT founded in Oulu in 1972 – the National Research and Technological Center of Finland, thanks to which the region became one of the country’s largest centers for development of data transfer and IT technologies. Finally, another event of key importance was the moving of Nokia’s department specializing in manufacturing of radio communications equipment to Oulu in 1972. However, the main motive for their moving at that time was not the high research and technical potential of the region, but the cheap labor force. Nevertheless, the corporation has had a considerable influence on later development of small technological companies in this region, as well as on emergence of new startups, because it widely applied the strategy of attracting contractors and subcontractors to organize production and R&D activities.

Coming back to the analysis of best management practices, we may conclude that the most pressing management problems at this stage were as follows:
• Attraction of first-class research and engineering staff into the region, as well as attraction of new research centers. In the studied innovation centers, this problem was solved by the lobbyism of regional authorities.

• Overcoming the “Great Wall of China” between research centers and industry (this is the problem that almost all successful innovation centers of today have faced at this stage, the only exception being the British centers).

• Attraction of anchor investors (large hi-tech corporations) into the region, and especially their research departments.

• Formation of a favorable business climate in the region, primarily for beginning and small companies (any companies, not only science-intensive ones).

2.2. Formation of ties (innovation ecosystem)

The second stage is actually the birth of the innovation center. It is heralded by the sudden appearance of the three most important processes, which could take place simultaneously or in sequence. In the first place, this is the remarkable growth in the number of technological startups and the general growth in the number of companies in new hi-tech industries. At this stage, the analyzed innovation centers began forming steady clusters of science-intensive companies. It is important to note that this took place against a background of a continuing degradation or stagnation of traditional branches of the regional economy, as well as gradual transformation of the regional labor market in favor of new hi-tech branches of the economy.

In the second place, at this stage, regional authorities switched to an active policy of supporting innovation entrepreneurship and creating the infrastructure required for it. It was in the 1980s, that the first European technoparks and technological business incubators appeared, and by the end of the decade, they became so widespread in Western Europe, that we could speak of an appearance of a certain rage for technoparks. Besides the technopark infrastructure, institutions were created at the regional and national levels to specialize in financial support services for technological startups. In the first place, this support was meant for projects at the stage preceding the creation of a startup, and at the “pre-seeding” stage, when external funding from other sources is unavailable.

Another important element of regional innovation policy is large-scale and PR campaigns meant to form a new brand of the region as an innovation center. For example, the Montpellier administration held a very expensive (for the city budget) nationwide campaign “Wunderkind City” in the second half of the 1980s, and starting in 1985, Oulu began to position itself as the “Technology City”. Besides positioning the city as the zone of hi-tech development and successful technological business, these campaigns were designed to shape the image of the abovementioned cities as the best place to live for well-educated and creative people.

In the third place, at the stage of transformation, we can see the final formation of what we are used to calling the innovation ecosystem, i.e. the symbiosis of technologic startups, small companies, large hi-tech businesses, research centers, as well as private investors. In most of the innovation centers analyzed here, with Montpellier being the only possible exception, this ecosystem was primarily based on personal contacts between the participants of the process. Another important event was coming of the first private venture investors to these centers.

There is much temptation to view the increase in the number of startups in the 1980s in the analyzed innovation centers exclusively in connection with the infrastructure for support of innovation entrepreneurship created there. There is not much doubt as to the fact that this infrastructure catalyzed the growth of
hi-tech industries. For example, most technological startups in Lund of the 1980s were located in the Ideon Research Park, which had opened here in 1982 – just because in this small city, with the third of its territory occupied by the university, it was the most suitable place for businesses of this type.

Nevertheless, the growth of high-tech industries in those days was primarily connected to the rise of a new global technological wave and the emergence of new markets for the IT industry, microelectronics, data transfer technologies, pharmaceuticals, etc. For instance, the first Finnish technopark in Oulu, which opened in 1982 and had to work in the small building of a former creamery in the city center until 1985, just could not admit a large number of companies, nor provide any suitable conditions for R&D activities. Yet the growing number of technological startups in Oulu, primarily in the ICT industry, can be noticed already in the early 1980s (see Chart 4)

**Chart 4. Dynamics of the number of ICT companies in Oulu (Finland) in 1968-1990**

![Chart 4](image)


In addition, usually the effect from creating infrastructure to support innovation business could be seen in full only after a certain period of time. There should have been a certain time lag for the new institutions to take root, and for the technologies they applied to become appropriate to the tasks they faced.

Let us study the following example. For the Montpellier Agglomeration, as the innovation development center, the transformation period began in the late 1980s. The infrastructure for support of smaller innovation companies began forming here since 1989 — that is when the Business Innovation Center (BIC) was founded. From 1988 to 2000, the number of residents in the Center’s business incubators was actually the same, around 20-25 companies. The brightest example to illustrate the lack of growth could be the dynamics of BIC receipts from leasing office and laboratory premises, as well as from providing office and laboratory services. As leasing rates and service fees have changed during the analyzed period only as much as the inflation rate (according to what BIC representatives say), this indicator demonstrates clearly the amount of the Center’s services actually consumed by its residents, and therefore can indirectly indicate the dynamics of the number of companies, as well as their growth rates. During the 1990s, the amount of services provided did not actually grow, as the increase in receipts from leasing and providing services
made only 30% for the period from 1988 to 2000, with receipts growing by 7% only in the period from 1995 to 2000 (See Chart 5). Steady growth began only in 2002, when the number of resident companies at first increased to 60, and in the three subsequent years to 100 companies. To a large extent, this was connected with the liberalization of the national laws on management of university intellectual property and on participation of state university faculty members in founding companies, which resulted in a growing number of university startups.

**Chart 5. Receipts from leasing of office and laboratory premises and providing services at the Business Innovation Center (BIC) at Montpellier Agglomeration (France)**

The most important managerial problems at this stage are as follows:

- Creation of an effective system of providing services to beginner technological companies, primarily business training services
- Creating of a system of financial support for innovation startups at the pre-investment stage
- Creation of mechanisms to encourage involvement of research workers in founding startups (for example, reserving vacancies at universities and institutes for several years for scientists who have decided to found a company)
- Organization of advertising and PR campaigns to position an innovation brand in the national and international arena and to create a strong brand.
- Development of a technology transfer system
- Ensuring high quality of life
- Forming a pool of investors loyal to the innovation center, attracting private investors into creating infrastructure for support of innovation businesses
- Creation of management bodies, independent from the government, universities and private investors, to control the supporting infrastructure.

**Source:** BIC
2.3. Breakthrough

The main features of the third stage in the studied innovation centers are the rapid growth in turnover of large anchor companies and their transformation into global players, emergence of new large companies, and a considerable growth in the number of technological startups. When talking about most of the innovation centers that proved their effectiveness, they have gone through this stage in the second half of the 1990s – the first half of the 2000s. It was the time of rapid development of a number of new markets that emerged after the latest wave of technology, primarily ICT and biopharmaceutical markets. Such innovation centers, as Lund, Oulu and Montpellier appeared to be ready for the technological boom and made the best of the advantages they had created in the previous decade.

Rapid development of anchor corporations that reached the global level, and new large companies, had resulted in the growing number of technological startups. On the one hand, a considerable share of startups appearing at this stage at effective innovation centers were projects that have separated from large companies working in the region. As a rule, innovation activity in large companies is hindered by the "corporate bureaucracy". That is why there is a common practice of taking prospective projects to affiliate companies or transfer of technologies to third parties for the performance of the necessary R&D work and bringing the new project onto the market. In the long term, if the project turns out successful, such small companies are absorbed by the parent company. On the other hand, large corporations are among chief consumers of developments and products created by small innovation companies.

At the same time, the process of globalizing innovation centers continues with the coming of new global players. For example, largest American corporations such as Intel and IBM are buying prospective companies in Lund and Montpellier.

On the background of the technological startup boom, formation of a venture investment market began in European innovation centers. Business angels became a massive phenomenon. Nevertheless, there was still a lack of large institutional investors (large venture funds). That is why in a number of European countries there appeared private and state venture funds, both nationwide and regional (e.g. TechnoSeed in Lund or Technoventure in Oulu).

Following the technological startup boom, the infrastructure for support of innovation businesses was extended in the 1990s – early 2000s, with areas of technoparks in most successful innovation centers increasing several times.

The most important management problems at this stage are as follows:

- Well-timed extension of the infrastructure meant to support innovation businesses, scaling and reproduction of the system of services created at the previous stage.

- Creating mechanisms for sharing risks of private venture investors, in particular private and state venture funds.

2.4. Mature development

The fourth stage differs from the third stage by the fact that the rate of increase in the number of existing companies and the number of created technological startups slows down considerably, in comparison with the peak figures of the technologic boom period (See Chart 6). For example, the number of resident companies of Ideon Research Park was growing much slower in the second half of the 2000s than in 1995-2002, when their number doubled. To a large extent, this happens due to the growing global competition in hi-tech markets, as well as because of the gradual fading of the technological wave related to the development of ICT and biotechnologies.
Brands of the most effective innovation centers of the Old World become subject to gradual erosion and obsolescence, which is primarily connected with their universal copying (it is mostly the offence of innovation centers in developing countries), and also with lack of new bright stories of success, as none of the studied innovation centers have managed to produce anything like Nokia Mobile Phone or Ericsson Mobile. Thus, for most residents of the Ideon Research Park, the limit of their ambitions is listing on Stockholm Stock Exchange or absorption by some multinational corporation.

The infrastructure for support of innovation companies that has been created now is working effectively, and is becoming much more “technological” and scalable. Yet it begins to display its negative “side effects,” and the more effective this support system is, the stronger these effects are. In particular, experts note that a relatively easy access to grant and share funding of innovation startups mostly played into the hands of “medium” projects that do not have any global ambitions and serious prospects in the international markets. In its turn, this circumstance hinders substantially the development of the venture investment market, in spite of all efforts to create a mechanism of risk sharing. Venture investors are not interested in “innovation projects in general”, because they need companies with a potential of becoming global leaders. Only in that case does the investor have a chance to receive compensation for the losses from investing into failures and projects that never came off, and achieve an acceptable level of return on his portfolio. As a result, virtually none of the European innovation centers we have studied managed to create new global success stories in the 2000s and repeat the breakthroughs of the 1980s – 1990s once again.

Moreover, the measures taken in Europe to involve university research into the creation of technological startups have failed to end in creating a class of real “science entrepreneurs” who were and still are the locomotive of Silicon Valley’s innovation system. As the Stanford University professor William Miller has noted, European scientists always remain scientists, even if they do create their own company, and they still tend to abandon business at the earliest opportunity. The result of this is that even in the well-developed innovation systems of European countries, there are no new global technological companies able to repeat the success of Google or Facebook.
Overcoming this stagnation is the problem which is being solved now and will continue to be solved in the nearest future. We may suppose that the most successful institutions in doing this will be those innovation centers that are capable of feeling and taking the lead of the new technological wave.

So far innovation centers, which have come through the three previous stages in their development, resort to strengthening and developing the management solutions realized at the previous stages:

- attracting new companies;
- supporting and developing their own brand;
- integrating into the existing processing chains and creating new chains based on international cooperation.

### Table 3. Main stages and management goals in innovation center development

<table>
<thead>
<tr>
<th>Stage of an innovation center development</th>
<th>Primary management goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage One: concentration of resources</td>
<td>Attraction of research and engineering staff to the region, as well as research and development departments of industrial and hi-tech companies</td>
</tr>
<tr>
<td></td>
<td>Creating a favorable business environment in the region, primarily for beginner and small companies (any companies, not only science-intensive ones)</td>
</tr>
<tr>
<td>Stage Two: beginning of economic transformation and formation of the innovation ecosystem</td>
<td>Creating an effectively working system for providing services to beginner technological companies, primarily business training services</td>
</tr>
<tr>
<td></td>
<td>Creating a system of financial support for innovation startups at the pre-investment stage</td>
</tr>
<tr>
<td></td>
<td>Creating mechanisms to encourage involvement of researchers into founding of startups</td>
</tr>
<tr>
<td></td>
<td>Organizing advertising and PR campaigns to position the innovation center in the national and global arena and creating a strong brand</td>
</tr>
<tr>
<td></td>
<td>Developing a system for transfer of technologies</td>
</tr>
<tr>
<td></td>
<td>Ensuring high quality of life</td>
</tr>
<tr>
<td></td>
<td>Forming a pool of investors loyal to innovation center, attracting private investors for building up of the infrastructure to support innovation businesses</td>
</tr>
<tr>
<td></td>
<td>Creating management bodies, independent from the government, universities and private investors, to control the supporting infrastructure</td>
</tr>
<tr>
<td>Stage Three: innovation and technological breakthrough</td>
<td>Extending the supporting infrastructure for innovation business, scaling and reproduction of the service-providing system created at the previous stage</td>
</tr>
<tr>
<td></td>
<td>Creating mechanisms for sharing risks of private venture investors, in particular, private and state venture capital funds</td>
</tr>
<tr>
<td>Stage Four: “Maturity”</td>
<td>Integration into the existing processing chains and creating new chains based on international cooperation</td>
</tr>
</tbody>
</table>

2.5. Special characteristics of innovation centers development in Asian countries

Development strategies of technology parks in Asian countries may be grouped, despite all their differences, into a common group, because these are net innovation importing countries — without their own well-developed fundamental science and engineering schools (Asia never had them before), those schools which have become the basis for the development of European and American innovation centers. Because of this, China and its adjacent countries (except for Japan) found themselves on the periphery of the scientific and technical development, and they have been in a catch-up modernization process until now (see Chart 7).

To eliminate this lag, Asian countries have formed two very dissimilar groups of innovation center development models, which can be roughly called a «Japanese» (it is also used in China and Korea), and a «Taiwanese» (also used in Hong Kong and Singapore) models. The main difference between them lies in the role the state and foreign capital play in them.
2.5.1. The role of the state

The role of the state as an active participant in the innovation process is to create conditions for the emergence and commercialization of its own genuine technologies. On a practical level this means:

1. To form a creative environment by funding the national science development, academic and educational institutions

2. To ensure the payback of new developments by means of protectionism in key industries and limited access of foreign companies to government contracts.

3. To create fiscal and other incentives to attract investments and reduce the risks of raising funds in innovative technology development.

It is obvious that we cannot compare actual possibilities of the countries of the first and the second groups in the process of science development. Singapore, Hong Kong and Taiwan are simply too small to cultivate and maintain a well-developed system of academic and educational institutions. The scale factor is also crucial when we choose an approach to carry out the trade policy. The national market of the second group members cannot generate demand sufficient to return investments into innovative developments, and therefore it makes no sense to protect it. In contrast, protectionism in relatively larger countries is an integral part of the public policy and it caused serious and repeated claims against them on the part of both the U.S. and the EU.

The use of fiscal incentives also directly depends on the size of the economy. Risks associated with their use, especially in the administration and control, are much higher in relatively big countries than in smaller ones. Therefore, such schemes were used in Japan, China and Korea, either in a differentiated way, or they were introduced for a short period of time. Hong Kong, which also provides almost no incentives to innovative companies, is the country with one of the lowest taxation levels in the world, so the use of this tool basically does not make much sense. Quite the opposite, Singapore and Taiwan...
actively use tax incentives to compensate for the lack of innovative projects, conditioned by the low level of the scientific environment and the narrowness of the national market. These countries count on attracting foreign scientists, engineers and entrepreneurs, therefore their funding level of research and development activities by foreign companies is very high. In fact, they have no other choice.

2.5.2. Role of foreign capital and import of technology.

To attract foreign companies to conduct research and development activities is a very risky policy. For the transfer of advanced technologies is not only a matter of business but also a matter of politics.

This trend has recently appeared, in the early 2000s at the zero level, therefore it is not well developed in Japan and Korea, which have started the formation of national innovation systems long ago. However, it is willingly used in Singapore, Hong Kong and to some extent in Taiwan, which are currently developing their national innovation systems (see Table 4).

The situation in China is unique. They attract foreign companies and specialists mainly consisting Chinese people of the Diaspora, or repatriation and expansion of citizens’ businesses, former students who studied and worked abroad. If we take this powerful factor into account, the share of foreign companies and specialists in research and development sector in China is quite comparable with that of Japan and Korea.

<table>
<thead>
<tr>
<th>NIS</th>
<th>Protectionism in key sectors</th>
<th>Level of tax incentives</th>
<th>Development level of academic science</th>
<th>Level of R &amp; D funding by foreign companies in the country</th>
<th>Development level of the venture sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Fair</td>
</tr>
<tr>
<td>China</td>
<td>High</td>
<td>Low</td>
<td>Fair</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Korea</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Singapore</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Low</td>
<td>High</td>
<td>Fair</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

2.6. Basic technologies of IC development

Despite the diversity of challenges an innovative enterprise faces at different stages of its development, the technologies of solving them - the sort of «building blocks» of the innovation infrastructure are divided into six major blocks (see Table 5)

- the incubation of innovative start-ups;
- the attraction of foreign funding;
- the development of effective technological park infrastructure
- the organization of horizontal relationships among the innovation system participants;
- Branding and PR;
- the formation of innovation center’s management authorities.

Each of these technologies is made up of several others – simpler ones. A successful innovation center is a result of a combination of these blocks.
For more information on management know-hows that have proven their effectiveness during establishment of innovation centers, see chapters 3-8 of this study.

**Table 5. Problems and tools to solve the problems analyzed in this study**

<table>
<thead>
<tr>
<th>The problem</th>
<th>Tool to address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deficiency of technology start-ups</td>
<td>Incubation technologies of innovative start-ups</td>
</tr>
<tr>
<td>High level of start-up &quot;infant mortality&quot;</td>
<td>Technologies to attract foreign funding</td>
</tr>
<tr>
<td>Lack of comfortable office and especially laboratory facilities for small and medium-sized companies which conduct R&amp;D, at a reasonable price.</td>
<td>Technologies to develop effective technopark infrastructure</td>
</tr>
<tr>
<td>Lack of a unique entry point to access the innovation ecosystem and support system</td>
<td>Technologies to create horizontal relationships among system participants</td>
</tr>
<tr>
<td>Barriers between different parts of the innovation system</td>
<td>Technologies to build public relations and reputations</td>
</tr>
<tr>
<td>Poor access to essential research resources and infrastructure</td>
<td>Technologies to form the innovation center management authorities</td>
</tr>
<tr>
<td>Weak brands of small and medium-sized technology companies</td>
<td></td>
</tr>
<tr>
<td>Deficiency of foreign funding and investments into innovation projects</td>
<td></td>
</tr>
<tr>
<td>It is difficult and expensive to search for information about potential partners, customers, investors and employees, high transaction costs of start-up innovative companies.</td>
<td></td>
</tr>
<tr>
<td>Competition for long-term government and private investment, the best projects and specialists</td>
<td></td>
</tr>
<tr>
<td>Seeking balance among the Innovation Center owners' interests (the state and private investors), development of a sustainable innovation center business model</td>
<td></td>
</tr>
<tr>
<td>Attracting public and private investments into the innovation center development</td>
<td></td>
</tr>
</tbody>
</table>

*Main tool*  
*Auxiliary tool*
CHAPTER 3

Business incubation

Since this paper is based on the problematic approach, we should immediately ask ourselves about the main problem that business incubators solve and their specific instruments to support start-up innovative enterprises. The problem is stated quite simply: the lack of technology start-ups.

The reasons that limit the number of start-ups created or hinder the development of those that already exist, may be described by the following simple situations:

- People who have a desire to establish a company and have the necessary technology and ideas, do not know how to run a business. As they learn from their mistakes, the start-up may fail. This can also happen because of the underestimation of the market role and determining one’s own niche in it, because they do not know the principles of business processes organization and the management structure of the enterprise, because they are not familiar with the legal challenges that accompany any business, etc.

- Start-ups cannot find comfortable and the most suitable premises for their type of business.

As the analysis of business incubator activity in successful innovation centers shows, all managerial and organizational decisions used there are in one way or another connected with the solution of the conflicts described.

These solutions are summarized in Table 6.

Table 6. Ways to solve the problems of innovative company’s sustainable development

<table>
<thead>
<tr>
<th>Problem</th>
<th>Ways to solve it</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of business knowledge and skills by the members of project teams</td>
<td>1. Place projects in a business incubator until they receive a legal entity status. 2. Mandatory personal business training during the entire period the project is in the business incubator. 3. Engage successful technology entrepreneurs and former managers of large high-tech companies as business coaches. To provide a full range of services for the development of business, adopted to the needs of each project-resident of the business incubator.</td>
</tr>
<tr>
<td>to successfully launch and develop a start-up.</td>
<td></td>
</tr>
<tr>
<td>Lack of comfortable, adjusted to the needs of a start-up project,</td>
<td>1. Create common offices and spaces in the business incubator which can be used for meeting and socializing and which project companies may use for a minimum fee or free of charge. 2. Create office and laboratory premises, equipped with the minimum necessary set of equipment and services that can be quickly redesigned and restructured in accordance with the needs of a particular company, including those associated with expansion. 3. Create equipment joint use centers.</td>
</tr>
<tr>
<td>premises at a reasonable price, as well as scientific and research</td>
<td></td>
</tr>
<tr>
<td>equipment.</td>
<td></td>
</tr>
</tbody>
</table>

3.1. Business education for start-ups

The basic principles to organize business education in incubators were developed in the first European innovation centers in the 1970s and 1980s, primarily in British and Scandinavian industrial parks, and later this model, with a varying degree of success, has been replicated both in the most developed and in the largest developing countries.

3.1.1. Why start-ups need “preschool education”

In terms of the business education approach, innovation centers can be conventionally divided into two large groups. The business incubators of the first group are mainly focused on the commercialization of technologies and developments («pushing» technologies to the market), created at universities and
research centers. The second group is largely focused on the projects that appear in the open market, as well as spin-off projects of already existing technology companies.

The first group differs from the second one, first and foremost, by the presence of the pre-incubation stage, which presupposes the involvement of a business incubator in the project’s development at the earliest stage of its existence, even before the enterprise is registered. The idea is that a business incubator takes over the custody of the start-up, i.e. the teams which have an interesting idea, but no detailed business plan, or even no idea how to embody this plan and make the business work. Thus, the business incubator actively participates not only in the enterprise support, but also in the enterprise establishment. This approach is implemented with some variations, for example, in Montpellier, Hong Kong, Singapore, and in the Tsinghua Technology Park TusPark.

Let us consider the way this model is implemented in business incubators (BIC) of the Business Innovation Center of Montpellier Agglomeration (see Chart 1)

*Chart 1. The stages of project development in the Business Innovation Center (BIC) Montpellier Agglomeration*

- **University**
- **Academic business incubator**
- **Business incubator (BIC)**
- **Technology park**

One of the organizational know-hows applied in the BIC is that the project originated from a university falls under the care of the Center long before it is chosen to be placed in the business incubator. The BIC specialists start working with projects at the earliest stage of their existence, in the so-called academic business incubator.

An academic business incubator is a specific organization, which has no clear structure, jurisdiction or its own staff. In fact, it is an informal partnership between the universities of Montpellier and BIC – a ground, where the project teams that appeared at the University consult with the BIC business coaches. The purpose of these consultations is the joint analysis of the proposed ideas prospects in terms of establishing viable enterprises, the preliminary preparation of a business plan and the preparation of a record file for the project competition, which is held to select projects for the BIC business incubators. Moreover, consultations with business coaches helps university researchers to more clearly understand whether they should bother with the establishment of their enterprise and what may change in their lives as soon as they become entrepreneurs.
After a competitive selection, the business incubator welcomes project teams which have not been registered as legal entities and are not officially engaged in business. The preparatory period, before an enterprise is established, can last up to three years – during this period of time the business incubator coaches work with the project team on a business plan, product and marketing strategies, and the organizational structure of the future enterprise. It then becomes clear whether a project team is able to cope with the problem or not, and how viable the project is. Finally, after the enterprise is registered, the project remains in the business incubator for 3 years, though this period may be extended.

It should be noted that the difference between these two groups is practically not so obvious. As to the business incubators focused on the technology commercialization, rather than on the support of start-ups already existing in the «open market», it is not always possible to develop a permanent commercialization line of university developments, even in the most successful business incubators. For example, the business incubator of the Business Innovation Center Montpellier (BIC), whose activity is primarily aimed at supporting university projects (at least if we talk about the goals of the Center stated in official documents), only 10 out of 98 residents have a direct relationship to local universities. The rest came from various sources - «from the street», thanks to national project competitions, upon the recommendation of other business incubators and friendly venture investors. The share of the projects drawn into the BIC from abroad is also great. At the same time, in business incubators of innovation centers where business enterprises based on university developments are not the priority, for example the share of university spin-off companies in business incubators of the Ideon Research Park(Lund, Sweden) and Technopolis in Oulu, is almost equal to or even higher than in the BIC. However, the differences in BIC and TusPark managerial models on the one hand, and business incubators Ideon and Oulu on the other hand, are quite distinguishable.

### 3.1.2. How and what they teach at business incubators

The first important principle is the **continuous business education**. The project team works with a coach from the first until the last day in the business incubator.

Next, **work with the business coach is mandatory for all projects** that command the business incubator’s services. In fact, training is the main service, provided by the business incubator. If the project team does not have anything to learn, it needs no incubator. The readiness of the project team members to allow a business coach to take part in the start-up establishment and development is a stringent condition to be selected in almost all business incubators considered in this study. A special agreement between the project team and the management company of the business incubator sometimes determines the obligation to work with a business coach and the degree of his authority in the project management.

In contrast to premises rental and office services, training in most of the innovative centers considered here is a **subsidized service, free for the incubator clients**. Despite the fact that coaching fees, as a rule, are the incubator’s second most important source of income after rents (the ratio of the BIC various budget income items in Montpellier may serve as an example - see Chart 8), the common practice is to subsidize these expenses of the business incubator’s clients from the state or municipal budgets.
And finally, training should be individualized. Since this is not a transfer of abstract knowledge about doing business, but about the survival of particular companies, each of which is unique in its own way, the basic form of learning is the work with a business coach who is “attached” to the project and is not changed throughout its life in the business incubator.

«Once we learn the extent to which the project suits us, we begin to work with it on the individual coaching system. An individual business coach works with each project. The work with a coach is mandatory; it is one of the BIC contract conditions with the team project. Three specialists work with the future company at the stage of enterprise establishment. After the establishment - other people work more on the strategy and structure of the enterprise’s operational management.» Catherine Pommier, Director General of the Business Innovation Center in Montpellier Agglomeration.
3.1.3. Where business coaches come from

Training is the most important, but at the same time, the most «low-tech» component of the innovative start-up incubation process. The task of the incubator is not only to transfer entrepreneurial skills, but also entrepreneurial culture. In this case, the entrepreneurial culture is not only the body of knowledge and experience, but also a specific behavioral pattern and approach to solving of problems — first of all, the attitude to risk and understanding of market laws and requirements. As it has been already mentioned, training in a business incubator has extremely practical tasks, and namely, to solve specific problems of a particular company in certain circumstances. Therefore, **training may be useful only if it is conducted in the form of permanent personal communication and not in the form of special courses, lectures and seminars.**

This kind of training can be efficient if one observes three conditions:

- The coach knows in detail the project he is supervising;
- The coach has necessary business skills and personal experience to serve as a guest advisor or senior project manager;
- The coach has the absolute authority in the eyes of the business incubator customers.

The degree of the business coach’s authority may vary in different innovation centers. The coach can act as a personal advisor as in some business incubators operating in the Swedish Ideon or Finnish industrial parks, or as an independent guest director, as for example in Montpellier and Hong Kong. In some cases, a business coach can fulfill almost the same functions as a business angel - thus, it happens often in Ideon that a business coach invests his private funds into the project he must supervise. However, in other innovation centers, for example in the BIC Montpellier Agglomeration such a combination of functions is seen as a conflict of interests.

In the light of the above mentioned, it is clear that professional advisers and teachers of business administration with no personal experience, are unlikely to execute this work. Therefore, the search for good coaches is both the most important and most difficult task to establish an efficient business incubator — one needs to find successful entrepreneurs and managers who are ready to engage in teaching on a regular basis.

As the activity analysis of business incubators, covered by this study, shows, **successful business coaches are usually recruited from three main sources:**

- entrepreneurs who have sold their business;
- professional top-managers (who have usually completed their career);
- professional coaches who have acquired practical experience during many years of work with projects of this incubator (Montpellier, Begbroke, TusPark, Hong Kong).

Thus, about 70% of the business coaches who work in business incubators and network organizations associated with the technology parks of Ideon (Ideon Innovation, Technopol, CONNECT) previously had their own businesses, about half of them previously held senior managerial positions in large companies, about 25% of them worked as business consultants, and 20% of them invested into technology projects as business angels.4

Here are some brief resumes of salaried business coaches, who are currently working mainly in the Ideon business incubator of Ideon Innovation:

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4 The sum does not equal 100% because, as a rule, one and the same person from the list we have considered could boast, for example, both about experience at a responsible position in a large company, and experience of a business angel investor.
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- **Patrick Soderlund**, senior business coach. One of the founders and general director of the Swedish computer game manufacturer Digital Illusions Creative Entertainment. When the company merged with Electronic Arts (one of the global leaders in video games production), he was appointed senior vice president and general manager of a group in Electronic Arts (Senior VP of EA Games Europe). After his resignation – he became head of the business coaches group at Ideon Innovation.

- **Mats Dunmar**, business coach. He worked his way up from an ordinary manager of IT projects in IKEA to the head of his own consulting company.

- **Philip Diab**, business coach. He worked his way up from an ordinary manager to the managing partner in a large Swedish software company. He closed several deals on merger and acquisition at this position. When the company was successfully launched at a stock exchange, he sold his share and set up his own consulting company.

- **Ola Andersson**, business coach. He had been working as the general director of a large publishing house in Denmark for over 10 years. Then he took part as an initiator or an investor in several start-ups in the IT field, developing databases, SMS-services and platforms for electronic trading.

- **Erik Larsson**, business coach. In the past, vice president of the consulting company Lunicor. This company is owned by the University of Lund and specializes in market research.

>“It is not easy to find a good business coach. These may be people who have worked for 20-30 years in companies like Tetra Pak, Ericsson and others. They became tired and they want to work with young people and new companies, as this is more interesting to them. These can be business angels too.”

**Thomas Möller**, general director the management company of the Ideon Technological Park

Some experts work on a permanent basis in the industrial park, and others are additionally attracted as advisors. Naturally, they are additionally paid. In general, attracting good staff is just a matter of money.

**Sven-Thore Holm**, general director of Lundavision AB, founder of the Ideon Technology Park, Lund, Sweden

Solving the problem of attracting such specialists to work with the business incubator has two components. First, it is the willingness of the business incubator management company to incur substantial costs for the labor remuneration of the business coaches. According to most of the respondents, these specialists are expensive. Savings on coaches’ salaries are useless - the price is directly related to the quality in this case.

Second, the market of such services must be established – the work of a business coach should be considered as an option to continue a career by a wide range of candidates. On the one hand, there should be a layer of socially responsible entrepreneurs and top-managers who have made a successful
career and are ready to share their experience. On the other hand, the state and municipalities should create an effective demand for such specialists, providing grants to pay for their labor.

If there is no visible layer of technology entrepreneurs and senior managers in large high-tech companies in the region (simply because high-tech industry is not developed there), the problem becomes much more complicated. For example, they have to literally «grow» their business coaches in BIC Montpellier and TusPark in Beijing – the specialists who do not have their own business and managerial expertise, acquire it during their practical work with the business incubator projects. It takes a long time - for example, it took over ten years to form the staff of the BIC business coaches at Montpellier.

In general, we can say that business training is not one of those managerial know-hows that can be easily replicated. Every time, the formation of a business coaching staff is a unique task, which is solved in accordance with the possibilities of both the incubator itself and the region in which it is located.

How to make business training effective

- The only effective form of business education in an incubator is individual training, which is assigned to the business coach of the project
- The teachers of business administration and advisors are typically bad coaches - they have no personal experience of doing business or management. Good business coaches come from successful entrepreneurs, managers, and in exceptional cases - from the business incubator’s specialists, who acquired the necessary practical experience during many years of work with innovative start-ups.
- Good business coaches are expensive. It is useless to save money on their salaries, since the price is directly related to quality in this case.
- The role of the state is to create a sound demand for business coaches services by subsidizing the costs of their salaries.

3.1.4. How to motivate business coaches

Even a brief acquaintance with the business coaches’ CVs mentioned above, the ones who work in innovation centers described in this note, will inevitably raise the question: what prevents these people, who know so well how to build an effective technological enterprise, use their knowledge and experience and set up their own company? Or, are business coaches not those people who have not succeeded in their own business careers, and who know how to do things, but they themselves cannot do them?

Respondents point out four main factors that make this type of activity attractive for successful people.

First, as it was already stated, this work is well paid – a business coach’s salary is usually comparable to the salary of a manager in a large private company in a similar position.

Second, it is an opportunity to expand personal relationships with investors, research centers and technology companies, both new and large, using the business incubator contacts and the networks created around it.
Third, it is access to insider information and the possibility to monitor technological innovations before they appear in the market.

Finally, fourth, this work is prestigious. Due to many years of fruitful work with the media, which is done both by innovation centers, and state and municipal authorities responsible for the innovative development, the society perceives training in a business incubator as a socially useful, demanding and prestigious job. The coaches who have come to the incubator from business are highly respected members of society, with a high social status, who are perceived as part of the managerial elite, which has a socially important mission.

Thus, the position of a business coach in a well-known innovation center (e.g. the Ideon Research Park or the industrial park Oulu in Finland) is, on the one hand, an excellent «pre-retirement» option for experienced top-managers and entrepreneurs who left business to continue their career (a kind of «second youth»), and on the other hand, such a position can be used as a springboard to technology business advisors, as well as for the young (35-40 years), but experienced entrepreneurs and venture investors.

«This work is very interesting in terms of the intellect, because our business coaches are familiar with every new thing that appears at the market in the near future. They like being involved in 20 projects at the same time, instead of one and the same boring thing. They learn different strategies, meet different people. Moreover, business coaches have the opportunity to substantially enlarge the number of their own contacts with investors, industry experts, and networks that support innovation business».

_Catherine Pommier, general director of the Business Innovation Center in Montpellier Agglomeration_

«There are hundreds of people across the country who are interested in working as business coaches in business incubators. Many of them are tired of their business, they are selling their companies. They want to work with newcomers and share their knowledge. Moreover, they are paid for their work at the market level».

_Sven-Thore Holm, general director of Lundavision AB, founder of the Ideon Technology Park, Lund, Sweden_

**Motivating entrepreneurs and managers:**

- Competitive salary
- Expansion of personal relationships through work at the innovation center
- Access to inside information and information about the latest technological innovations and market trends
- The status value of such work in the eyes of society
3.2. Business incubators: a hotel or an education and service center

The problem of comfortable premises search is not by accident at the last place among business incubation technologies. Contrary to the belief, widespread in our country, as well as in several other countries that have recently initiated the development of the innovation infrastructure, the term «business incubator» has a very close relationship to real estate.

The business incubator residents of the innovation centers considered in this study receive no benefits and subsidies to pay for leasing office and laboratory premises. As a rule, this is the average market rental rate, though sometimes it may be even a little bit higher than the average market rate in the region. For example, the residents of BIC Montpellier Agglomeration business incubators pay about 200 euros per square meter per year for office premises, while in some business centers located in suburban areas (i.e. close to the BIC incubators), you can find an office for 180-190 euros per square meter per year.

Moreover, other key issues of innovative start-ups, which are mentioned above, and namely the lack of business skills, the lack of external funding and the lack of relationships with partners and potential customers, can be actually solved without being associated with a particular place. This approach is most typical for Scandinavian countries. Moreover, there is a sort of division of labor between organizations involved in supporting innovative start-ups in Sweden, when a structure, such as the private-public organization Technopol, which does not have its own business incubators, but offers some services (for example, business coaches) for the residents of other business incubators.

Respondents agreed that the main function of business incubators is not to supply start-ups with office premises, but to solve other three key tasks – to teach business skills, to attract funds and to establish horizontal relationships.

As for the premises, they function rather as a place for communication than an office real estate complex. This approach in its purest form is implemented in the Ideon Research Park (Lund, Sweden). There are four business incubators in Ideon, only two of which - Ideon Innovation and Ideon Bioincubator – are institutionally connected with the industrial park management company. The other two are controlled and funded by the University of Lund (VentureLab) and non-government organization (CONNECT), specializing in mass business support and development in general and innovative entrepreneurship in particular. The offices for start-up companies actually occupy only a small part of space in the building called Agora, which was built for business incubators. It should be noted that these are rather ascetic offices, which are rented out at a fairly high rate, at least, such an office can be rented at a lower price outside the industrial park. The building is designed so that its most part houses small rooms, cafes and equipped «corners» for negotiations, business meetings or simply to communicate with colleagues. The business incubator clients can use these facilities for a token payment or even free of charge.

Thus, their task is not to provide innovative start-ups with offices, but to create a comfortable place for communication, located close to the offices of business incubator management companies, the industrial park buildings, which house larger companies, R&D centers, a number of transnational high-tech corporations (first of all, Sony-Ericsson and AstraZeneca), as well as laboratories and research centers of one of the largest Swedish universities. Business coaches have the possibility to work with the business incubator clients in common meeting rooms and on common spaces located in Agora.
A similar decision was made in the Business Innovation Center Montpellier, where they organized office premises as well as about ten “common” offices equipped with computers and necessary office appliances, which companies or project teams — BIC residents can rent free of charge for a few hours or a day. This service is first of all designed for project teams — newcomers that still cannot afford to rent even a small office in one of the BIC business incubators. These common offices are typically used for business meetings and conferences.

«Business Incubator is not only an office or a laboratory; it is also the coaching for companies. All services are individualized and provided by true specialists».

Thomas Møller, general director of the management company of the Ideon Research Park

«Finnish industrial parks provide the business environment mostly for start-ups and small and medium-sized companies. Most industrial parks have business incubators. This is not a place, but a process. The most important thing that an industrial park or a business incubator should do is to help its clients develop their business knowledge and skills, push them to grow and raise their level of ambition and aspiration, and help in financial matters.»

Mervi Käki, managing director and chief consultant at InnoPraxis International Ltd. Founder and former CEO of Technopolis Capital Region, Helsinki, Finland

«The building is not the point. The main thing is its equipment. Politicians like solemn opening ceremonies of beautiful buildings, but a beautiful building is not a technology park. Technology parks and business incubators — are the internal structures. Many industrial parks actually look unattractive, but their equipment is gorgeous and they have fantastic products. Both products and services of these parks, not buildings themselves, are in demand by customers of these industrial park companies».

Pertti Huuskonen, co-founder and chairman of the board of directors of Technopolis, Finland

Another important principle to organize the work of a business incubator — a new innovative company should be provided with the facilities and services which it really needs at the moment.

Since the rental cost of office and laboratory premises is either equal to or higher than the average market cost in most of the analyzed innovation centers, such an approach allows novice innovative companies to save money, without reducing the quality of service and comfort, as well as rationally using available space and resources of the technology park or incubator.

This primarily refers to the arrangement of laboratory and office premises in incubators and technology parks. All technology parks and innovation incubators covered by this study have the possibility to quickly redesign office and laboratory premises in accordance with a particular project’s needs. As a result, an industrial park or an incubator can offer its residents, for example, laboratory
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premises from 30 - 60 square meters to 500 square meters or more. In addition, these laboratories are provided with the same set of equipment and services. If a company begins to expand, its laboratory and office expand along with it. The redesign of premises takes from one to four months (in the case of laboratories for biotechnology research). To provide this flexibility, most management companies in European industrial parks either have to constantly involve architectural companies, or hire an architect.

Innovation centers in developing countries, which are forced to withstand the extremely fierce competition for qualified specialists and long-term projects with colleagues from developed countries, «tune» services to the needs of a particular enterprise «manually». In particular, the industrial parks that operate in the HSTPC of Hong Kong have a special Business Development Group, whose mission is to adopt the service support to the needs of each project. We mean the full range of services - from technological support and organization of advertising campaigns to office services.

Table 6. Technologies used by innovation centers in the field of innovative start-ups training and improvement

<table>
<thead>
<tr>
<th>Innovation Center</th>
<th>Business education and entrepreneurial culture transfer</th>
<th>Provision of comfortable office and laboratory premises at a reasonable price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Park, Oxford University Begbroke, UK</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Technological park Technopolis, Oulu, Finland</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Montpellier Agglomeration, France</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Technological park Ideon, Lund, Sweden</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Dedok Science Park, South Korea</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Biopolis in the Science Park One North, Singapore</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>TusPark (Science Park at Tsinghua University), Beijing, China</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Science and Technology Park of Hong Kong</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

How a business incubator differs from the usual office center:

- Business Incubator is not a hotel for business, but a service and educational center.
- The business incubator needs premises to create comfortable grounds for communication, rather than to provide its customers with offices.
- A novice innovative company should be provided only with the premises and services that it really needs at the moment.
CHAPTER 4
ATTRACTING EXTERNAL FUNDING
FOR INNOVATION PROJECTS

The majority of efficient innovation centers have mixed programs of start-up financial support that involve the use of public funds as well as the capital of private investors. In the latter case we are talking about a so-called venture capital, which played a significant role in the high-tech sector development in recent decades. Silicon Valley is a well-known example of the implementation of this interaction model. A self-supporting process of reinvesting the incomes of new high-tech industries into new innovation developments appeared as a result of a combination of unique factors. However, despite numerous attempts to reproduce this model in other regions of the world, none of them can be considered successful yet.

Besides this, one can hardly count on the appearance of a «Silicon Valley 2» in the near future — the situation with the involvement of the private venture capital has seriously deteriorated because of the current financial and economic crisis. Thus, according to Peter Dobson, the founder of the science park of Oxford University Begbroke, since 2008, venture capital funds of the United States and Great Britain virtually stopped investing in British projects. Therefore, to solve the problem of funding shortage, technology parks have to look for:

• optional investment schemes;
• the creation of a «climate» that will be the most intuitive and friendly for investors.

4.1. How to attract private investments into programs of shared financing and conditional repayment financing for start-ups

The need to financially support innovative projects by means of government grants and funding programs (grants, participation financing, soft loans) is recognized today in almost all the countries that pursue an active policy of innovative development. The need for such programs is recognized by specialists from the countries where they do not exist or the amount of funding is definitely insufficient. In particular, Peter Dobson, academic director of the Oxford University Science Park, says that the lack of grant and participation financing sources is one of the main factors which limit the number of start-ups and lead to a high «infant mortality» among novice projects (85-90%) in the UK.

The problem of innovation projects financing at the pre-investment stage of their development is successfully solved by national government programs of innovative business financial support in most countries, where studied innovation centers operate. Thus, Sweden and Finland are among the world leaders in terms of participation and grant financing of innovative start-ups, in per capita terms, due to the programs of government agencies Innovationbrum and TEKES.

However, the amount and form of these financing types are sometimes insufficient, which is a great problem for innovation center leaders - such issues are beyond the competence of both the management companies and regional authorities and municipalities. In such a case, regions and innovation centers themselves have to develop their own financing instruments for start-up projects that could compensate for the lack of funding for national programs.

One such tool was developed in the Montpellier Agglomeration — this is the Crealia Foundation, which provides grants for novice innovative projects, including those who are not registered as a legal entity. We emphasize that it is a public-private foundation that is Agglomeration managed to attract private investments into the foundation, which is non-profit by definition.
We want to make it understood from the very beginning, that it was possible to establish this foundation due to the EU programs for regional and innovative entrepreneurship development. Essentially, the Foundation practical tasks are to «match» the funds provided by the EU, as one of the main conditions of almost all EU programs is co-financing from the regional budget and private investment sources.

The Crealia Foundation draws funds in the following way. The European Union and Montpellier Agglomeration provide about 60% of the foundation funds. The remaining 40% are provided by private companies. In addition to the image component, such companies get very tangible benefits when they pay local taxes (see Chart 2).

The Crealia Foundation finances start-up technology enterprises and projects, which are not registered as legal entities in the form of interest-free loans for up to 3 years. The foundation does not require project participants’ personal guarantees, nor other types of collateral. That is, in fact, we are talking about so-called soft loans - loans that are repaid only in case of project success. The borrowers are subject to no sanctions if they do not succeed.

This form of support is used in several countries, particularly in Sweden. However, unlike Crealia, these loans are, as a rule, provided on a reimbursable basis by government development institutions. It should be noted that the share of problem loans in the programs of the Swedish Agency Innovationbrum and Crealia are almost the same - 15% and 20% respectively.

**Chart 2. Scheme to attract funds to the public-private foundation Crealia (Montpellier Agglomeration)**

- Financing of innovative projects at early development stages must be carried out by government grant programs and participation financing, as well as by means of soft loans. The vast majority of projects do not reach their seed stage if the amount of such financing is insufficient.
- The problem of lack of funding for national grant programs and participation financing can be solved by the establishment of regional public-private foundations, engaged in grant support of start-up innovative projects. Private investors are willing to invest in such foundations in exchange for beneficial regional and municipal taxation rulers.
4.2. Attracting funding from unqualified investors

It is also possible to expand the range of potential sources of external financing by attracting funds from unqualified investors. The term “unskilled investor” may refer in this context to both large institutional investors, and private small ones. The unifying feature is that they lack previous experience of innovative project financing. The combination of high risk at early stages of innovation project development, lack of experience and adequate investment tools used to create an insurmountable barrier for unqualified investors’ money to penetrate into the innovative sector. Anyway, this was until recently. The situation is changing now, as is evidenced by the experience of Hong Kong Science and Technology Park and Lund Ideon Industrial Park.

The problem of attracting venture capital was one of the most acute since the Hong Kong Science and Technology Park was established. “Hong Kong is a financial center. We do not suffer from a lack of money, but unfortunately, we do lack all types of venture capital and business angel funds, because there are too many possibilities in Hong Kong, more precisely, in China and Asia. One typically invests money in already established businesses, in the companies that have been already formed and are established on the market. We have to compete for investment with banking operations, the retail sector, electronics manufacturers, etc. It is obvious that their predictability and the speed of account turnover are much higher, so we are forced to seek non-standard arguments to persuade investors», said Anthony Tan, CEO of the Hong Kong Science and Technology Parks Corporation.

The way out was the formation of a special «package» investment scheme, focused on large entrepreneurs, manufacturers of original equipment, who have accumulated a lot of money over the past 30 years. There are two most difficult problems under the traditional approach to the attraction of this type of investors - the risk level and the payback period. A special investment scheme can reduce the risk level of investments by the formation of a pool of start-up stocks which specialize in the development of a specific family of technologies. Instead of investing in a particular company, whose fate can be hardly predicted, the investor gets an opportunity to invest in the development of an entire cluster of companies working on a certain topic in the industrial park. It is important to mention that the industrial park is a co-owner (less than 5% of authorized capital) of all the start-ups that are included in the investment pool. Thus, investors have an additional guarantee of proper supervision and control of the effectiveness of their investments. According to Tan, in terms of competitiveness, their offer may be compared with investments in traditional pension funds by reducing the risk level.

In the Swedish Ideon Technology Park the scheme to attract unqualified investors is much different and it is based on the use of the individuals’ funds. According to Thomas Moller, general director of the management company of the Ideon Science Park, he began the formation of the seed foundation TeknoSeed as he looked through the list of the largest taxpayers in the city – this was obtained from the tax authorities. Then Ideon sent its proposals to 400 of the richest people in Lund - whether they would like to invest in the seed fund and thus promote the development of their city? «I did not expect that 550 people would say “yes”. We told them about the fund’s strategy - and they liked it. They invested not much - about one thousand euros each. I am a member of the Managing Board of Directors, it is headed by the Governor of Skone,» says Thomas Moller.

It should be noted that the success of attracting funds to TeknoSeed was largely caused by the fact that both private investors and large institutional investors Lansforsakringar Skane, Sparbanken Finn, IKANO, and Innovationbrum invested into it, their investments amounted to about 50% of fund’s assets.
One of the ways to attract funds of unqualified investors, who do not have experience in venture investments, is to establish a foundation for joint investments into Innovation Center projects, with the participation of large and specialized venture funds or the state. Risk-sharing mechanisms in such funds may be the participation of the innovation center’s management company in the projects’ capital, government guarantees or the participation of senior government officials in the administration bodies of the foundation.

4.3. How to gather loyal investors

Efficient mediation and establishment of communications among resident companies on the one hand, and venture investors and business angels on the other hand, is an essential condition for the innovation center’s success, and one of its most important functions.

This mediation can be fully successful under two conditions - the availability of sound demand for this type of investment (a sufficient number of «quality» promising projects, properly prepared and understandable to investors), and sufficient supply.

Management companies make significant efforts to form a steady pool of investors around innovation centers, those people and entities that are willing to invest into projects housed there. The presence of such an informal pool greatly facilitates resident companies’ access to venture capital, as its investors are primarily focused on the work with projects of this innovative center, are loyal to it, have constant informal contacts with the leaders of both the management company and individual projects, are informed about resident companies’ development and prospects, and trust the project selection procedures and methodologies of their support that are used in the center. We emphasize that there are no universal technologies to form a pool of investors loyal to an innovation center.

If we talk about European innovation centers, such pools usually include 20-40 investors. We are basically talking about business angels, but such pools usually include private venture funds and even banks. Thus, 43-44 investors constantly take part in the activities of the Business Innovation Center Montpellier Agglomeration, including project presentations. About 20 major private investors and venture funds make up the core of the business angel community in Oulu (Finland). The pool of investors, those that work with Oxford Begbroke Science Park, also includes about 20 individual investors.

Government-sponsored national networks of venture investors and business angels play an important role, assisted by state-supported institutions of development. Nevertheless, as experience shows, it is practically impossible to create a stable pool of venture investors and business angels loyal to an innovation center.

Personal relationships and contacts of leaders of management companies (in the case of Montpellier Agglomeration - responsible municipal officials), as well as contacts within the communities of investors that have been already formed in the region, (in fact, informal clubs) are of great importance for the formation of a pool of investors focused on the work with the innovation center project. In particular, the majority of active business angels in Oulu – usually retired business owners or top-managers of large corporations such as Nokia Mobile, Ciberbit or CCC - are former members or alumni of the Faculty of Electrical engineering of the local university, as well as the VTT Research Center located in the city. The same can be said about many leaders of the management company
of the industrial park Technopolis Oulu. As a rule, these people have known one another for more than 30-35 years.

In Ideon, the pool of investors has been formed mainly due to personal contacts of the technology park founder Sven-Thore Holm. The pool of investors around the Oxford Begbroke Science Park has been formed in a similar way - the majority of active business angels, who have worked with Begbroke projects, and are loyal to it, are former students of the industrial park, founder Peter Dobson, owners of companies that have already left the industrial park, members of Oxford University informal student and entrepreneur societies (for example, the Oxford Entrepreneurs Society, Brotherhood of entrepreneurs, etc.), Professor Dobson is also a member of these societies.

The importance of such contacts has significantly increased in recent years as business angel investment plays an increasingly important role against, as it has been already mentioned above, the stagnation of the venture investment market caused by the current financial and economic crisis.

Thus, the fact that leaders of the innovation center management company have extensive personal contacts among venture fund managers, operating and potential business angels, is one of the key conditions for effective work of managers who hold such positions in a number of leading innovation centers.

- The formation of a pool of investors that are loyal to the Innovation Center is one of the most efficient ways to facilitate the resident companies’ access to the venture and business angel investment.
- These kind of investment pools are formed and maintained usually by personal contacts of the managers of the innovation centers management companies.

«Managers of venture companies, when they look for new projects, come to me. They ask to arrange a meeting with the best ones. One can talk about both the competition of projects, and the competition of investors. It depends on whether we are experiencing a crisis or not. When the economic situation is favorable, managers themselves call me. If we are in a downturn, I call them.»

Thomas Møller, general director of the management company of the Ideon Technological Park

«Technology parks must have contacts, know every venture investor in the country and arrange meetings between investors and companies. The of course, technology parks can help most by promoting the companies’ development mainly by the organization of such meetings. They organize meetings with investors, clients, potential customers, make people acquainted with the market and help them to understand how social networks work and how contacts are established. A business environment is developed in such a way».

Mervi Kaki, managing director and chief consultant at InnoPraxis International Ltd. The founder and former CEO of Technopolis Capital Region, Helsinki, Finland
4.4. How to carry out effective meetings with investors

Regular meetings of innovation center residents with potential investors and presentations are the most common tool used to attract venture and business angel investments to innovation center projects. This tool is very efficient in most innovative centers. According to the interviewed experts from Montpellier and Lund, such presentations result in that project teams receive about a dozen invitations to individual meetings with potential investors and eventually receive 6-7 preliminary proposals to organize quite meaningful negotiations. That is, we have a very favorable situation for an innovative enterprise when several investors compete for a promising project.

How do they manage to win the investors’ confidence in the projects they know almost nothing about? The main factor is confidence in the quality of the procedures used in the innovation center, as well as in the quality of the project’s preparation. In fact, business education programs, project selection procedures and organization of such meetings are considered to be a tool that reduces the investors’ risks. The project submitted by an innovation center and admitted to such presentations, is beforehand perceived by potential investors as well-prepared and promising. This is possible if the following conditions are fulfilled:

- Qualitative and transparent project selection procedures in the innovation center business incubators or a serious competition between the projects (a queue) for a place in the innovation center, which «automatically» provides a selection of the best ones. The investor must be confident that the project, which has become a resident of the innovation center, is a quality project.

- Meetings with investors, presentations for these meetings, preparation of business plans of projects is an integral part of business training programs at the incubation stage. The authority of a particular business coach, in the eyes of investors, that is working on the project whose team is not known outside the business incubator. In addition, another important point - business planning and development of a management and organizational structure of a start-up company is beforehand made fit the requirements, which specific investors may have set.

- An organization that conducts such meetings, ensures that only prepared projects – those with a developed business plan that is clear to potential investors, with a functioning organizational structure, those that understand their marketing strategy - will be allowed to take part in presentations. It is an additional tool to reduce risks for investors who are focused on the work with the incubator and IC projects, and trust in the mechanisms developed there for the project preparation and selection. In fact, the structure which conducts business trainings and project presentations, assumes part of the work on risk management implementation. The problem is that investors should have confidence in the quality of the work.

**Conditions of efficient work on establishing communications between resident companies-resident of the innovation center and investors:**

- Qualitative and transparent project selection procedures in the innovation center
- Meetings with investors, presentations for these meetings, preparation of business plans of projects, all are an integral part of business training programs at the incubation stage.
- The project selection procedures for presentations, as well as the quality of business education and project support in the innovation center, must enjoy investors’ confidence, be clear to them and perceived as a mechanism to reduce investment risks.
### Table 7. Key challenges and approaches used by innovation centers to address the problem of innovative development financing

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient amounts of grant and equity funding for projects at the pre-seed stage by national programs of innovative business support.</td>
<td>The attraction of private investments to the programs of grant financing of projects at the pre-seed stage. 1. The formation of a pool of the investors who are loyal to the innovation center. 2. Regular meetings with investors, the preparation of which is an integral part of individual business training programs for each project. 3. Transparent project selection procedures that can be easily understood by investors which are allowed to participate in meetings with investors.</td>
</tr>
<tr>
<td>Investors perceive risks of investment into the innovation center projects as excessive, the lack of reliable information about the projects; project teams do not have skills to present their projects to investors.</td>
<td>The development of special investment schemes that allow attracting unqualified investors’ funds.</td>
</tr>
<tr>
<td>Deficiency of venture and business angel investments, unattractive venture investments compared with other types of investment.</td>
<td></td>
</tr>
</tbody>
</table>

### Table 8. Technologies, used by innovation centers to solve the problems of innovative development financing

<table>
<thead>
<tr>
<th>Innovation Center</th>
<th>The attraction of private investments to the programs of grant financing of projects in the development stage</th>
<th>The development of special investment schemes that allow attracting unqualified investors’ funds.</th>
<th>The organization of contacts between potential investors and resident projects of the innovation center</th>
<th>Regular meetings with investors, the preparation of which is an integral part of individual business training programs for each project</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Park, Oxford University Begbroke, UK</td>
<td>-</td>
<td></td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Technological park Technopolis, Oulu, Finland</td>
<td>-</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Montpellier Agglomeration, France</td>
<td>+</td>
<td></td>
<td>-</td>
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<tr>
<td>Technological park Ideon, Lund, Sweden</td>
<td>-</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
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<tr>
<td>Daedeok Science Park, South Korea</td>
<td>-</td>
<td></td>
<td>-</td>
<td>+</td>
<td></td>
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<tr>
<td>Biopolis in the Science Park One North, Singapore</td>
<td>-</td>
<td></td>
<td>-</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>TusPark (Science Park at Tsinghua University), Beijing, China</td>
<td>-</td>
<td></td>
<td>-</td>
<td>+</td>
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</tr>
<tr>
<td>Science and Technology Park of Hong Kong</td>
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</tbody>
</table>
CHAPTER 5

BUILDING HORIZONTAL TIES
WITHIN AN INNOVATION SYSTEM

The formation of horizontal links between the participants of the innovation system – researchers, innovative entrepreneurs, venture investors and institutions to support innovative entrepreneurship – a key and necessary condition for a successful innovation center. Innovation ecosystem, the occurrence of which distinguishes successful projects from unsuccessful innovation centers, in fact, is the interweaving of many personal contacts and relationships between all stakeholders.

Mechanisms to encourage the emergence of horizontal ties, contribute to the formation and accumulation of «social capital» – raising the level of confidence and awareness of each other by the actors in the innovation system, thereby decreasing the costs of cooperation. This is about reducing not only time-losses (through direct contact one can quickly obtain the necessary information, agree to cooperate, find partners and employees), but the financial costs as well, as based on personal contacts and mutual trust allows on to receive business cooperation for mutual benefit, and necessary services information cheaper or even for free.

Horizontal and networking ties play a key role in the development of an innovation center, regardless of its degree of maturity. At the beginning of innovation centers, the main task is to catch-up with the development of such ties in order to compensate for the shortcomings of the institutional environment, and this is necessary in the first place, to enhance mutual trust between the participants of the innovation ecosystems. In the mature network of innovation centers, the horizontal linkages are an additional catalyst for the development of relevant industries, which saves time and cost to establish business cooperation.

«University laboratories, university professors are extremely independent, which means that the most important level of interaction – is not the highest, and is not between the chiefs. This is not the interaction between our chief operations director and the president of the University. This is not the most important level. Of course, it is important that good relations exist between us, but the most important level of interaction - is still among the companies and laboratories. That is, extremely important direct contacts between laboratories and companies.»

Pertti Huuskonen, co-founder and chairman of the board of directors of Technopolis, Finland

5.1. What problems can be solved by horizontal ties?

In general, tools and management techniques used to stimulate the creation of horizontal links are designed to address four key challenges to building an effective innovation ecosystem.

- Lack of information that participants of the innovation system have about each other, as well as about the situation in their respective markets, trends in technology.

- The lack of mechanisms and sites for the permanent establishment of personal and business contacts. This problem is compounded by the fact that the backbone of the innovation system –
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are small and micro enterprises, lacking sufficiently tried and tested business experience. The scope of their business contacts, as a rule, is fairly narrow. Even if the head of the start-up company is willing and able to cooperate, he is often simply not able to reach the necessary people who know anything about his project, or about him.

- Lack of trust. From the perspective of investors, the technology business is a high-risk investment object, particularly during the start-up stage. In addition, for beginners there is a risk unprofitable investment transactions, leaks of information about the technologies and know-how, etc.

- The problem of status. Various members of the innovation system are at different levels of the social and business hierarchy. Most clearly, this problem manifests itself in the relationship between starting innovative enterprises on the one hand, and large companies and investment funds, on the other. Unknown head of the novice technological enterprise, which could potentially be interested in a large corporation or a major venture investor, often does not know how to draw the attention of the «senior».

5.2. Innovation center as a referee

The simplest and most obvious way to stimulate the creation of horizontal links between different actors of the innovation system — is to gather them under one roof. This greatly simplifies the task of not only the creation of a platform for communication⁵, but also creates conditions for increasing the capitalization of each resident company of the innovation center, which in turn facilitates the innovation center’s referee function for the resident companies. The vast majority of experts stress the importance of regular personal contact between managers, asset managers of innovation centers with all the relevant members of the regional innovation system.

These are, first of all, universities, research centers, large corporations, venture investors and government agencies engaged in supporting business innovation. Moreover, these contacts should be maintained not only and not with the leaders at the top, but also directly with those who may be helpful to the beginner innovative enterprise. The use of such bonds greatly enhances not only the innovation center’s opportunities, but also the start-ups located there. The innovation center and its managers «bestow» their personal contacts and reputation on novice entrepreneurs. The ability to obtain advice and to communicate directly with the desired person or organization is often more important than the financial or advisory support.

In particular, in the Science Park, Begbroke Oxford University problems related to lack of the necessary scientific equipment in the industrial park needed by a project, are not dealt with by an official request addressed to the leadership of the university or the faculty, but a telephone call to the appropriate laboratory of the university. These calls are made by Peter Dobson himself, who has held a professorial position at the University for over 30 years and personally knows all the teachers and researchers specializing in the natural sciences, or upon his recommendation - the administrators of the business incubator.

The problem of finding cheap accommodation for project teams that have not yet launched a start-up and cannot afford to rent offices and laboratories directly at the Business Innovation Center of Montpellier Agglomeration, is solved the same way - a phone call by the Director of the BIC, Katrina Pommer, to the administration of one of the three universities of Montpellier, or directly to the heads of university laboratories.

⁵ For details see Chapter 6.
«If you can establish contacts between people working in different organizations in different countries, then this is a great way to make the system work - and this is almost free. If you have an Internet relationship and from time to time you made efforts to meet each other, the rest happens by itself. This is much better than an organized process of negotiations and discussions at the highest level.»

*Peter Dobson*, founder and academic director of Begbroke Science Park, Oxford University

«Co-operation - that is what is working and bearing fruit. This is co-operation between the companies - big companies, small companies, medium-sized companies, universities, research centers, with the state, and with the city government. However, this collaboration does not happen by itself, automatically. This is where technology parks play a huge role - they establish cooperation... The most important places in the industrial parks – are their restaurants.»

*Pertti Huuskonen*, co-founder and chairman of the Board of Directors of Technopolis

«Companies are paying for rent in the business incubator at market rates. However, the company is not required to immediately move here. If this is a young company with no money to pay, we try to negotiate with the universities so that they provide such companies with a room next to one of the laboratories. Then, as soon as they receive some kind of revenue, they move here.»

*Catherine Pommier*, director of the Business Innovation Center in Montpellier Agglomeration

- The easiest way to stimulate the emergence of horizontal ties between the participants of the innovation system is to gather them all under one roof.
- The most important function of the management company of an innovation center is to «share» its ties and reputation with its resident companies, and act as an intermediary and referee between them and their potential partners.

### 5.3. Autonomous networking organizations

Another important tool to create horizontal linkages among the participants of the innovation system in a number of innovation centers that we have considered are autonomous networking organizations (specialized networks). Typically, these types of network structures were formed around one or another «reference» of the Institute - most often they were universities, technology parks, as well as regional and municipal government agencies responsible for conducting the innovation policy. Sometimes the network organization is used as an instrument of national innovation policy. One example is a program in Finland, the OSCE, which resulted in research centers and R & D centers of private companies being merged in the network of «centers of expertise» on the six priority areas of technological development.
However, networks serving the entire innovation system created on the state initiative are rather an exception then the common practice. Network organizations we know as a rule serve the needs of regional innovation system participants and are formed around the regional institutions mentioned above. Moreover, the story of the most successful networks shows that, having reached maturity, they, as a rule, free themselves from institutional control and become financially self-sufficient and self-managing organizations.

One of the most striking examples of such specialized network companies, which unite and serve the members of an innovation system, is the Connect network, operating in San Diego region, South California. Largely due to Connect, during recent years San Diego has started to win the competition against its famous nearby rival Silicon Valley. The network was started in 1985 by University of California, San Diego in order to develop technical entrepreneurship in the region, as at that time South California was not participating in the technological boom, and in its development of the high tech sector, lagged behind Southern San Francisco region and Palo Alto (the Silicon Valley).

In 2005, the Connect network left the University structure and was reorganized into two non-profit organizations (this was done because of specific American laws regarding non-profit organizations), whose activities are coordinated by two boards of directors partially composed of the same members.

The network, with an annual budget of about 3 million dollars, is financially fully self-sufficient. About a half of its income consists of membership fees paid by permanent members – big companies, service providers (consulting, audit, law firms, and patent agents), research institutes and venture funds. The rest consists of additional fees paid by permanent members for individual services not included in the corresponding membership packages, incomes from sale of entrance tickets for events held at the Connect, and some small grants provided mainly by private foundations.

Today the network unites 18,000 companies and organizations of the region – from start-ups to big venture funds, high tech corporations and backbone organizations including the San Diego University. More than 10 billion dollars of venture investments were attracted to innovation start-ups through the intermediary work of Connect, and more than 3,000 start-ups used its services. The network is recognized as one of the most efficient organizations of this type in the world. During the last 15 years, more than 10 analogues (franchises, in fact) of the network have been created in other countries, e.g. the Connect network in Swedish province of Skone, where one of the innovation centers we researched is situated – the Ideon science park in the city of Lund.

The network activities are multifaceted – its programs cover practically all spheres of technology and venture business in South California. Here is a short list of the main Connect sectors and programs:

- Assistance in the creation and development of technological companies (individual training of professional practitioners, devoted to technology and other kinds of intellectual property transfer, analyses of perspectives of commercial projects, creation of start-ups, releasing of new products and services to the US and foreign markets).

- Increasing the investment quality of small technological companies (the so called “springboard”: individual training in optimization of company organizational structure, market research and making business-plans that are clear to investors).

- Creation of horizontal connections between investors and innovation companies, attraction of external financing to projects of the network. In this direction the network carries out
a number programs: organization of "investment round tables" (in fact, informal meetings between major venture investors and teams of the best technological start-ups); delivery of data about projects designed for venture investments to venture investors included in a closed database, consulting services in attracting regional and federal grants and participation in shared sponsorship programs, contacts with business angels being members of the San Diego Tech Coast Angels.

- Assistance in formation of high tech company clusters. The network organizes seminars and conferences for companies participating in defense programs; events with the participation of regional companies providing services and working in the outsourcing format ("nearsourcing" development); maintains a database of outsourcing and subcontracting companies, trains network participants to use outsourcing. Moreover, Connect successfully creates sector "subnetworks" unifying high-tech companies and research centers working in similar fields of technological progress. In this way, Connect has created "virtual clusters" of companies specializing in sports industry and rehabilitative medical innovations. Cooperation within such sector networks may take different forms – from the search of business partners for R&D to searching for employees.

- GR, strategic researches, lobbying and participating in national innovation policy formation. Network representatives take part in the work of the US Congress commissions and Federal executive bodies as invited experts in legislative developments, which can have an impact on innovation business activities. A research institute (an association of innovation researchers) was founded within the network, it researches the problems of innovation policy and technology entrepreneurship and development of the innovation environment. The institute publishes the Innovation Institute White Pages – the periodical where the results of the project participants’ research works are published. Connect also organizes annual forums, devoted to innovation policy and development of the innovation environment (Innovation 101 and Policy Forum, CONNECT/Economy Research & Innovation Summit). Finally, the network provides its members with legal assistance in cases concerning Government Purchases and participation in tenders for defense contracts.

- Promotion of regional technological companies on the national and global levels. Entrepreneur Hall of Fame was founded for the most successful tech companies, started in the region, and an annual Prize was also instituted to award the best innovation project.

- Professional training, experience exchange and popularization of tech entrepreneurship in society. This direction comprises regular organizing of Strategic Forum for CEOs of tech companies, regular lectures by entrepreneurs, who received the Annual Connect Prize, in schools and colleges of the region, regular seminars and lectures by leading specialists of the University and private company R&D centers about discoveries and trends in technological development.

- Providing legal and consulting assistance in creating professional sector unions, sector business associations and chambers of commerce and industry in high-tech sectors.

Another striking example of an autonomous network organization, orientated to providing services to innovation system members, is the Tsinghua Alumni Association, TAS, which is an important element of the ecosystem being formed around the Tsinghua University Technopark TusPark (China). Organizationally and legally, it is not associated with the technopark, however, both organizations are situated on neighboring floors of the same building and actively supplement each other in their activities.
The association is of an umbrella pattern, and it is the coordinative center for smaller Tsinghua alumni associations in China and abroad (the USA, Australia, UK, France, Canada, Japan, South America and Africa). Total the number of alumni working abroad, according to TAS estimates, is over 20,000, about a half of them are active members of the association’s local departments.

TAS structure is built according to the functional and sector principles. It carries out:

- Job placement for alumni (there is a kind of Internet exchange of vacancies and applications).
- Organization of meetings, entertainment events, science symposia and business conferences.
- Providing consultations on a wide range of questions (naturalization, professional activities, financial matters, etc.).
- Collecting, generalization and publishing of information about central bodies and departmental activities in periodical newsletters and support of Internet sites where this information is constantly updated.
- Maintaining a database containing all the department members’ contacts.

Sector principle is realized through clubs and associations having no territorial linkage, membership in which is secondary to membership in the territorial organization. At present 9 such clubs and associations are in operation:

- Green technologies (Tsinghua Environmental Industries Club)
- Insurance (Insurance Industry Tsinghua Alumni Association)
- Internet technologies and new media (Tsinghua Alumni Association of Internet and New Media)
- Investments (Tsinghua Alumni Association of Investment Industry Association)
- Real estate (Tsinghua Alumni Association National Association of Realtors)
- Wind power (Wind power, Tsinghua University Alumni Association)
- Hydraulics (Department of Hydraulic Engineering, Tsinghua University Alumni Association)
- Journalism (Tsinghua University Press Alumni Association)
- Automobile Industry (Tsinghua Automotive Industry Alumni Association)

These associations differ considerably in the level and size of their activities, but the majority of their programs include:

- Preparation and publishing of analytical materials about the most important trends of the sector (in January 2012, the Investment club presented a report on investments in pharmaceuticals);
- Organizing of events orientated to the attraction of venture capital (in February 2012, Internet and New Media Association conducted special salon for presentation of their new projects to business angels and venture funds);
- Organization of seminars for further education (in July 2011, Insurance association conducted a seminar devoted to investment strategies).

It is important to note that as opposed to territorial departments, the oldest of which (Californian) was founded in 1936, sector clubs are relatively young structures and were founded during the last two years.
Association financing is based on individual and corporative contributions. Individual membership fees are used to finance local departments, and corporate fees are used to finance central bodies and sector clubs.

In other words, the Tsinghua Alumni Association is a big, multi-branch network of business and personal relations, that provides opportunities for collecting and exchange of information about latest trends and designs, search for qualified specialists and attracting venture financing. As TusPark representatives say, a project created in TAS, later on often becomes a technopark resident, as this permits these projects “not to lose their roots” and continue to benefit from the association’s resources.

In addition, the membership of high-level state officials and powerful entrepreneurs, who used to be Tsinghua students, in the association opens for the technopark additional opportunities for business development. As an example, we were told about the most successful first start-up, which was actually realized on the request of Ministry of Public Security, a government department with a great number of Tsinghua alumni. Formerly China did not have its own technology for the mass production of systems used for revealing hidden metal objects and explosives, known as the “security frame”. However before the Olympic Games of 2008 in Beijing and because of the activity Xinjiang separatists, a decision was made to equip all the most important objects with such devices, and this had to be done without the use imports, but by creating a domestic competitive product.

According to TusPark representatives, the cooperation of State bodies with big business, where Tsinghua alumni work, went on developing very fruitfully after this project.

In Oxford, network organizations uniting members of the innovation system do not have formal organized structure or a legal entity status at all. In English universities the traditions of informal organizations and societies and clubs organized “from below” are very strong. One can remember the joke about an Englishman who got to a desert island and built there two huts. One of them was the club he visited and the other was the club he did not visit. Just such traditional institutions based on personal relations of the members are the main instrument for the formation of horizontal relations between the members of the innovation system, formed around the Begbroke University Technopark and around the University. In particular Begbroke residents receive substantial support (from participation in joint R&D, providing efficient consulting in practically all questions concerning R&D and business management to informal contacts with business angels and venture investors) from such university societies as the Oxford Entrepreneur Society.

The most successful autonomous network organizations, uniting the members of an innovation system, were created around universities and informal university organizations.

“Everything here is based on social networks and societies. For the most questions I am asked by people, I do not take any money. Often I simply introduce people to experts. We also can help students to find financing».

Peter Jobson, founder and academic director of Begbroke Science Park, Oxford University, UK
5.4. Success factors for autonomous networking organizations

In spite of significant differences between the successful autonomous network organizations mentioned above, it is possible to point out a number of factors which contributed to their efficiency and popularity.

**Instruments and possibilities, provided by a network, must meet a user’s needs here and now.** Successful networks use instruments and services already created in one or another form in the regional innovation system. A network can unite only those, who already exist in the real life (and not in the plans of network creators or innovation policy conductors). Otherwise it does not work.

In particular, the basic instrument used by the Connect network in its business education programs and increasing investment quality of start-ups, is individual business-training, by former chief executives, financial officers, marketing directors of technology companies, and also former owners of technological enterprises who left the business. Invitation of such business-trainers, called the «invited entrepreneurs» (Entrepreneurs-in-Residence, EIR) is by no means a unique Connect know-how. In the USA, EIR are widely used as the invited specialists by venture funds, law companies and even business-schools.

The experience of Connect network franchises convincingly shows that attempts to create the instruments of cooperation «in a vacuum», expectations that the subjects of this cooperation will appear thanks to them, and then the created skeleton will become covered with flesh, usually fall apart. So, in those countries, where the private venture investments market is not well-developed and venture culture has not been formed yet, the instruments, facilitating cooperation between start-ups and venture investors (for example, references to their own closed database of venture investors contacts, venture round tables and other instruments about which we will tell about further on) used by the Californian Connect are of no use. For this reason, relying on successful experience of networks, it is important to avoid a blind copying, as this is a direct way to the failure.

**Strong brand and high reputation among all IC participants.** Possessing reputation capital by the network is important not only for involving the widest circle possible of professional participants, including those occupying high positions in the business and social hierarchy. Good reputation and a well-known strong brand permits the network to extend considerably the number of provided services and to increase their quality — if the cooperation with the network is prestigious, it becomes attractive.

As an example we can mention the Connect network of the «invited entrepreneur» again. This network with a permanent staff of a little more than 20 specialists has managed to involve into cooperation more than 1800 volunteers, including top-managers of tech companies, both still working and retired; former owners of tech enterprises who have already left old projects, but have not started new ones yet. Involving such a number of highly skilled and highly paid specialists to unpaid cooperation became possible only because the work with Connect is very prestigious. Participation in the network programs as an «invited entrepreneur» is an important line one’s résumé, helping in further employment or in creating new start-ups, and it is also a kind of admission into the «innovation establishment» of the region.

**Readiness for cooperation by members of the innovation system.** The organizers of the network have to give the potential network participants (in everyday life competing with each other for market share, investments and technologies) the idea, that their voluntary and unpaid cooperation is more profitable than a general war of all against all. The main thesis that must be brought to future network clients is that in growing markets, which are the young high tech markets, everyone will have a place under the
sun, therefore all market participants, without exception, will benefit from the sector’s growth and the appearance of new sectors. That is why to cooperate with competitors within the network’s projects, aimed towards sector development, is not only possible, but also necessary. As Connect experience shows, the most difficult thing is to convince key IC members of this. Nevertheless, as paradoxical as it may sound, to convince large companies and investment funds is much easier, than the teams of numerous start-ups and small tech enterprises that are very vulnerable and operate in a very tough competitive environment.

*Adaptability and flexibility.* A network, orientated to the service of rapidly developing high tech market members, cannot be concentrated on providing the services in one or a few already existing high tech sectors.

One of the Connect success secrets is that this network is sensitive to the changes going on in technological development, the birth of new markets and new sectors. The network creates new virtual clusters and starts new services, as soon as there appears a group of companies operating in a new technology market, having common specific needs and interests.

**Conditions for success of a specialized network for innovation system members:**

- Instruments and possibilities, provided by a network, must satisfy the consumers’ needs in a definite place and in a definite time.
- Strong brand and high reputation among all IC members
- Readiness for cooperation by members of the innovation system
- Adaptability and flexibility.

5.5. Network as an instrument of risk management: a chat or closed club

It is generally assumed that the criteria of social networks success are its coverage and the number of its members. However, as Connect, and experience of its most successful foreign analogues shows, for the specialized networks this statement is not always true.

A successful network, uniting professionals and aimed at facilitating their business contacts, must possess two key characteristics. First, it must enjoy high authority among all the process participants, to represent the association of professionals, apart from the common people. In other words, the network must have a strong brand. Second, it must be considered by them as a really operating and effective instrument for business management. Otherwise it would seem a waste of time, and often money, in participating in the programs of such an organization.

Neither the first nor the second is possible without using the mechanisms or selection of the best (start-ups, venture investors, etc.) or defining of target groups for participating in specialized events. Moreover, many such events can be organized only in an «exclusive club» format. For example, one of the «hits» of Connect network in San Diego is the so-called venture round table (VRT). The aim of these events is not just to acquaint start-up teams with investors, but to organize a meeting of the best beginning innovators with the grandees of the venture industry – managers of the biggest venture funds in the country.

Organization of venture round tables is preceded by a rather complicated procedure of selection – at first Connect consultants from Entrepreneurs-in-Residence conduct a pre-selection of applications –
as a rule, these are submitted by the participants in the «Springboard» programs mentioned above. Then the selection committee consisting of top-managers of major American corporations (for example, among the members of the committee engaged in the selection of start-ups based on new technologies for interaction between man and computer were the top-managers of Hewlett Packard, Lockheed Martin Corporation, Ernst & Young LLP, Wells Fargo, etc.) selects 10 the most perspective projects. Finally, in the last stage a special selection jury, which partially coincides with the composition of the selection committee, selects the best five start-ups out of these ten start-ups. These start-ups are admitted to participating in venture round tables – private meetings with 25 largest venture investors and venture fund managers, which, as a rule, take place in private residences and are carried out through a «by invitation only» format.

In fact, the venture round table copies the model of the exclusive elite clubs, characteristic of the leading American universities: high admission barrier, authoritative jury and the main prize is the opportunity to start personal contacts with the elite representatives who would be inaccessible without the club.

Despite the fact that the strict multilevel selection of pretenders for participating in venture round table leaves the overwhelming majority of start-ups competition participants on the outside (on the average, 60-80 companies apply for each available place), it is the exclusive character of such events (the best meet the best) that considerably increases the practical value of such events and the Connect network’s prestige on the whole. From the point of view of technology start-up teams, the venture round table is the real opportunity to get into the Californian «innovation establishment». The opportunities of the start-ups that managed to go through the start-up selection sieve increase greatly. From one side of the barrier are numerous start-ups, unknown to anyone, and whose perspectives are not clear. From the other side are a selected few, recommended by the best sector experts, and they have the opportunity not only to present their projects to investors managing billions of dollars, in an informal atmosphere, but also, and this is no less important, to start personal acquaintance with these people. It is important that initial opportunities of all competition participants are equal, and they are selected by specialists having unquestionable authority.

As far as large managing venture funds are concerned, multilevel selection of meeting participants held by competent experts considerably saves on time and costs for search of interesting investment ideas. In fact, the competition held by Connect replaces the initial stage of a due diligence start-up seeking investment.

A successful network uniting professionals and aimed to facilitate their business contacts must have two key characteristics.

- To enjoy high authority with all participants of the process, to represent the association of professionals, apart from the common people.
- The network must be considered by professionals as a really operating and effective instrument for business management.

Neither is possible without the use of mechanisms for the selection of the best (start-ups, venture investors, etc.) or selection of target groups for participating in specialized events. Moreover, many of such events can be organized only in the «exclusive club» format.
### Table 9. Basic challenges and approaches, used by innovation centers, for the creation of horizontal connections

<table>
<thead>
<tr>
<th>Problem</th>
<th>Ways of its solution</th>
</tr>
</thead>
</table>
| Lack of information of innovation system members about each other, and about the situation on corresponding markets, trends in technologies development | 1. Uniting innovation companies and university research laboratories under the same roof in technoparks  
2. Organization of joint introductory seminars and lectures by leading researchers, covering the latest trends in development of technologies and science knowledge.  
3. Organization of specialized meetings and conferences for general directors, chief financial officers and marketing directors of technology companies.  
4. Use of the innovation center connections and reputation for recommendations of resident companies. |
| Absence of mechanisms and permanent grounds for starting personal and business contacts. | 1. Creation of comfortable spaces for communications in the technopark  
2. Creation of specialized sector and inter-sector networks (virtual clusters), using social networking technologies  
3. Organization of regular specialized events and conferences for different groups of members of the innovation system |
| Lack of trust between innovation project teams and potential investors, the status problem – differences in position in the social and business hierarchy of beginning innovation companies and their possible partners from venture funds and large companies. | 1. Use of the innovation center connections and reputation for recommendations of resident companies.  
2. «Springboard» programs – meetings of project teams with potential investors after preparation of the project under the guidance of business-trainer  
3. Organization of closed meetings between the pool of investors and projects specially selected as a result of a competition  
4. Creation of networks, uniting the alumni of the anchor University of the innovation center.  
5. Encouraging the creation of informal clubs and societies in the anchor university and innovation center |

### Table 10. Technologies used by innovation centers for creation of horizontal connections between the "ecosystem" members

<table>
<thead>
<tr>
<th>Innovation center</th>
<th>Creation of grounds for information exchange, communication and setting of horizontal connections between members of the innovation system</th>
<th>Using mechanisms for creation of horizontal connections for decreasing MIB costs and increasing the trust among different members of the innovation system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford University Begbroke Science Park, UK</td>
<td>+ + + - - + - - + + - -</td>
<td>+ + + - - + - - + + - -</td>
</tr>
<tr>
<td>Technopolis Oulu, Finland</td>
<td>- + + + - + + + + + +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>Montpellier Agglomeration, France</td>
<td>+ ? + + + - + + + + +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>Ideon Research Park, Sweden</td>
<td>- + + - + + + + + +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>Daejeon Innopolis, South Korea</td>
<td>+ + + - - + + + + +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>One North Biopolis, Singapore</td>
<td>+ ? + - + + + + + +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>TusPark, China</td>
<td>+ + + - + + + - - +</td>
<td>- + + + - + + + + + +</td>
</tr>
<tr>
<td>Hong Kong Science and Technology Park</td>
<td>- + + - + + + - + +</td>
<td>- + + + - + + + + + +</td>
</tr>
</tbody>
</table>
CHAPTER 6

CREATING ADAPTABLE TECHNOPARK INFRASTRUCTURE

The currently held public idea of a technopark as a complex of futuristic buildings, stuffed with modern equipment and communications, often has nothing in common with the reality. Foremost, because a technopark is, first of all, not a beautiful building, but a complicated ecosystem formed under the influence of specific local conditions and market demands. Mervi Käkä, the creator and former CEO of Technopolis Capital Region (Helsinki, Finland), says that, «A technopark is not a place, it is a process, and the main objective of the technoparks must be the assistance of companies». Therefore, from one side, the technopark is a real office, where its residents are located and where they meet and communicate with their clients, and from the other side, it is the set of concrete and extremely varied services provided to these residents.

«Politicians like solemn opening ceremonies of beautiful buildings, but beautiful buildings are not technoparks yet. Their internal organization makes them technoparks. Many technoparks look quite unattractive, but their inside is simply magnificent and they have fantastic products, and these technopark products and services, and not their buildings, are in demand by the client companies of the technopark.»

Pertti Huuskonen, co-founder and chairman of board of directors of Technopolis, Finland

6.1. Choosing a location for a technopark: urban location vs. “open fields”

If we analyze the trends the territorial placement of technoparks, retrospectively, it is possible to notice that, up to the 1980s there was a steady tendency to place them outside of the existing municipalities, to build «cities of the future» in an open field. However, in the last quarter of the century, the idea of a science park inside the city gained greater popularity. This way it is much easier to form the connections between innovators and financiers, and the park becomes city-forming enterprise. Therefore, these days science and technology parks are mostly municipal phenomena. Two thirds of modern science parks are located inside a city, and the other one third are located very close to a city, at distance of less than 50 kilometers.

For example, the Philadelphia technopark (University City Science Center, the USA) is interesting because of its concept of the «technopark in the city center». Founded in 1963 in the university district of Philadelphia, it was able to provide the base conditions and infrastructure necessary for development of the innovation ecosystem. Companies that went through the technopark, and its present residents, created more than 15,000 jobs in the city, and their annual contribution to the local economy is about 9 billion dollars.

The parkland is another concept; the Research Triangle Park is based on this other concept. It was founded in 1959 on an area of about 1,800 ha in North Carolina (USA) as a joint project of local authorities and universities. The aim of the project was the displacement of regional development focus from agriculture and industry to high tech. Today the park occupies an area of more than 2,800 ha, and the total area of its real estate is 1.8 million sq. m. As in the case with Silicon Valley, the park became overgrown with real estate of the «science format». The nucleus of this technopark consists of a «historic» triangle, where the tips are the University cities of Chappell Hills, Durham and Raleigh. The population of the cities inside the triangle is 1.1 million. Some towns and settlements inside the triangle are built as bedroom communities for technopark workers.
Today, according to various estimates, a total of 150 to 300 science parks operate in the USA. What is an average American technopark? It is located not far from a city, with a population of less than 500 thousand and it is managed by the university or an affiliated partnership. The sizes vary from 0.8 ha to 2,800 ha, but most have an area of less than 45 ha. Mainly on the park territory there are from 6 to 16 buildings where 15-45 tenants rent areas. On the average, less than 750 persons work in the park. Financial indexes of technoparks as structures are not high: the budgets of half of these does not exceed 300 thousand dollars.

There is no single model of a European technopolis or technopark. We can only note that the degree of state participation in their creation and development is higher, than in the USA. Such projects in Europe are also considered as social projects, creating new jobs. Besides this, the characteristic of European technoparks is the presence of several founders: it complicates the management mechanism, but it is effective from the point of view of access to financing.

Great Britain became one of the pioneers in organization of European science parks. In the 1970s the research park of the Hariot-Watt University in Edinburgh and Trinity Collage Science Park in Cambridge were founded here. In the 1980s, the process was considerably accelerated and in the mid-1990s, 36 completely formed technoparks already functioned and created over 20,000 jobs. Today from 300 European technoparks, 80 are located in Great Britain. The area of majority of them is small – up to 10 ha. Usually 8-13 middle-sized independent companies are situated on their territory. The majority of the parks are concentrated within the limits of Greater London – not further than one hundred miles from the city.

In 2004, the program for transforming the country into key knowledge hub was passed in Great Britain. Its basic element is the creation of science cities. Six cities were chosen for this part: York, Newcastle, Manchester, Bristol, Birmingham and Nottingham. Generally they develop on the basis of the American experience, and the special attention in the program is paid to the redevelopment of old industrial enterprises and improvement of each city’s environmental quality.

The most notable example of the «park inside the city» concept in France became the Montpellier Agglomeration, the capital cities of the Languedoc-Roussillon Region. Formerly the region was almost exceptionally agricultural; today the contribution of agribusiness to the regional economy does not exceed 10%. Over 70% is brought in by high tech industries – ICT, pharmaceuticals, and «green» technologies. Along with Paris, Lyon and Grenoble, Montpellier grew into one of the largest French centers of high tech, specializing in medical, information, agro-technical, biotechnology and renewable energy, as well as water resources control and regeneration. The population of the city (now it is the single agglomeration of Montpellier and adjoining municipalities) during this period doubled, and the high rates of demographic increase have been preserved until now. Unlike the rest of France, the population of Montpellier is getting younger – today 43% of agglomeration residents are younger than 30. In the 2000s, Montpellier several times was recognized as one of the most comfortable and cheapest cities for starting and managing business in Western Europe. As a result, the R&D centers of such giants as IBM, Dell, Sanofi, Veolia, Ubisoft, Intel were placed there, and per 420,000 residents over 29,000 private enterprises operate here. The city is a confident leader in the number of annually created start-ups in the country.

As to Asian technoparks and innovation centers, then main initiators and operators of such projects here, unlike Europe, are not regional and municipal authorities, but state bodies of the national level.

A typical example of Asian approach is the Japanese Tsukuba Technopolis, which appeared in an open field. Everything began in late 1950s from the idea of borrowing the experience of Soviet Science Towns and American Silicon Valley. However, the real steps were made only in 1970, when the money for the project realization appeared. Twenty years and 5.5 billion dollars, exclusively state moneys, were spent for the city’s creation. Today Tsukuba is a rather large city; its area is 27 square kilometers, with a population of 180,000, including 13,000 researchers. There are 59 science and research institutes and more than 200 private companies. Tsukuba became a pilot project within a very ambitious program calling for the creation 19 ultramodern cities in different parts of the country. In 1982, the competition for the
building of five technopark started, and a keen competition broke out between the municipalities. As a result 19 territories were selected, and in 1986, in 14 new technoparks more than 2,000 companies already operated.

Japanese science parks are planned to be multifunctional and complex, and this makes them different from the science parks created in the USA and Europe. Technoparks consist of three areas. The first is a science town with universities, state research institutes and corporate research laboratories. The second is the industrial area, where factories, distributive centers and offices are located. The third are residential settlements for the researchers and their families.

The role distribution between the center and the periphery is as follows. Tsukuba is the main Japanese research center, and the technoparks are introductory grounds, where all Tsukuba institutes opened their test laboratories. The example of such a science park can be the Kumamoto project, which includes 12 cities. It occupies an area of 96,000 ha, and its nucleus, the Technology Research Park, occupies 39 ha. The technopark combines sparse buildings, forest laboratories, high tech areas along a 325-motorway to the East of the city.

The Tsukuba technopark is orientated to fundamental science research. For many years a closed-door policy was followed here, and only in the mid-1990s the Department of Industry and Foreign Trade let the private companies have access to research equipment and enabled co-ownership.

The enormous Chinese Zhongguancun Science Park is arranged differently than the Tsukuba. It, like technoparks in Montpellier and Philadelphia, is integrated into the existing city – Beijing. Zhongguancun Science Park differs from Tsukuba from the point of view of space as well. The Chinese park is not a single territory, but a set of fragments. Historically, everything began with an area on the North-West of Beijing, now this part is called Haidan Subpark. However, besides it there are 9 science subparks and 17 university science parks, all composing the Zhongguancun Science Park today. All these parks are located in different parts of the city. Big subparks, as a rule, have their own specialization: software and electronics, new energetic and industrial design, new materials and biotechnologies, medicine, digital media, creative industry, etc.

The science park arose in the North-West of Beijing not by chance. More than one hundred science and technical institutes and laboratories are concentrated here, as well as the strongest Chinese institutes of higher education – Beijing and Tsinghua Universities. They became the base elements of the technopark: the Universities created science products and the companies to promote them, and trained skilled personnel for high tech businesses.

Thus, the experience of the last decades definitely testifies on behalf of territorial integration of technoparks into cities or suburbs, as this approach allows reducing the costs of creation of the necessary infrastructure, and also it facilitates the forming of relations with the outside world and facilitates the inflow of the park residents and their clients.

6.2. Who are the consumers of technopark services?

If everything is clear with the residents of a business-incubator – they are start-ups striving only to become more or less sound businesses, the composition of the technopark «lodgers» can be much more varied. In different proportions they can be:

- young innovation companies that went out from the incubator;
- large companies – both national and international;
- university research centers;
- start-ups (if a business-incubator operates in the technopark).
However, irrespective of the «lodgers» correlation, the experience of successful technoparks shows that their infrastructure and provided set of services, first of all must be orientated to the beginning enterprises. A simple way to put this: large companies are less depended on the availability of service from a technopark. They come here not for these services, but after the opportunity to use the potential of beginning enterprises, which can realize their potential to the maximum only in the proper conditions.

The unsuccessful experience of the Texas technopark, Austin, is demonstrative in this respect. It simplified the set of the provided services to the maximum, intending to attract subdivisions of large companies, who would be able to obtain the missing services from their «maternal» structures. However, this model did not work, as transnational giants did not show any interest in a technopark, wherever they could not find the main thing they need – fresh ideas and the people able to realize them.

The orientation of technoparks to small innovation business is also related to the fact that in most cases (if not taking into account the Asian «catching-up» model) they appeared as an answer to the obvious, and hard-to-solve within the traditional economic model, crisis in the region where the technopark is created. So, in French Montpellier, the stake on the creation of infrastructure for development of innovation enterprises was related to the stagnation in the agrarian-industrial complex that for a long time served as a locomotive for the region’s economy. «When the first enterprises went out from our business-incubators they disintegrated very quickly, and their teams, together with their intellectual property started working in big companies. Simply because they had nowhere to continue their work. This did not make us happy, as in this case, it turned out that monies spent on business-incubators was wasted. That is why it was decided to invest into the construction of a technopark,» says the economic development vice-president of Montpellier Agglomeration, Gilbert Pastor. As a result, the local authorities took a decision to create two technoparks (Euromedecine Biopolis for projects in the medical and biotechnologies sectors and Millénáire for ICT-projects), specially intended for business-incubator graduates.

The technopark Ideon in Swedish city of Lund owes its appearance to the crisis. It was created in the conditions of an industrial slump, which resulted in mass unemployment in the province of Skone. All of a sudden, thousands of skilled and experienced specialists became unemployed. In 1983, the governor of the province decided to start Ideon in order to create new jobs. Ideon became the place where specialists who lost their jobs were able to start businesses, and it was they who became the first consumers of its services, the technopark was created especially for them.

The task of creating the Ideon technopark was facilitated by the fact that the city was a university center for a long time already. There are 40,000 students per 100,000 of Lund residents. Ideon is across a narrow street from the University’s School of Economics, Technological University, Chemical Center, Ecological Center and Biomedical Center. Today among Ideon residents it is practically impossible to find a company, which is not somehow related to the University - by origin, employees or business contacts.

Ideon also serves as a prime example of how a technopark, initially orientated to the needs of beginning innovation enterprises, became a magnet for transnational corporations. The technopark in fact is the connective link between the University and large corporations. From the West and the South, its buildings are surrounded by University campuses and from the East and North – by the R&D centers of AstraZeneca, Garbor, Ericsson, Tetra Pak, and ten other smaller companies.

Opened in 1982 on the outskirts of Oulu (Finland) this technopark was also initially orientated towards small enterprises. During the first decade, only about 20 start-ups went out of it, however, they were mostly small enterprises engaged in R&D. The vast majority of them did not grow to the creation of their own serial production and were closed or taken over by the companies already present on the market. However, the environment created in Oulu opened the space for big companies: for example CCC and Electrobit were able, over time, to grow into international corporations.
Nevertheless, as Pertti Huuskonen said, a viable nucleus of technopark clients was formed by enterprises, split off from already existing large and middle companies, having connections with the market and managed by professional managers. By the end of 1980s, already more than 200 resident companies were present in the Oulu technopark, therefore, very soon the management faced the question of expansion. Then just 5 years later, when the stake on ICT, once made by Nokia and its numerous partner companies from Oulu, paid off, the corporation turned into one of the global leaders cellular communications equipment and ICT markets, and a boom of technology start-ups began in the region, further expansion of the technopark became a vital necessity.

6.3. Why technopark services should be flexible

Technoparks, though not so obvious a degree as business-incubators, are aimed to be conveyers, serving high tech businesses. Appearance of new companies instead of old ones is the norm here. Therefore the technopark premises and the set of the services provided by it must undergo constant revision, and adaptation to constantly changing needs of the clients.

For example, Biopôle Technopark in French Montpellier consists of three five-story blocks in the city outskirts. Today there are ten companies in the technopark. To rent offices here is a little more expensive, than to rent an ordinary office, but significantly cheaper, than laboratories, all the more, it is not possible to organize a laboratory just anywhere. In the nearest three years the number of blocks will have doubled, as a long queue has formed of people wanting to lease laboratories here. Gas and cold water necessary for work are brought to all laboratories, the blocks are equipped with a unified system of air disinfection.

According to Pertti Huuskonen, usually the technopark passes the break-even point, when its area exceeds 20,000 square meters, on condition that all these premises at least 95% occupied by tenants, among which there must no common companies.

To attain so high a occupancy rate, the needs of future tenants must be taken into account at the stage of planning the technopark buildings. Ideally, its premises must allow for a quick change in configuration and at a low cost, and to be «cut» into separate offices. The technopark or the incubator must have an opportunity to offer their residents, for example, a laboratory with an area from 30-60 to 500 sq. m. and more, besides this, these laboratories should be provided with the same set of equipment and services. If the enterprise begins expanding its laboratory and office will expand together with it. Rearranging of the premises takes from one to four months.

No less important is the individualization of business management services, as well as the adaptation of premises of business-incubators and technoparks to the needs of every concrete project. A beginning innovation enterprise must be provided only with such premises and only with such services that are really necessary for it at the current stage. As in the majority of successful innovation centers, the cost of an office and laboratory rent is either equal to, or is higher than the market average price, this approach allows beginning innovation enterprises to save money without decreasing the services and comfort quality, and the technopark or the incubator can rationally use available areas and resources.

In the innovation centers of developing countries, which are forced to face very tough competition for skilled personnel and perspective projects with colleagues from developed countries, the adaptation of services to the needs of concrete enterprises is carried out literally in the «manual mode». In particular, in the structure of Hong Kong Science and Technology Parks Corporation, managing organization there is a special business development group whose task is to adapt the service support in accordance with the needs of every project. Whereas, the question concerns the whole complex of services – beginning
with technology support and organization of advertising companies and finishing with office services. However, such an approach is realized in many European technoparks as well. As Barbara Allsworth, a member of support group in Begbroke Science Park, Oxford, says, «If the residents of the Technopark need some special equipment or material for biological or chemical works outside our standard set, we nevertheless find something for them, usually within a day».

"We learned as we grew and gradually began to understand, what type of infrastructure is necessary. Companies are attracted not just by a beautiful building. It is the correct environment, or functionality, or ability to support and help tech companies that matter."

Anthony Tan, CEO of the Hong Kong Science and Technology Parks Corporation, Hong Kong, China

However, the question of necessity to equip the technopark laboratories with a maximum possible set of equipment does not have an unequivocal answer. For example, in the already mentioned biotechnological technopark in Montpellier, which was modeled after the American, English and Scandinavian technoparks, the expensive centers of collective use of research equipment (and the budget of this project was very modest) were originally created. Nevertheless, in a few years after the technopark’s opening these centers were closed, and the equipment was sold at a great discount. The technopark residents did not want to work on common equipment, as they wished to preserve theirs know-hows and confidentiality research work. At the same time, in Ideon (Lund, Sweden), Technopolis (Oulu, Finland), and Begbroke (Oxford, Great Britain) such problems did not arise. Rather vice versa, the availability of nanotechnology and materials science university research center in Begbroke, used by residential companies collectively, became one of the main competitive advantages of this technopark.

Finally, an important, though not so obviously, adaptive function of the technopark is the creation of comfortable conditions for communications. On this account it is extremely desirable to unite under the same roof the companies that are at different stages of development (e.g. to place in one technopark, both small innovation enterprises and subdivisions of large corporations), as well as university laboratories and R&D centers of big companies. As the creators of such successful technoparks as Technopolis in Oulu (Finland) and Ideon in Lund (Sweden) said, the most important part of the technopark form, without every irony, the restaurants (in Oulu - also the saunas).

The maximum technopark adaptability to clients’ needs supposes:

- Taking into account the constant change in number and structure of clients during the stage of general layout planning.
- Including an architect into the management company staff or concluding a contract about the operative rearranging of the premises by an architectural bureau, being in a close and permanent contact with the technopark management structure;
- Purchasing of multi-profile equipment, taking into account basic directions of the technopark clients’ activities and organization of operative access possibilities to narrowly specialized equipment of «external» science centers.
### Table 11. Basic challenges and approaches used by innovation centers in the creation of the technopark infrastructure

<table>
<thead>
<tr>
<th>Problem</th>
<th>Ways of its solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underdevelopment of the infrastructure in place of future building and/or necessity to lower the initial costs of technopark construction</td>
<td>1. Location of the technopark near to or within the cities or other places with already existing developed infrastructure, for example, university towns. 2. Building of technoparks according to the general layout.</td>
</tr>
<tr>
<td>Constant appearance of new clients and leaving of old ones</td>
<td>1. Construction of the building with the minimum number of internal bearing elements, that makes the rearrangement as quick and cheap as possible. 2. Cooperation on a continuing basis with architects or including an architect in the technopark’s staff list. 3. Readiness of the management company to make as quick as possible changes to the set of services provided to the clients.</td>
</tr>
<tr>
<td>Potential clients’ lack of the necessary funds for conducting research work</td>
<td>1. Creation in the technopark of laboratories, equipped with necessary equipment that are affordable to the clients. 2. Development of special measures, aimed at preserving the rights of equipment users to their know-how. 3. Concluding contracts with science centers (including institutes of higher education, universities) about access of technopark clients to their research infrastructure.</td>
</tr>
</tbody>
</table>

### Table 12. Technologies used by innovation centers in the creation of technopark infrastructure

<table>
<thead>
<tr>
<th>Innovation center</th>
<th>Quick and flexible adaptation of the services provided to the clients</th>
<th>Reduction of expenses for the creation or changing of the infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creation in the technopark of laboratories, equipped with necessary equipment affordable to the clients</td>
<td>Creation and development of the technopark’s general layout planning</td>
</tr>
<tr>
<td>Oxford University Begbroke Science Park, UK</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Technopolis Oulu, Finland</td>
<td>+</td>
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<tr>
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<tr>
<td>Hong Kong Science and Technology Park</td>
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</tbody>
</table>
CHAPTER 7

PUBLIC RELATIONS AND BUSINESS REPUTATION

The ability to build up a substantial dialog with the society (in the broadest sense), and its separate
elements (business and academic environment) is one of the key factors needed for the steady
development of innovation centers and science parks.

The questions of identity, positioning, choice of an effective development strategy of individual brands
became especially critical in the recent years, along with the growth in the numbers of innovation
centers around the world, intensifying the competition between them, and what is important to note,
the increasing vagueness of the base brand — the «science park».

We will recall that its birth was thanks to Stanford University, where the first science park was
created in early 1950s. The whole series of derivatives — business-incubators, innovation centers,
technoparks, and research parks have appeared in addition to the initial brand in the subsequent 60
years. Unfortunately, the process of «splitting up» resulted not in forming a family of brands, possessing
a unique content, but in vagueness, splitting up of the initial brand. Besides this, the additional negative
factor became the compromising of the brand relating to its high initial attractiveness. As it is noted in
the materials of United Kingdom Science Parks Association (UKSPA), under the name of science parks
and innovation centers the projects of country’s real estate development often were realized, the projects
having no direct relation to innovations or science development.

7.1. Why a strong brand and positive public relations in mass media and society
are of crucial importance for success of an IC

From the point of view of brands evolution, science parks and innovation centers can be divided into
three groups:

1. Parks whose brands are built up on the reputations of their base academic institutes (Stanford,
   Begbroke Science Park, Research Triangle, Daedeok Innopolis, etc.) and for which the connection
   with base institutes remains determinative and the main factor in their identity and the model
   of business development;
2. Parks, whose PR-capital is the derived from their biggest resident brands (Hong Kong Science
   and Technology Park, Hsinchu Science Park, etc.);
3. Mixed variants of brands, arising due to the synergy of the reputations of their base scientific
   institutes and the biggest or the most successful residents (Oulu Technopolis, Ideon, TusPark, etc.).

For each of these groups, the set of ingredients in the recipe of the strong brand obviously will be
different. However, the majority of experts agree that there is one general condition that all of these
recipes must satisfy: the brand must be exact to be strong.

The development of any long-term high-risk project, which in fact is a science park or an innovation
center, largely depends on the expectations regarding its results formed in the society. The main risk here
is the appearance of the negative feed-back, when such expectations are overrated or simply erroneous.
Frequently this occurs at estimation of intermediate results or comparison of the «achievements» with
analogical projects abroad. Avoiding this trap is possible only by constant explanatory work in the mass

media. The society must clearly understand what tasks and aims are set for a specific technopark, see the upper limit of its possibilities, and understand the direction and the strategy of its development.

«In many science parks, not enough attention is paid to work with the mass media. They are not concerned enough with the project’s reputation. They cannot explain, what the technopark will become and what it will produce, and as a result, the mass media often paint a picture that is very far from the truth, overestimate the projects, and form unjustified expectations. The mass media must be helped in this question. They must understand the real aims of the project and what it will result in, if it develops successfully, for example, how it will affect the country’s economy.»

Pertti Huuskonen, co-founder and chairman of the board of directors of Technopolis, Finland

7.2. How an innovation center brand helps resident companies

The fate of a science park or an innovation center is practically always a derivative of its residents’ successes and failures. However, on the initial stage of start-ups development, while they do not have their own «record», their apprehension by banks, venture companies and other contractors is largely determined by the reputation of the technopark, the residents of which they are. Empiric data confirming this thesis were obtained during research in the Italian region of Turin. The innovation environment in Turin is formed around two of largest local institutes of higher education – Turin University and Polytechnic University, and structured in the form of two business-incubators (Incubatore di Imprese Innovation del Politecnico di Torino, Incubatore Imprese Università di Torino) and two science parks (Environment Park, Bio-Industry Park of Canavese). During the research, including in-depth interviews with 30 companies, it was discovered that the presence of a strong umbrella brand gives the start-ups and spin-off companies a serious advantage and can even be one the key factors determining their general success. It is emphasized in the research, that the level of trust to resident start-ups of a science park or an incubator depends on the acceptance terms and the procedure of resident company selection. The higher the requirements for start-ups and the level of selection bodies, the higher reputational advantages are obtained by the companies, having become the residents of the specific science park or incubator.

The presence of positive feedback is also underlined in the research: the further success of spin-off companies, having passed the strict selection procedure and having realized the advantages given them by the science park’s reputation, positively effects both the development of the technopark brand and the perception other technopark residents by the contractors.

«The status of technopark resident provides an advantage on the market for the companies, as they use its brand. When you start a company, no one knows you, and that is why new companies can position themselves as Ideon companies.»

Thomas Moller, managing director of the management company at Ideon Technopark (Sweden)

«Daedeok is the synonym for science in Korea, and it is a great honor for a company to be a resident here. We attentively select the residents, and if a company passes through our filter and obtains the «registration», this becomes a quality certificate in a way. In other words, Daedeok Innopolis is an elite brand, and many are ready to pay for this. We understand clearly, that PR-component was and still remains an important stimulus for many companies that came to the Daedeok Innopolis.

Jae Goo Lee, president of Korean Innovation Cluster Foundation, Daedeok Innopolis, South Korea

7.3. What makes a strong innovation center brand?

As it was mentioned above, the set of ingredients for creation of a strong brand can greatly differ in different science parks. This is connected not only with the differences in the forming conditions, but also with the unique evolution of every specific science park. Therefore, considering the list given below, it is important to take into account that for general level of the brand, the level of development of separate factors and their synergy are much more important than their number.

The factors, forming a strong brand of the innovation center, can be divided into two groups. The first comprises the environmental factors that are out of a science park’s control, the second comprises factors that directly depend on the development strategy and policy, chosen by a specific science park or innovation center:

**Group 1. Environmental factors**
- Science reputation of the base institute of higher education, academic institute, university
- Level of technological and infrastructural development of the region
- Level of socio-economic development of the region
- Level of the state support of the innovation economy

**Group 2. Manageable factors**
- Involving of big international companies
- Stories of successful development of the residents
- Significant positive effect on the regional, national economy (employment, taxes)
- Quality of resident company selection procedures
- Quality of management of the operations of the park
- Quality and range of services provided to the residents
- Presence of well-developed network of informal contacts with businesses
- Effective system of the brand promotion and spreading of information about the center (publications in the mass media, organization of conferences and other events for exchange of experience)
Preparation and realization of the science park brand development strategy, as the experience of the most successful of these shows, are based on the following general principles.

First, the science park brand development strategy must provide involving and support of the key interest groups: the state, institutes of higher education, businesses and directly the resident companies. Accordingly, in the process of formulation, the strategy must make its start from identification of their needs and the answers on how the science park can meet these needs.

Second, the science park brand must accent the positioning of this technopark on the global and national scale. Under conditions of keen competition for development resources (perspective projects, venture financing, skilled personnel) the science park must formulate a unique proposition exactly for those potential residents and contractors who can of maximum use for the achievement of its strategic aims.

Third, strategy of the brand development must be dynamic and take into account the changes in the development level of the science park itself, its residents and flexibly react to the changes in the external socio-economic environment.

In general these principles are represented in Table 13.

**Table 13. Main principles of forming strategy of innovation center brand development**

<table>
<thead>
<tr>
<th>Manageable factors of strong brand formation</th>
<th>Instruments used for brand promotion</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Invoking big companies</td>
<td>Publications in mediaOrganization and participation in national and international conferencesSpreading information through informal and professional relations</td>
<td>Increase of brand awarenessIncrease in number of applicants attracted by presence of big international companies</td>
</tr>
<tr>
<td>Stories of successful development of residents</td>
<td>Publications in mediaSpreading information through informal and professional relations Own printed publications</td>
<td>Improving of residential companies access to venture financing and bank credits</td>
</tr>
<tr>
<td>Significant positive effect on regional and national economy (employment, taxes)</td>
<td>Publications in mediaOwn printed publications</td>
<td>Forming conditions for receiving state assistance, in particular by creating venture funds</td>
</tr>
<tr>
<td>Quality of resident selection procedure</td>
<td>Own printed publications Organization and participation in specialized and professional conferencesSpreading information through informal and professional relations</td>
<td>Improving of residential companies access to venture financing and bank credits</td>
</tr>
<tr>
<td>Quality of management of the operations of the park</td>
<td>Own printed publications Spreading information through informal and professional relations</td>
<td>Increase in number of applicants</td>
</tr>
<tr>
<td>Quality and range of the services provided to the residents</td>
<td>Own printed publications Spreading information through informal and professional relations</td>
<td>Increase in number of applicants</td>
</tr>
</tbody>
</table>

«The presence of large well-known corporations, such as Ericsson, ABB, AstraZeneca, is good advertising in any case.»

*Thomas Möller, managing director of the management company at Ideon Technopark (Sweden)*
«The grapevine – the opinions of former residents and their fate are very important. If you properly serve companies in a technopark, it serves as the technopark’s best advertising».

*Peter Jobson*, founder and academic director of Begbroke Science Park, Oxford University, UK

«You must have several well-known big successful projects to compensate for the failures.»

*William Miller*, professor of state and private administration of Stanford University

«Everyone understands that in the 21st century the development of the country, its prosperity can be provided only by innovation technologies. Therefore, everyone is actively engaged in this. Undoubtedly, the competition is very high. Therefore you must find your niche. Otherwise you will not be able to avoid the competition. Now everyone is trying to attract investments, but not everyone manages to achieve it».

*Anthony Tan*, CEO of Hong Kong Science and Technology Parks Corporation, Hong Kong, China

### 7.4. Goals and methods of most effective PR campaigns for innovation centers

To illustrate the way these methods act in practice, we can refer to the evolution of the Manchester Science Parks (MSP). The project was started in 1984, and originally its mission was formulated as «The development of economic and technological potential of Manchester». Later on to this base formulation the following addition was made: "to assist the creation of an economy based on knowledge, the expansion of opportunities for employment by involving resources of the city, academic institutes in the development of economic, technological and creative wealth.»

This addition related to successive expansion of business of Manchester Science Park in the mid and late 2010s, when additional departments were opened in Manchester region and its business strategy was reformulated. Instead of being in the business on leasing premises, the first place took the business of providing services to the resident companies. In this connection the following decision was made: first, to concentrate on an umbrella MSP brand promotion, which in fact had already gained not local but global status, secondly, to refuse from outsourcing of PR-functions, as an external company was already not able to keep up with all the changes or to deeply enough understand the specifics of the residents’ businesses, and consequently, to position the park efficiently among its competitors. Thirdly, the transfer of PR functions into the park structure enabled them to engage in brand promotion the resident companies, investors, partners, suppliers and other contractors, forming an effective network structure for spreading information about the aims and achievements of the park, and what contributed to its further development by attracting the target audience. In 2009, MSP successes permitted it to win the management contract of the Salford Innovation Park (in a town not far away from Manchester).

Montpellier may justly be considered as the prime example of successful realization of innovation center brand strategy development. In 1978, on the city mayor Georges Frêche’s initiative, a wide national PR-campaign
«Montpellier is a gifted city» was held, it was aimed at attracting skilled and active people. The city pressed its candidacy actively, as soon as the question of placing the next large science project came up. In the 2000s, Montpellier was several times admitted as one of the most comfortable and cheapest cities in Western Europe for starting and doing business. As a result, the R&D centers of such giants as IBM, Dell, Sanofi, Veolia, Ubisoft, Intel were placed there, and per 420,000 residents over 29,000 private enterprises operate here.

Another example of successful realization of the brand strategy belongs to Technopolis, managing a series of technoparks in Finland and in the North-West of Russia. One of the company’s projects was the creation of their subsequent technopark in the suburb of Helsinki, Vantaa, next to the international airport. However, the company faced serious problems in attracting clients from among the technology companies. ICT companies wanted to work either in another suburban district, because a large information technologies development center located there, or in the capital. And Vantaa was known as a region, where industrial companies, having no developed technologies, worked. That is why it was decided not to concentrate attention on Vantaa, but to speak more about the airport and to tell that it was the most industrially developed region in the country. The new park was repositioned as the ground for more mature companies which wanted to take advantage of access to the markets, and special development programs and different services were created for them.

«Participating in international events, IASP conferences, organizing its own events, a technopark attracts attention and increases its renown. Membership in the IASP is important by itself».

*Thomas Møller*, managing director of the management company at Ideon Technopark (Sweden)

«For promotion of the brand, one may accent its strong sides (for example, developed transport system, closeness of big universities, etc.) in order to compensate for weak sides. It is best to do this during regular personal meetings and events.»

*Pertti Huuskonen*, co-founder and chairman of board of directors of Technopolis, Finland

**Basic principles for the formation of strong brand of the IC**

- to be strong, the brand must be exact.
- ensure the involvement and support of key interest groups: government, universities, business and directly the resident companies
- highlight the positioning of the industrial park on the global and national scale
- brand development strategy must be dynamic and take into account changes in the level of development of the Science Park and its residents, and be able to respond flexibly to changes in the socio-economic environment
- the main risk in the formation of the brand of the IC is the emergence of a gap between formal broadcasted image, the view of the professional community and the expectations of society. In this regard, particular importance for success is the formation of informal and professional contacts, which allows dynamic adjustment to brand strategies, based on the reaction of the target audience.
### Table 14. Instruments used by innovation centers for development of public relations and reputation, and for solving the problems of positioning and attracting resources

<table>
<thead>
<tr>
<th>Innovation center</th>
<th>Attraction of big international companies</th>
<th>Significance of positioning effect on regional and national economy (employment, taxes)</th>
<th>Quality of resident selection procedure</th>
<th>Development of the residents</th>
<th>Quality of management of the operations of the park</th>
<th>Quality and range of services provided to the residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxford University Big House Science Park, UK</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Technopolis Oulu, Finland</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Montpellier Agglomeration, France</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Ideon Research Park, Sweden</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Daedeok Innopolis, South Korea</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>One North Biopolis, Singapore</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>TusPark, China</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<td>+</td>
</tr>
<tr>
<td>Hong Kong Science and Technology Park</td>
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</table>
CHAPTER 8

ORGANIZING THE WORK OF INNOVATION CENTER MANAGERIAL BODIES

An innovation center is usually considered first of all as an institute of development, aimed to assist the growth of high tech industries, increasing number of high-paid jobs, commercialization of advanced technologies, involving of private investments into the R&D system, etc. However, the fact that an innovation center is an organization, performing economic activity, is frequently forgotten. Meanwhile, this part of their activity has a key value for providing efficient support to innovation businesses.

8.1. Why an innovation center needs a business model

Paradoxically though it may sound, the innovation center must be considered not only as an institute of innovation development, but also as a development project, although specific and orientated to a special group of consumers. Operational recoupment (and in the ideal – the ability to generate income) and the possession of a constant business model of the innovation center is the necessary condition for its success – all the cases we studied, without an exception, show this. The question is not only about the achievement of financial self-sufficiency and stability, although they are also important and are the conditions for steady development of the innovation center. Only this way will it be possible to attract non-government investments into the development, to reduce dependence on the state financing and to secure itself against possible collisions related to the change of political course or «impatience» of the state. Moreover, for the number of innovation centers, studied by us, profitability is the only justification of their activity. First of all this is so for such innovation centers as the Begbroke Science Park, which is one of the most stable income centers of Oxford University, and technoparks under Technopolis management, which is a publicly traded stock company, and it has to see a growth in capitalization and to pay dividends to its shareholders.

In addition, the innovation center must have a working business model for another important reason. A steady business model allows the relations between the management company and the owners of innovation center, from one side, and residential companies, from the other, to more clear and transparent. The essence of these relations can be shown by a simple chart «service – client – provider»: innovation companies buy from the innovation center, at the market prices, those services (leasing, services for development and doing business) which they really need. And vice versa, if they do not buy these services, then the innovation center project fails. Characteristically, Technopolis managers, who have fully implemented this approach in the Finnish technoparks, never talk about «support of innovation businesses» or about the «creation of an innovation ecosystem» - they talk only about the sale of services to their clients.

How do the innovation centers earn money? In spite of all differences, and frequently the non-comparability of successful innovation centers, they all have a practically identical structure of revenues. The principal income item is the leasing of offices and laboratories, which makes up from 70% (BIC of Montpellier Agglomeration) to 85% (Technopolis) of their total revenues. It is important to note that not one of the successful ICs practices subsidizing the rental payments of its resident companies, neither by the centers nor by the state or municipalities. Moreover, the leasing rate of technopark and business-incubator offices, and especially laboratories, may be even slightly higher than the market average, as
the local real estate market simply cannot offer to small and medium-sized companies conducting R & D, a decent alternative.

The second income item is the fees for the services provided to innovation companies. On the average these fees make about 20% of the revenues. With rare exceptions, the resident companies pay for office services and services of laboratory maintenance in the studied innovation centers. The only type of services, which to some extent or another are subsidized practically everywhere, are the services of business education and the services of individual business-trainers. In the majority of studied innovation centers, these services are paid either directly from the state or municipal budgets or are provided for free by external organizations, which in their turn, are subsidized by the state or private sponsors (as, for example, Connect network in the province of Skone, Sweden). Therefore, the direct consumers, resident companies and project teams, obtain these services at symbolic prices (for example, 1% from the real cost, as in BIC Montpellier), or for fully free.

A steady business model not only allows an innovation center to develop stably, but also makes the relations between the managing bodies of the innovation center and its residents more clear and transparent. A sustainable business model makes the center consider innovation companies as clients, to which the innovation center provides services, but not as wards among which assistance is distributed.

"We do not only obtain state financing and simply distribute it. We must find ways to make and use our income to support the development of the innovation technologies economy. In general, we work on commercial principles, and I constantly tell my subordinates that our task is to maximize our income. We must have enough income to carry out our programs in the creation and development of innovation and high tech production."

Anthony Tan, CEO of Hong Kong Science and Technology Parks Corporation, Hong Kong, China

"Never start anything with the buildings. It is better to start regional programs of development in different directions; this may be a small incubator, which will start all these processes. Than you may see that your companies have started growing, and they need more room, and then you will be able to propose that they move into the technopark. However in this case you have a viable and successful business model right from the beginning."

Mervi Kaksi, partner, managing director and chief consultant for InnoPraxis International Ltd. Creator and former CEO of Technopolis Capital Region, Helsinki, Finland
8.2. Why owners should not interfere in innovation center management

Effectively functioning innovation centers have various organizational and juridical forms and various structures of management. According to these criteria they may be grouped as follows:

- Open joint-stock companies managed by a Board of Directors elected at a shareholders meeting.
- Managed by the founders (owners of Innovation Center property) management companies, to which the functions of IC asset management have been entrusted as well as provision of management and business development services for innovative companies - Innovation Center residents.
- Operating under special statutes or mandates, autonomous management companies responsible for innovation center asset management, as well as state assets transferred to the disposal of the innovation center (primarily land plots).
- Management companies in charge of state property management, working for remuneration (Singapore).
- The governing bodies within the structure of executive bodies of municipal powers (Innovative business center and industrial park Biopolis, Agglomeration of Montpellier).

These all have one aspect in common – in all studied cases, the authorities of the innovation center have considerable autonomy in making decisions with respect to the founders and owners. First of all, this refers to the owner in the person of the state and (or) bodies of municipal power, which played a crucial role in the emergence and development of the vast majority of innovation centers reviewed in this study, being their founders (or co-founders) and the largest investors (or co-investors). The exceptions are two innovative centers created and owned by universities (Begbroke Science Park, Oxford University, and Tsinghua University Technology Park, TusPark).

Most of the Scandinavian innovation centers were created within the public-private and private-municipal projects. In particular, the Ideon technology park, which was created by the initiative and with the active support of the governor of the province of Skone, and Lund municipality, has never received direct investments from state or municipal budgets. Support of the province has been limited to the allocation the land plot, as well as mediation in negotiations with private investors. Through the influence of the governor, who participated in the negotiations, the industrial park project has managed to attract one of the companies belonging to the founder of IKEA, Ingvar Kamprad, which has invested in the industrial park more than 1 billion Swedish crowns. Precisely because of this investor, who to this day remains one of the industrial park property owners, the project eventually became successful.

The Technopolis Company, which currently owns and manages assets of more than 20 Finnish industrial parks, was created as a private-municipal joint venture, in which the municipality and the pool of investors owned equal shares. The innovative infrastructure of Montpellier Agglomeration was also created with the participation of private investors.

The subsequent ownership structure of these innovation centers has undergone significant changes. Thus, the Technopolis Company, to attract investments for the development and creation of new parks has decided to enter the stock market, and was turned into a joint-stock company. Today, the municipality of Oulu retains only a 5 per cent stake in the equity of the company, which is dispersed among more than three thousand individual and portfolio investors of more than 30 countries around the world.

Assets of the Ideon Industrial Park several times changed owners. In the late 1990s, when one of the owners of industrial park’s real estate filed for bankruptcy, authorities in Skone, together with the
The largest regional bank developed a rescue plan for Ideon, providing for the allocation of a concessional loan for the University of Lund to purchase the industrial park property and shares in its management company. However, at the earliest opportunity, the university divested itself of these assets - in 2006 its share was sold to another development company, Wihlborgs Fastigheter AB, which is the co-owner of the industrial park’s real estate to this day.

Quite the opposite, the real estate of the Business Innovation Center of Montpellier in the early 2000s, was completely bought out by the local municipality. This is due to the specifics of French law – and this action made is easier to finance the activities of the Center from the municipal budget and to invest into its development.

Nevertheless, the basic principles laid down in the governance structure of these innovation centers, based on public-private partnerships and implemented at the initial stage of their development, have remained unchanged. Foremost among these is the independence of the governing bodies, from the founders, when making decisions, and especially from the state and municipal authorities.

Characteristically, the same principle is laid as the basis of the management structures of Asian innovation centers, where the state is the sole owner of their real estate. Thus, the activities of the management company of the Hong Kong Science and Technology Parks Corporation, where the state is the sole owner of the real estate, is governed by a special statute, which significantly limits the influence of state bodies on its activities. Also the science park Biopolis in Singapore, created at the expense of the state budget, has been placed under the control of the State Corporation JTC Corporation whose Board of Directors however, by more than two thirds consists of independent members.

The autonomy of the governing bodies is expressed not only in their independence in the management of the current activities of innovation centers and investment decisions, but also in their staffing. In particular, despite the fact that when creating the Technopolis company, the municipality of Oulu was the owner of 50% of its capital, only one representative of municipality, namely the Mayor, was elected to the Board of Directors. Subsequently, after the incorporation of the Technopolis Company, not a single municipal or state official remained in the management bodies. The management company of the Ideon Industrial Park has never been controlled by the provincial government of Skone, municipality of Lund or state university of Lund. In its authorized capital, equal shares (50% to 50%) belong to two private companies - owners of the industrial park’s real estate. In the 16-member board of directors of the management company of the Scientific and Industrial Park of Hong Kong, only one represents the interests of the state, the rest are independent directors. There are other examples. In general, the autonomy of the governing bodies from the founders and the involvement of independent directors to work in them is one of common aspect of the innovation centers we have studied.

Importance for ensuring such autonomy is due to the following factors:

- The main objective of the innovation center is to create a favorable business environment and to provide services demanded by innovative companies in the field of business management and development. Only managers with own experience of doing business can cope with this task, because only they understand what services are needed and how they should be provided.

- The leaders of the management company of the innovation center should have experience in the organization and earning money, but not in distributing the money. If the state directly or through its representatives begins to exert too much influence on the management of
the innovation center, there is a great risk of its transformation from a center for rendering services to innovative business, operating on the basis of clear business model (customer-provider), into the center for the distribution of state support. In other words, its activity begins to be determined by a bureaucratic, rather than business logic - not by the necessity to meet the needs of specific project teams and client companies, but achieving the goals, which may be just, but are divorced from practical life. Practice shows that such innovation centers begin to consume the resources of the innovation system, rather than to multiply them. The main difference between these approaches is illustrated in the scheme proposed by Mervi Kaki (see Chart 3).

- **Innovation Center is a long-term project, whose planning horizon is at least 15-20 years, and the state, with rare exceptions is an extremely impatient and inconsistent manager.** Excessive dependence on the state (including too great an influence of public officials in the management bodies of the innovation center) increases the risks associated with changes in state policy priorities, personnel changes, the state of public finances, etc. In particular, managers of the Ideon Industrial Park complained that the policy of supporting innovation in Sweden, as to the amounts and priorities of budget expenditures for these purposes, changed after each election cycle. The same problems with respect to the support system of the innovation of the UK economy were also highlighted by Peter Dobson of the Begbroke Science Park, Oxford University.

- **The objective of the management company of the innovation center cannot only be making a profit. This is why the governing bodies of the innovation centers should have autonomy not only from government, but from private investors and shareholders.** The problem is that even the most commercially successful model of a service and business center for innovative companies in the risk-return ratio will lose, in comparing it to alternative projects in the real estate business. Building of a nice office complex is much easier, faster and cheaper than of an effective industrial park. Therefore, undue influence of private investors on the management of the innovation center usually leads to a distortion of the meaning of its work. International practice, knows numerous instances where building and development companies received undue influence in the management bodies of industrial parks. As a result, the industrial parks were turned into common office real estate complexes, with no high-quality «content», or a special business environment conducive to the growth of innovative companies.

In this regard, is the remarkable experience of Ideon Industrial Park whose property does not belong to the state, university, or the numerous owners of shares (as is the case with the Technopolis Company), but to two private development companies (see Figure 4). One of them, IKANO Fastighets AB, has been the co-owner of the real estate of the industrial park since its inception - it belongs to the heirs of Ingvar Kamprad. The second development company, Wihlborgs AB, as stated above, acquired the assets of Ideon relatively recently, in the early 2000s, from the University of Lund. In the near future, they will be joined by the third owner – the Paulsen Foundation, which bought the huge research center laboratory buildings of AstraZeneca, located in close proximity to existing buildings of the industrial park. The management company of the Ideon Industrial Park, Center AB belongs, on an equal basis, to the IKANO Fastighets AB and Wihlborgs AB, and the brand of Ideon belongs to the university foundation, the Sun Foundation. In the structure of management of Ideon the functions between the industrial park real estate owners and the management company are rigidly delineated. The MC is not involved in the real estate relations associated with the rental of premises of the industrial park (the main source of profit for the owning companies). Its objectives are management of the property and the provision of a package of services to resident companies, from office services
to the business incubation services and business development. At the same time, in relation to its two co-owners, Ideon Center AB, is a non-profit organization, since its purpose is not making profit by providing services but improving the attractiveness and ensuring the filling offices and laboratory spaces of the industrial park.

**Figure 3. Bureaucratic (distribution) and business approach (providing services to clients) to the activity of an innovation center**

**Short-term vision:** technology parks and business incubators as public services, facilitating the creation and development of innovative enterprises

**The long-term vision:** technology parks and business incubators as providers of services to clients - innovative companies and creators of a favorable business environment in conjunction with the state, universities and research centers

**Figure 4. The structure of ownership and governance of the Ideon Industrial Park (Lund, Sweden)**

**Source:** Ideon Center AB
The reasons that the governing bodies of the innovation center should have autonomy, in relation to the owners, both state and private investors, and that in most of them there should be independent directors are:

- The main objective of the innovation center is to create a favorable business environment and provide the needed business management and development services to innovative companies. Only the managers having own experience of doing business, can cope with this task.
- The leaders of the management company of innovation center should have experience in organization, and earning money, but not in distributing the money.
- An innovation center is a long-term project, whose planning horizon is at least 15-20 years, and the state, with rare exceptions, is an extremely impatient and inconsistent manager.
- The objective of the management company of an innovation center cannot only be the making of a profit. And this is why the governing bodies of the innovation center should have autonomy not only from government, but from private investors and shareholders.

“In those regions of Finland, where local authorities are too strong, business is in a state of neglect, and industrial parks themselves are not that strong. They do not actually bring income, but suffer losses, and this means that local authorities must annually pour money into them. These industrial parks consume resources, because they do not even think that they have to worry about money matters. On the other hand, the development of entrepreneurship and high technology is not a problem of the state. It is a matter of business and the problem of creative people. Therefore, if the state is too actively involved in organization of such things, do not wait for success.”

Pertti Huuskonen, Co-founder and Chairman of the Board of Directors of Technopolis, Finland

8.3. Partnership against hierarchy

Perhaps most surprising from the standpoint of the Russian manager or official, is that a complex network of support institutions with similar goals and a different jurisdictions, that has developed around the most of «mature» innovation centers, is not coordinated by anyone from the top, while it is working as a harmonious mechanism. A vivid example of such a complex system can be Ideon Industrial Park. As is seen from the diagram (see Figure 5), support institutions that are under the direct supervision of the management company of the industrial park, constitute an absolute minority. The other institutions are of very different legal form of organization and jurisdiction (state agencies, units of the university, university subsidiaries, private companies and investment foundations, non-bank crediting companies). The main reason for this complexity lies in the fact that the network of support institutions has developed gradually and without any clear plan. The industrial park has «overgrown» with new government, municipal and public institutions to support business innovation, to the extent that the state and big business were becoming more and more convinced of the need for such support.
These elements of the innovation ecosystem in Lund did not always agree to cooperate with each other. For example, the tasks of all of four business incubators of Ideon, two of which belong to the industrial park, one to the university, and one to the non-bank crediting company, often overlap, and they often begin to compete for resources and prospective projects. However, as the experience of this and other Innovation Centers shows, the only way to effectively eliminate these contradictions are regular meetings of the heads of the industrial park with the heads of support institutes working in Ideon, but independent from it, and search for compromises, rather than creating a single focal point or "super administrator".

We know the experience of another major Swedish Innovation Center - Linkoping, which began to develop rapidly only after the heads of all institutions participating in the innovation system (Technology Transfer Center, business training center, business incubator, industrial park, and university) established an informal club that became the only coordinating body in the innovation center.

In contrast, according to Professor Peter Dobson, academic director of Begbroke Science Park, all the attempts to establish in the University of Oxford the position of coordinator, who would handle the development and commercialization of nanotechnology in all departments of the University, including Begbroke had dire consequences, and led to the complete disorganization of work in this area.

Figure 5. Infrastructure of financial and service support in the Ideon Industrial Park, Lund, Sweden
“Ideon is an ecosystem. No one heads or manages it. We are all interrelated and interdependent. Sometimes there are difficulties, but we resolve them. Maybe everything looks like a smoothly working mechanism. However, sometimes there are problems, but we are trying to optimize the system”.

*Thomas Möller*, general director of the management company of the Ideon Technological Park

“In fact, we have no coordination of activities of the individual participants of the innovation system. Perhaps for this reason something is not working, but nevertheless, everything continues to operate. Yet if we introduce a coordinator, then all will stop.

If you assign the wrong coordinator, the consequences could be catastrophic. We have already tried it here at the University, at a lower level, in a separate area. If your coordinator is mad about control, all freezes and stops working. In fact, we had such a situation in the field of nanotechnology with the most negative consequences. In the University there were two people who too heavily controlled what was happening in the field of nanotechnology, and they just completely destroyed many of the connections and contacts, which worked fine before. Now it’s all over”.

*Peter Dobson*, founder and academic director of Begbroke Science Park, Oxford University, UK
ANNEX A

MEDIA ARTICLES ABOUT PROJECT PARTICIPANTS

1. Article about the Ideon Research Park (Sweden), based on the interview with Thomas Möller, general manager of the management company of the research park and with Sven-Thore Holm, founder of Ideon

Swedish Triple Helix

_Ideal pays considerable attention to the organization of spaces for informal communications, as well as to the proper equipping of offices and laboratories. Photo provided by Ideon_

If we compare the success stories of the largest innovation centers of the Old World, we can notice one thing they have in common: they all appeared not in the best of times, economically. The story of Ideon, the oldest and largest technology park in Sweden, located in the south of the country in Lund (province Skåne), fully confirms this observation. Sweden was one of the first countries in Europe to feel the impact of the economic boom in Southeast Asia, as well as that of the de-industrialization that began in Europe. In late 1970s - early 1980s, the shipyards in Malmö, the largest industrial enterprises in Skåne, began to lose market share under the pressure of competition from South Korea. Many of them were closed. The province faced mass unemployment.

In 1983, a team of young scientists from the University of Lund, which is one of the two largest universities in Sweden, led by chemistry professor _Sven-Thore Holm_, proposed to the university administration, the municipality of Lund and the Governor of Skåne to build a technology park in the city, which could help to create new jobs in knowledge-intensive industries. If such a proposal had been made five years earlier, Dr. Holm would have been brushed away as an irresponsible schemer. Today there are over three thousand technology parks in the world, but at that time there were only eight of them. There were no such parks in Scandinavia; they hardly talked about technology parks in the university environment. However, the economic crisis forced the management of the university and regional authorities to take an unusual step — and in September 1983, the foundation for the first building of the technology park was laid, a few months later, two beginning pharmaceutical companies became its first residents.

Today, Ideon surprises even the most skeptic persons by its impressive results: in 28 years that elapsed since the day it has opened, more than 10 thousand jobs in knowledge-intensive companies have been created. It is home to 280 companies, employing three thousand people. Only 15% of them specialize in consulting and servicing. Others are companies that implement projects in ICT, pharmaceuticals, biotechnology and «green» technologies. More than 80% of high-tech start-ups survive here three years after their creation, while the average of 60% is considered a good indicator for Western Europe. «We must bear in mind that one new job in high tech creates three jobs in the service industries: consulting, taxis, restaurants and so forth,» said Sven-Thore Holm.

Today, the founders of Ideon explain the success of their brainchild by the concurrence of favorable circumstances. Due to a successful start, as well as to the fact that it was the first experience of a technology park in Scandinavia, Ideon quickly managed to build a strong brand that attracts both new projects and investors. «The brand of Ideon greatly simplifies the lives of our residents. The general director of a company, which was
created only yesterday, can easily call the top managers of Ericsson and say hello, I’m calling on behalf of Ideon,» says Sven-Thore Holm. The structure of owners of property in the technology park has practically remained unchanged since the time of its creation, so we managed to create a stable and effective management system in Ideon (the management company has just 12 employees, as many of the functions are outsourced). The example of Ideon quickly convinced Swedish politicians in the effectiveness of such parks for development of the national economy. Thanks to this, the country established a system to support business innovations, which is financed by the state. Today, the technology park makes full use of this system.

However, constant support from the state, university and large private business, as well as interaction with them was crucial to the success of Ideon. This is the very «triple helix», which is so often mentioned today - this is the necessary condition for the efficient operation of the innovation system. When Ideon was created, this term had not been coined yet, and the «Swedish triple helix» has some unique features which, in fact, ensure its effectiveness.

Technology Park of Culture and Leisure

Upon entering the city, it becomes evident that the university has played a crucial role in the development of both Lund and the Ideon Technology Park. Out of 100 thousand residents of Lund 40 thousand are students. Actually, it is almost impossible to determine exactly where the city ends and the campus begins, the first university buildings are located a few hundred meters away from the ancient Romanesque cathedral, which is situated in the heart of the city, and then university buildings extend further to the north-east, occupying about a quarter of the urban area. Ideon is located on the opposite side of the narrow site street from the university buildings of the School of Economics, University of Technology, Chemical Center, Environmental Center and Biomedical Center. Today, it is almost impossible to find among the residents of Ideon a company that is not connected with the university either by origin, co-workers or by business contacts.

Although the university was among the founders of the technology park, university leadership has never sought to actively participate in the management of Ideon, all the more have any property relations with it. Any undertaken obligations were viewed by the University as a threat to its autonomy. Only once, in the early 1990s, the university was forced to sacrifice its principles when a new economic crisis, which affected the Swedish financial system and the real estate market, led to the bankruptcy of the real estate development company, which was the co-owner of Ideon. The plan to rescue the Ideon was developed by the authorities of Skåne, in cooperation with the largest regional bank. It provided that the University would receive a preferential credit to repurchase the property of the technology park and shares in the management company. However, the University parted with these assets as soon as it was possible. In 2006, its share was sold to the development company Whiborgs Fastigheter AB.

The relations between the resident companies of Ideon and university professors have played a much more important role. On the one hand, professors often work to the order of the residents of the technology park, which is not surprising, since many projects of Ideon sprang within the university. On the other hand, the leading experts of R&D departments of resident companies in the technology park, and giant high-tech laboratories, are routinely involved in teaching at the university. It is important to mention the informal personal contacts, which would be impossible if the technology park and R&D departments of large companies were not in close proximity to the university.

Commercialization of university developments is facilitated by the fact that, according to the Swedish law, intellectual property, founded on government budget funds, is wholly owned by the researcher, and
not by the university or the state. «Some time ago, our neighbors from Denmark decided to change this system and made the state the right holder. The reform turned out to be destructive to the innovation system. Universities do not understand at all, about how to turn their developments into money,» said Sven-Thore Holm.

**The science of sales**

During the 28-year existence of the technology park the value of the university as a source of new business ideas and personnel for the projects of the technology park has markedly increased. Since 1980, the Swedish government has consistently implemented the policy of transforming purely research universities into entrepreneurial ones. «To create a steady stream of projects, a system of purely practical business education has been introduced at all the universities in the country. Students are not told about business, they are taught to be entrepreneurs. To run these programs, we had to invite many people with practical experience from outside of the university. First, these courses were taught by a professor, but who needed that?» says Sven-Thore Holm.

Today, Swedish universities receive government funding to implement three equally important functions: teaching students, conducting research and diffusion of knowledge. The latter task involves not only the popularization of scientific knowledge, but rather its commercialization. Therefore, the number of university developments, introduced onto the market, directly affects the amount of funding, received by the university from the state. All this forced the University of Lund to create its own system of commercialization, which includes the Office of Technology Transfer, structures providing advisory support to newly starting projects, as well as its own business incubator, which operates under the wing of Ideon.

University of Lund has always had strong relations between natural science departments and large corporations. However, the university tried to find opportunities to develop relationships with small businesses, as well as for the commercialization of knowledge, even in those areas of research where this is theoretically impossible.

«In fact, this approach has never been traditional to Swedish universities, neither was it for the Russian universities,” said Sven-Thore Holm. “Working with small businesses, you will never make an academic career. They do not invest in long-term studies. They need the product right now, even if they use outdated technology. These companies may use almost any knowledge, but the problem is that they usually do not know what a university can offer them.»

To solve this problem, Lund University launched the program entitled ‘Employment Expert’. «The program covered all the departments, including the humanities. Before, when you would ask the staff of the university, whether they had anything they could sell, people would often say: that is interesting, we have never been asked anything of the kind. Now we understand that what we do has an economic value,» says Dr. Holm.

As an example, Sven-Thore Holm says that as a result of the future expansion of Ideon, the territory of one of the villages adjacent to the city will be affected. «I asked the management of the development company, which is engaged in this project - What do you know about this village? They replied - We only know what we are going to build on this site. Then I came to the history department and asked them the same question. They said - We know everything about this village. We have photos of its residents since the 1880s, we have the recipes of the dishes they cooked, and we have recorded oral stories about many of its inhabitants. We know all about the history of agriculture of the villages and farms in this region.» When I told all of this to the developer, I was told - We would like to order a book about this village,” said Sven-Thore Holm. “In addition,
the History Faculty has recordings of folk songs, made in the 1920’s, not on tape but on wire. They have
digitized these and made ring tones for mobile phones, which are in great demand.

**How to establish relations with Ericsson**

Large private business has played a significant role in the fate of Ideon. We should start with the fact
that the technology park would not even exist, if in 1983 the project team and the regional authorities
had not convinced **Ingvar Kamprad**, the founder of IKEA, to join the board of directors of Ideon and
invest 1 billion kronor. Today, Kamprad’s family, through the IKANO Group, owns one of the two real
estate companies, which in fact own the real estate of the technology park and the management
company.

The technology park is literally an intermediary between the university and major corporations. Its buildings
are surrounded by university buildings from the west and south, and from the east and north by R&D centers
of corporations such as AstraZeneca, Garbor, Ericsson, Tetra Pak, and a dozen of other smaller companies.

The reputation of the university and the initiative of the local authorities were crucial in attracting R&D-units of high-tech corporations to the Lund University. In this regard, the example of SonyEricsson is significant.
In the early 1980s, Ericsson did not consider mobile communications as a priority for business development,
so the team of 16 professionals, involved in these developments, became a separate research group. The
governor of Skane and the founders of Ideon persuaded the corporate bosses to place the group in the newly
created technology park.

From the viewpoint of Russian companies, Ericsson’s decision was pure charity. The company did not receive
any benefits; moreover, it agreed to pay a 20% higher rate than the standard market rate. «We needed
money for investments, as well as to support the start-up companies that had little money,» says Professor
Holm. In addition, the company established a switchboard in the technology park at its own expense, so Ideon
received free telephone connections. «Ericsson realized that they were a large corporation, and therefore
needed to bear some responsibility. This is the peculiar mentality of our large businesses,» Sven-Thore Holm
explains this type of generosity.

The partnership of Ideon and Ericsson had a happy sequel: in the 1980s-1990s, the research group that
moved to Lund, and which consisted of a handful of employees, grew into a huge R&D Department, specializing
in the development of software and equipment for cellular communications. Today, Ericsson and its joint venture
with Sony is one of the largest employers of graduates of the University of Lund, as well as the engine of
development of ICT projects in the Ideon. A large number of ICT companies operating in Ideon, are either «sister
companies» of telecommunication giant, or participate in joint development work. In particular, this is how the
standard for wireless Bluetooth, which is used worldwide, appeared.

The same can be said about biotechnology and the pharmaceutical industry. To a great degree their
development in Lund was associated with the presence of R&D centers of such pharmaceutical companies
as AstraZeneca and Pharmacia. Today the company Active Biotech, which specializes in drug development in
oncology and immunology, operates in Lund. It separated from Pharmacia after its absorption by Pfizer. In
their turn, large pharmaceutical corporations are attracted by the availability of skilled labor and proximity to
strong university research centers in the field of medicine, biology and chemistry. In particular, Lund houses the
country’s largest University Hospital and the University Biomedical Center. More than 700 researchers are
employed in these institutions. Furthermore, the success of the technology park and the established system
of commercialization of scientific research became an additional incentive.
A Hypermarket of Services

If we talk only about the support tools, available to companies in the Lund Technology Park, there is nothing unique about them. These are business incubators, providing innovative start-up companies with offices, laboratories and services for the management and development of business, business training systems for such projects, and financial support. In the early stages of development, projects attract mainly government grants, in the growth stage the main role is played by private investment. In general, everything happens as usual, most of the innovation centers of the world, including Russian ones, are trying to implement approximately the same pattern of project support system.

Another surprising thing is the density of the network of organizations, involved in supporting start-up technology companies, which were created within and around the Ideon. At first glance, it might even seem excessive. Ideon can be compared to a servicing and financial hypermarket, where any aspiring company will be able to find a suitable support program.

Let us start with business incubators and business development services. In addition to the two business incubators, created by the technology park, Ideon Innovation and a specialized incubator for biotechnologies, Ideon Bioincubator, the structure of the technology park also runs a student business incubator, the VentureLab, which is funded by the university. Special attention should be paid to the non-profit organizations working within the Ideon, which join big business and municipalities. Such organizations exist in many developed countries, but perhaps nowhere else is their role as significant as it is in Sweden.

Thus, the business incubator LIFT, established by the Center for Support of Entrepreneurship of Lund, operates under the wing of the technology park. Such centers exist in 200 out of 290 Swedish municipalities, and they are not created by the state, but on the initiative of the NGO Society and Jobs, established in the mid-1980s by the former top executives of Volvo. Half the budget of the organization is formed by voluntary contributions from large corporations; the other half is contributed by municipalities and business associations. The main objective of the organization is business development in Sweden and employment problems. During its existence, Society and Jobs contributed to the opening of more than 190 thousand small businesses.

CONNECT is another organization of this kind. It helps technology companies in Skåne to develop a business plan and to «package» their projects. It organizes meetings with investors (both with large companies and with private venture capitalists), and also provides legal, auditing and consulting services - and all this is done for free. The CONNECT network integrates all the major municipalities and universities of Skåne, as well as large industrial and service companies and banks present in the region, including Volvo, AstraZeneca, Preab, and Swedbank.

Innovative tutelage

The system of personal mentoring is, perhaps, one of the key know-hows of Swedish business incubators. Each project, which becomes a resident of the business incubator, receives a personal tutor, who through daily communication helps budding entrepreneurs in developing marketing strategies, management systems and strategies to manage intellectual property. Work with a mentor is a must for all the projects in the incubator. Several organizations provide mentors for the residents of the business incubators, such as the state-owned company Teknopol, University Office of Technology Transfer LU Innovation, the above mentioned CONNECT. With few exceptions, services of business coaches are subsidized by the state or public organizations, so the residents of Ideon receive them for free.
«It is not so easy to attract such a number of good business coaches. Basically these are people who have worked for twenty or thirty years in large companies such as Tetra Pak and Ericsson, and who are tired of such work. They are interested in working with young people and young companies. Often, these same coaches act as business angels, that is, they invest their own money in the projects supervised by them,» said Thomas Möller, general director of the management company of Ideon.

Typically, coaches work on a permanent basis, but if necessary, third-party consultants are also attracted. This is an attractive job, as business coaches receive salaries and fees that are comparable with salaries in the private sector. «The number of consultants and trainers is solely a question of money. It all depends on the fact of whether the government understands that a successfully launched project from the business incubator requires certain expenses,» said Sven-Thore Holm.

The current network of Ideon institutions, which are involved in financial support and investments in innovative projects, is distinguished by its diversity. At a very early stage, when the project is just a promising idea, it may pretend for government or university grants and special grants to «test» the idea. Next, to start a business, the project team can apply for the so-called “repayable conditional loan” of up to five thousand kronor, which is allocated by the state agency Innovationbron (Innovation Bridge) to support the innovative business. If the start-up gets on its feet, it repays the loan with low interest. If the newborn company fails and is liquidated, it returns nothing, and no sanctions are imposed on the project team. According to Thomas Möller, during the time of this program, loans have been fully returned by more than 80% of the recipient companies.

Private investors, or the so called business angels, often enter a project at the time of start-up. According to Thomas Möller, today exclusively Swedish investors invest in Ideon projects. As a rule, these are retired top managers and executives of large corporations or managers of successful projects that have already left the technology park and worked on their own.

Venture capital funds working with Ideon join at the seed stage. The largest of these are Lumitec and TeknoSeed (specializing in seed and venture capital investments in projects and universities in the region). In addition, funds from Denmark and Norway operate in Lund.

“There is a shortage of private investments into innovative projects everywhere, except for the East and West Coast of the U.S.A.,” said Sven-Thore Holm. "In Sweden, money can be obtained only here in Lund and in Stockholm. However, the task is easier in Lund because it is a small town in which there are a lot of events taking place. People meet and talk about the research that they are conducting, about the investments they have made. Therefore, I started TeknoSeed seed fund by looking at the list of the largest taxpayers of the city, which I obtained from the tax authorities. Then we sent to the richest residents of Lund an offer to invest into the seed fund, and thus help the development of their city. I was not expecting that 550 people would say ‘Yes’. We told them about the fund’s strategy and they liked it. They did not invest that much, about a thousand euro each. I am a member of the Board of Directors of the Fund, which is headed by the Governor of Skane. The only problem I have now is that it is difficult to go shopping on my bicycle: investors are constantly stopping me to see what I think about a particular issue.»

Finally, the companies that are in the growing stage may qualify for investments from the state investment fund.

Support institutes, working in the technology park, regularly organize meetings of project managers with investors. Such presentations are called «springboards» and only projects that are already working with business coaches are involved in them. «We can talk about both the competition of projects for private investments and the competition of investors for good projects. It all depends on the current state of the industry. In good economic times, the investors call me and in bad economic times, I sit down and begin to call the investors. Now
the times are good for ICT, Internet projects and «green» technologies, and the times are hard for medicine and biotechnology, especially for the development of medications,” says Thomas Moller.

Ecosystem against hierarchy

Perhaps, the most surprising, from the standpoint of the Russian manager or official, is the fact that this complex network of support institutions, with similar goals and different jurisdictions, is not coordinated from the top - and yet at the same time, it works as a cohesive mechanism. The fact is that it evolved gradually and without any clear-cut plan. The technology park acquired more new state, municipal and public institutions which support innovative businesses, as the government and big business became convinced of the need for such support. Moreover, some institutions at the national level, such as the government agency Innovationbrum, were born in Lund. The prototype of the Innovation Bridge was established in Skåne by Sven-Thore Holm, the founder of Ideon, and at first it operated on a regional scale. In the mid-1990s, its achievements formed the basis of a national platform to support the commercialization of knowledge.

“At the beginning of its operations, Ideon acted alone. Today, I cannot name one person or organization that could be the principal and be responsible for everything,” says Thomas Moller. “This is a kind of self-regulating ecosystem. We all depend on each other, and that is why it works.”

Author: Dmitry Mindich.

Anna Nikiforova was also involved in the preparation of this article.

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WELL-SEASONED INNOVATIONS

In thirty years, Montpellier has evolved from a rural town into a high-tech center of world level. The secret of success is the consistent policy of the municipal government, and the system of «hands-on» growing of high-tech companies

The phrase «economic miracle» is usually associated with post-war reconstruction of Germany and Japan, or with the explosive growth of Asian «tigers» in the 1960s-1980s. Meanwhile, the last third of the 20th century was marked by a number of local «economic miracles». Little is said about them, but their experience may turn out to be no less useful than the stories of global success.

One of these stories happened in the city of Montpellier, the capital of the French region of Languedoc-Roussillon. Back in the late 1970s, the region was known only for its great climate and abundance of wine. Sometimes they also remembered the great François Rabelais, who taught medicine at the local university.

Now, after several decades, Languedoc-Roussillon continues to produce more wines than they do in Chile, South Africa and Australia put together. The difference is that the contribution of agriculture to the region’s economy today is less than 10%. Over 70% is provided by high-tech industries: ICT, pharmaceuticals, «green» technologies. Along with Paris, Lyon and Grenoble, Montpellier has become one of France’s largest high-tech centers, specializing in health care, information, agricultural and biological technologies, as well as renewable energy, water management and their regeneration. The city’s population (now a single metropolitan area of Montpellier and its surrounding municipalities) has doubled during this period, high rates of population growth continue to this day. In addition, unlike the rest of the population of France, the residents of Montpellier are getting younger, today 43% of metropolitan residents are younger than 30.

«We are the eighth most populous city in France. However, if we talk about the level of economic, scientific, social and cultural development, Montpellier is now the second or third city in the country,» said Gilbert Pastor, Vice President for Economic Development of Montpellier Agglomeration.

Very solid business manager

Any economic miracle has its father. For Montpellier it was Georges Frêche, who from 1977 to 2002 served as the mayor of the city, and then, until his death in 2010, he headed the combined agglomeration of Montpellier and the Regional Council of Languedoc-Roussillon.

A committed socialist, Frêche had little in common with the politically correct European left-wing intellectual. In his youth, he was a member of Marxist-Leninist Circle, participated in student riots, and for the rest of his life made no secret of his sympathy for Mao Zedong. Shortly before his death, Frêche ordered the installation of the only monument to Lenin in France, in addition to the monuments of Jean Jaurès, de Gaulle, Churchill and Roosevelt. Georges Frêche ruled the city for more than a quarter of a century and was unconditionally supported by its citizens. He was solely guided by his own ideas about what was right and what was wrong. The administrative district of Antigone, built-up with pompous buildings of white concrete and dark glass, which resembles the Italian architecture of the era of Mussolini, can
tell a lot about the late mayor. He built the district on his initiative and in accordance with his tastes, and designs of the Catalan architect Ricardo Bofill. Mr. Frêche, formerly a teacher of Roman law, gave names to the streets; he came up with the street of Zeus, Marathon Square, and Sparta Square.

This voluntaristic approach to management, multiplied by a love for large-scale risk, would have been a disaster for the city, if in addition to a complete disregard for criticism and a strong penchant for decisive actions, Georges Frêche had not been gifted by amazing insight and foresight, as well as the ability to set ambitious goals and to achieve them.

Back in 1978, Mr. Frêche decided to turn Montpellier into one of the capitals of France, and of the world. The mayor began the offensive on all fronts. The city started the construction of a conference and concert hall, the second largest in the country after the Bercy in Paris. Fabre Museum was reconstructed, becoming the third largest museum in France. There was carried out a nationwide PR campaign entitled «Montpellier is a Gifted City». It was aimed at attracting skilled and active people. During Mr. Frêche’s rule, Montpellier was always among the leaders in all that concerned implementation of the latest urban planning ideas, starting with the development of public rail transportation (light rail is now the primary means of transportation around the city) up to the creation of «smart» power networks.

**Proper business landing**

However, it was not sufficient to have just ambitious administrative, urban planning, sports and cultural projects. The Languedoc-Roussillon Region had no industrial past, but it had a solid scientific potential – three powerful universities were located in Montpellier. Two of these worked in the natural sciences, including the oldest Medical University in Europe, and one humanities university.

The strategy of transforming the city’s economy consisted of three pillars. First, during Georges Frêche’s administration, Montpellier seized every opportunity to increase the scientific and human potential of the city. The city actively pushed its candidacy when it was any major research project was proposed. Second, Mr. Frêche paid great attention to the creation of a «greenhouse» investment climate. The city established a system of «soft landing» – a set of benefits and services that provide foreign companies the most comfortable adaption to local conditions and their access to French and European markets. In the 2000s, Montpellier was repeatedly recognized as one of the most comfortable and cheapest cities in Western Europe to open and conduct business. As a result, it became home to the research and development centers of such giants as IBM, Dell, Sanofi, Veolia, Ubisoft and Intel. There are over 29 thousand private enterprises for the 420 thousand permanent residents. The city is the country’s undisputed leader by the number of start-ups created each year.

Finally, under Georges Frêche, one of the most effective systems of commercialization of scientific research and support of new technology companies was founded in Montpellier. Each year, about 20 new technology companies are created with the support of the agglomeration. Of these, 84% survive three years after their registration. That is a huge figure, considering that the national average does not exceed 60%.

**Three sources**

The system consists of three main elements, said Gilbert Pastor. The first is the university, which gives birth to new knowledge and new business projects. Then the projects are moved into one of the two technology business incubators: CapAlfa and CapOmega, which are managed by the Business Innovation Center (BIC), where the new company is created and gets onto its feet. Finally, the third stage, which
the growing companies pass, is the technology park. There are 18 business parks and two technology parks in Montpellier, specifically designed for graduates of the business incubators.

This seemingly harmonious scheme was not that productive in the beginning. To tell the truth, ten years ago it did not work at all. In France, universities are state institutions. Therefore, until recently, the state had a monopoly on all university developments. I cannot say that French universities in this situation turned into a «mass grave» for future developments. However, only major transactions were subjects of patent sales to large business.

The turning point came in 1998-2002, when at the initiative of the Minister of Education Claude Allegra, a number of laws that allowed university researchers to create a company, with no loss of basic salary, at the university were adopted. These laws ensured that the founders of the university’s intellectual property could obtain income from its commercialization, and established a system of tax incentives and tax credits for companies, investing in research and development, as well as in innovative projects.

Today, the universities of Montpellier annually transfer 10-15 licenses for the use of intellectual property belonging to them, to start-up companies that are created within their walls. In most cases, this license is provided free of charge, with the condition of royalty payments when the project begins to generate profits. What is their motivation? First of all, says Pascal Ribes, director for International Development of Montpellier Agglomeration, today the amount of money received from the state depends on how actively the university transfers technologies to business. Second, university laboratories are interested in this. The more private companies originate from a particular laboratory, the more chances it will have to attract private investments. Finally, scientists are interested in the commercialization of their own developments, because after the Allegra law was adopted, their academic careers equally depend on the number of publications and the number of patents they receive. «It is important that there exist a real interest in the commercialization of technology at all the three levels - university, laboratory and scientist. Otherwise, as experience shows, the whole system begins to stall,» says Mr. Rib.

Annually, about 20 new technology companies are created with the support of the agglomeration. Of these, 84% survive three years after their registration.

Innovative dirigisme

«Actually, we got into the business incubator by chance,» says Tomas Bergerot, one of the cofounders of the RadioShop Company. Two years ago, their company became a resident of CapOmega, one of the two technology business incubators of Montpellier, and this year its turnover has already exceeded one million euro. The essence of the innovation that underlines the business of RadioShop is a remote online service that solves the problem of musical design of stores. Today, such a giant as Carrefour is among its main clients, as well as dozens of other smaller retailers.

«Three years ago my friend and I developed an idea on how to use cloud computing for the retail trade,» continued Mr. Bergerot. “We knew nothing about business incubators. Once we saw an advertisement for a free seminar being given by the BIC, and decided to attend it. We liked the things that we were told and we applied. We were accepted, and there we created our company.»

The intermediation of the business incubator played a crucial role in finding an investor for the project. «The business incubator organized for us a meeting with potential investors, which was attended by sixty people,» says Tomas Bergerot. “We gave a ten-minute presentation, and after the meeting we had six offers from several banks, venture funds and business angels. We chose the one least burdensome for us.»
The history of the RadioShop Company has reflected all the features of the model to support innovative projects used in Montpellier. First of all, attention is drawn to the fact that the project had nothing to do with the university. Although the mechanism for the commercialization of university developments is already running in Montpellier, local universities have not yet become the main suppliers of new projects for BIC business incubators. Of 98 companies located here, only 15 have their origins in the university. The rest came from outside. «We are looking for projects through the national network of business incubators RETIS, we are conducting free lectures and seminars for those, wishing to start a business, we have several sites with remote services for start-ups, which contain detailed information about our services,» says Catherine Pommier, director of BIC.

The BIC is engaged in active searches not for the lack of volunteers. They simply pay scrupulous attention to the quality of the projects. It is not easy to get into BIC business incubator. According to Ms. Pommier, out of 230 submitted applications last year, at best 30-35 projects had any chance of being accepted. The projects are evaluated by a special commission, which in addition to officials, includes investors, industry experts and leaders of successful technology companies. There are only two selection criteria. First, the project should be based on a breakthrough innovation that has prospects in international markets. Second, the project team must include qualified specialists, able to implement this project. Furthermore, the ideology of BIC does not allow competition between projects.

Another important feature, the BIC business incubators admit project teams that have not yet registered as legal entities, and are not officially engaged in business activities. The preparatory period before the creation of the company may take up to three years - all this time, the business coaches will work with the project team on the business plan, product and marketing strategy, organizational structure of the future enterprise. During this period, it becomes clear whether the team is able to cope with the problem and whether the project is viable.

After the registration of the enterprise, the project remains in the business incubator for three years. However, the agglomeration does not abandon its full-fledged projects without care, even when they leave the business incubator. Almost all the residents of CapAlfa and CapOmega are in advance directed to the two technology parks, which will be discussed below.

Finally, the BIC is a link between projects and sources of external funding and investment. The agglomeration itself does not provide financial support to projects located in business incubators. Start-ups can rely on funding from three sources. First, these are grants from the Ministry of Science. Second, there is the regional public-private fund Crealia, which supports innovative business start-ups. It offers interest-free loans to project teams to test the project without requiring personal guarantees. The public and private Soridec Regional Development Fund, the agglomeration and the region, as well as several private venture capital funds join the projects at the start-up stage. Once each year, the BIC selects 15 projects from among the residents of the incubator. These are projects that need, and most importantly, are ready to attract foreign investments. These teams benefit from additional training and consultation. Then, at the annual meeting, these projects are introduced to a pool of investors (typically 40-50 individual business angels and representatives of banks and venture capital funds).

**The visible hand**

In general, it seems that in Montpellier they do not really rely on the «invisible hand of the market» and «the entrepreneurial spirit of the nation». The created system of innovative business support provides for the development of new projects in the «hands-on mode», under the solid tutelage of the agglomeration. By the way, all the support institutions are owned by the agglomeration and are under its direct control, specialists of BIC incubators and technology parks are municipal employees.
The key element that allows the system to work effectively are business coaches, who, in fact, have the task to help create new businesses and prepare them for the real world. Work with a business coach is a must for projects that have become residents of the BIC, this is one of the conditions specified in the contract with the incubator. There are not that many coaches, only six people for nearly 100 companies and 20 projects at the preparatory stage, and that if we do not count projects that are on the way to the business incubator.

Typically, business coaches in the BIC are either professional business consultants, since in addition to good wages, the agglomeration offers them a considerable social package, or former executives, who grew up in the BIC, who had already sold their businesses and want to try a new career. «This work is interesting, because business coaches are in the know about all the new things that will enter the market in the near future. In addition, it is interesting for them to deal with twenty projects at one time, instead of one and the same boring thing. You see different strategies, different people,» says Catherine Pommier. The quality of training is proven by the fact that a number of start-ups, placed in the BIC, are founded by people who had already once created an operating business within the BIC, and managed to sell it. «People come back to us, because it is very helpful to receive a qualified opinion on the part of an outsider, as well as free advice, which is necessary to study the competitiveness of the project,» says Ms. Pommier.

For residents of the BIC, services and business training are more important than the provision of office and laboratory premises. «Our residents rent the premises at market rates, this is our policy», says Catherine Pommier. However, the project that has concluded a contract with the BIC, does not necessarily have to move into the incubator immediately. «If the team cannot yet pay for office rent on our territory, they can be accommodated elsewhere. Nevertheless, they do have access to our entire infrastructure. The Business Incubator is primarily service and training, rather than office premises,» says Catherine Pommier.

**A healthy aura**

The technology park is the last link in the system to support start-up technological companies, set up in Montpellier. «When the first companies came out of our business incubators, we were faced with the fact that they rapidly decayed, and their team, along with intellectual property owned by them, went to work in large companies, simply because there was no place for them to continue their work. We were not happy with that, because in this case, the business incubator’s funds were simply wasted. Therefore it was decided to invest into the construction of technology parks,» says Gilbert Pastor.

Today, there are two technology parks in Montpellier, Euromédécine Biopôle for projects in the field of medicine and biotechnology, and Milénaire for ICT projects.

The Biopôle Technology Park consists of three 5-story buildings, located on the outskirts of the city. The number of buildings will double in the next three years, because those wishing to rent a lab here have formed a long queue. All the laboratories are equipped with the gases required for work, as well as chilled water. The buildings also have a single system of air disinfection. The design of the buildings allows residents to modify the layout of the laboratories according to their wishes and possibilities; it is possible to rent furnished premises ranging in size from 60 to several hundred square meters.

Today, the technology park accommodates ten companies. It is a bit more expensive to rent premises here than in a traditional office, but it is much cheaper than leasing laboratory premises, especially as it is not everywhere possible to organize a laboratory.
Any company with a legal entity status in France, and engaged in research in the pharmaceutical and bio-technology, can become a resident of the technology park. The number of jobs that a company can create in the future is another criterion for candidate selection. However, in practice, all the residents of Biopôle come from the BIC business incubator, except for the laboratories of the pharmaceutical giant Sanofi Aventis (one of the investors in the technology park, which rents laboratories there).

The agglomeration pays great attention to international cooperation. One of the main objectives of its «foreign policy» is attracting interesting projects from abroad. Seventeen companies from the UK, China and Brazil are working now in the BIC business incubators. MIBI business incubator was opened this year. It is especially designed to accommodate foreign projects.

Our Obninsk is among the international partners of the agglomeration. Two companies of the science city will soon have to replenish the number of residents of the MIBI. «How can we make the innovation system in Obninsk work just as well as it does here? We must have the political will, and this is important. I do not think that money is a problem either. However, what is to be done with all this? You cannot just take a model that works here, and apply it to another place,” believes Gilbert Pastor. “The only advice I can give you is that the quality of professionals, who manage the innovation system and innovative companies, is crucial. As well as the quality of people who hire these professionals. The quality of the people is everything.”

Written by Dmitry Mindich.

Anna Nikiforova was engaged in the preparation of this article.

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3. Interview with Philip Yo, architect of the innovation policy of Singapore

«THEFT IS A GREAT STRATEGY»

One of the main elements of the innovation strategy of Singapore is the mass purchase of talents from abroad. However, in the long term, the main ideologists of the country first and foremost rely on their own scientific and engineering personnel.

They do not like Philip Yeo at the major universities and research centers of the United States and Western Europe. There is nothing strange about this, as he has a firm reputation of one of the most aggressive talent scouts. This «serial kidnapper», as he was nicknamed by the Western media, over the last decade spent most of his working time outside of his native Singapore. While abroad, he always seeks out scientists and engineers who are not happy with their current financial position or working conditions, and who could be interested in the prospect of temporary «registering» in an exotic city-state in South-East Asia.

However, at home he has earned enormous respect and credibility. Dr. Yeo is recognized as one of the most effective managers in the entire galaxy of state managers; one who has laid the foundation for Singapore’s economic miracle. Almost all the projects which he led during his long career — initially seemed unrealizable. Yet nevertheless, he made them work. In one of his numerous interviews, without undue modesty, he stated, «In fact, I spend an average of about five years to raise a new industry, after which I simply move on to solving the next problem.»

So, Mr. Yeo was at the background of the defense industry in Singapore and established the Singapore Technologies Group, now a prosperous corporation, manufacturer and exporter of modern arms. In the early 1980s, he became the first chairman of the National Council for computer technology, and largely thanks to his efforts, Singapore has become one of the leading players in the global semiconductor industry.

In the mid-1990s, for some time, Mr. Yeo turned his attention to the chemical industry. The result of his work in this direction was the successful completion of the largest ultramodern petrochemical complex in Asia, situated on the man-made island of Jurong, while at the same time attracting to the island multi-billion investments of the leading transnational companies.

From 1986, for nearly two decades, Mr. Yeo headed the council for economic development — the key government agency that coordinates the development of long-term innovation policy. Then in April 2007, retaining his post of Special Economic Development Adviser to the Prime Minister of Singapore, he moved to The Standards, Productivity and Innovation Board, SPRING Singapore. The new government department, headed by Philip Yeo, faces an even more ambitious goal to create in this tiny country, almost from scratch, a «creative class» - a layer of scientists, innovative entrepreneurs, managers, who would administer the new economy of Singapore.

As Dr. Yeo acknowledged in an interview, his favorite historical figure is Alexander of Macedon, the king of a small and poor country, who had surrounded himself with talented associates and conquered half of the then known world. Books about Alexander and his army, his campaigns and the great empire he had created, occupy an entire section of the huge bookcase in his office.

Philip Yeo told us with great pleasure, why the country is spending billions of dollars on the development of innovative economy and why the main focus of his current work is the large-scale program to stimulate the inflow of the best brains, and not only through the bulk and wholesale purchasing of foreign experts, but by deliberate cultivation of national scientific and engineering personnel.
“If you want to build a great country, create your own army of talents,” was Dr. Yeo’s advice at the end of our conversation. This interview was held at an office, located in a skyscraper, which is part of the Biopolis. The development and successful launch of the project to create this ultra-modern technology park, on the territory of which various areas of biomedical research are actively developing, is another significant success of the indefatigable conductor of the Singaporean innovation policy.

— It would be very interesting for us to understand the specifics of the innovation infrastructure of Singapore. What difficulties arose when it was created, what mistakes should be avoided?

— Innovation is not a luxury, but a necessity. We have always been primarily export-oriented, because we have hardly any domestic market. We have no natural resources, so people and brains are our trump card. Before gaining independence from Britain, we had survived due to our advantageous geographical position for international trade, and then from the mid-1970s we began to actively implement the industrialization of the national economy. However, in fact, today we produce products for other states. The annual volume of net exports is very decent for such a small country as Singapore; this is about 200 billion USD. However, the share of production accounted for only 20 to 24 percent of the GDP. So in fact, our main problem is not related purely to the industrial component.

Let me explain this in a simple way. Let us say someone has a unique idea, on the basis of which a product is created, such as the Apple computer, for instance. Our problem is that we engage in manufacturing, marketing and distribution of the product, but the idea is not ours, it is an asset of the Apple Company. This is the main limitation of our growth - as the producers, we get a little, while Apple, which does not produce, but only owns the idea, receives the major profits.

— What are you doing to change this situation?

— As concerns sustained economic growth, it is necessary to create one’s own products and services, to generate innovation. In 1991, the Council for Economic Development (CED), which was headed by me back then, decided to establish a special national council for science and technology. The main income is provided by new ideas, so we need to develop our own ideas to make money.

The next step, after developing one’s own idea, is its successful commercialization. Of course, it is good to have a lot of scientists, but scientists do not create new jobs. It is important to take the scientist’s idea and to use it somehow, for example in the manufacturing of a product. Therefore, since 1990, the CED, in conjunction with the council on science and technology, has been significantly investing into the development of products and services, based on the ideas invented in our research institutions.

— Apparently the lack of its own research base was a very serious obstacle to the development of innovation in Singapore, was it not?

— In many ways this was the case; after all we were trying to be competitive. For now, at this point, we are just trying to reduce the cost of production, in comparison with China, which is our main competitor. Our main concern now is that whatever competitive advantage we may have, it is steadily declining. We badly need people who can think and plan. That is why we invest in people.

Today, we are simply forced to go this way. In the 1970s we did not have time for this, since the British went back home. We had an urgent need to create new jobs, and the easiest way to achieve this goal was the mass attraction of foreign companies on ultra-preferential terms. The Apple Company has been here since the early 1980s. However, this model of development quickly brought us to a deadlock, because it cannot be effective in the long run. There are many other countries that have chosen the same path, such as China, Vietnam and India, almost all of our closest neighbors in the region.
– To what extent is Singapore now dependent on global economic conditions?
– Given the large number of bankers in Singapore, there was a pretty sharp decline during the recent global financial crisis. Yet we are a small country, and we can easily rebound. I shall repeat once again, we have almost no domestic market, all of our production is dependent on exports. Therefore, when the world market sags, we also suffer losses. However, we have no debts and more than enough savings, so we are not experiencing any problems with the import of all that we need. Finally, because we are small, we can, in contrast to most other countries, afford such a «luxury» as an active social policy, care for our own population. In addition, we can afford to invest heavily into the future of this population.

We made some strategic mistakes in the 1990s. My colleagues and I simply did not have enough experience. We did not understand at that time that it was possible and necessary to attract foreign scientists and technologists, but we definitely needed to grow our own specialists as well. This is what I am doing now.

Then in 2001, a special program for the preparation of thousands of PhDs in Science was launched on my initiative. We spent a million dollars for each graduate, 50 percent of which goes to pay for their studies abroad.

When they all come back, they will play an important role in science and in our economy. My idea is that innovation comes from people, rather than from products and developments. We do not invest into innovation, we invest into people. People create innovation. All of our seed financing funds and state agencies for business support are only a way to achieve a more important goal. They all serve to support people who want to start their own business.

– To coordinate various innovative programs, to manage research and developments, as well as their commercialization, not only excellent scientists are needed. One requires managers of innovation projects, mentors for young talents. How do you get them?
– Indeed, the search for such people was, and remains, one of the most serious problems for us. We have to look for such specialists virtually everywhere in the world. Let us say we recruited around a hundred experienced scientists, researchers, whose average age was about 45-50 years. I hope that they will teach our younger and inexperienced guys. Generally speaking, finding the right number of mature and experienced people, who can lead the younger ones, is another big headache of mine.

This type of soil cultivation takes a long time, and as far as I understand it, Russia needs everything «right now». I was in Yaroslavl last year, and I have the feeling that you need to get all this going very quickly. Yet, things do not happen this way! Although, Russia, of course, is lucky in this respect, you have a rich scientific tradition. Thus far, in Singapore, there are very few scientists, and these are mainly British. Therefore, we are now actively working in this direction.

However, by and large, in order to bring all these people, we simply need to create a special environment.

– How do you manage to create such an environment?
– All you need to achieve this is to provide people with adequate financial support and freedom of action.

– So in your opinion, almost everything is connected to money?
– Basically all the professionals need - is money.

– Well, then where do you find innovation ideological leaders, such as you, for example?
– They also can be bought. Just import them. For example, import me.
— OK, we shall think about this proposal. To continuing talking about money: does the state assume all the costs to finance your «Personnel Program»?

— Yes, the government pays for everything. Singapore is not like Russia, where there is oil and gas. We have to save money for the most appropriate goals. We manage the economy in such a way that our savings increase every year by five billion dollars, and we invest the money into people.

— Have you invited experts from Russia?

— Yes, we have a few scientists from Russia, Ukraine, and even one woman from Kazakhstan, but so far, there are only a few here.

— How tough is today’s competition for the best specialists, for talents? Does Singapore have to compete with the U.S., China and other rapidly developing countries?

— Of course we do. They have a numerical advantage, we have our eastern mindset. In addition, in Singapore we speak good English, which is also a big plus.

— At the same time, you are inviting foreign experts, engaged only in the field of applied research, are you not?

— That is true. We do not have the time and money to study neutrinos. We are not able to do basic science.

— However, in the future do you plan to develop basic research?

— No, for this we simply do not have enough people... or patience. In Russia you still have much human potential, who can actively engage in basic science. In addition, in basic science, success largely depends on chance. We cannot afford to wait long for the results, and hope for good luck. Therefore, we need only applied research and developments in the field of biology, medicine, genetics, computer science, etc.

— However, now all are engaged in the development of these areas, are they not?

— Yes, but it does not matter, because specialists in these areas are, in any case, the best investment. We invest into people, while you invest into buildings. How can buildings make a difference?

— So you think we should concentrate on people?

— Exactly. If I worked in Russia, I would launch a special program for child prodigies, for the most gifted children, instead of specific construction projects. You invest too much in construction and almost nothing in talented people. Find the funds to attract, develop and cultivate talents. Why do you need the buildings? There is nothing good in them, and many people construct these buildings better than you can.

The main thing is to find a «godfather» for gifted children, an experienced politician, who would become their reliable protector. You need clever and smart kids, look for these children among school age children from low-income families. Look actively for children with mathematical abilities. Mathematics is essential. Smart kids, who understand mathematics, may engage in physics and all the other sciences. Test them and select 10,000 of the best kids.

The book worth a billion dollars

— Does the book, which now lies in front of you, contain information on all Singapore graduate students that you support?

— Yes. I am like a horse breeder; I select the «best horses». I have to constantly take care of them, and I know them all by name. In addition, I know the names of their girlfriends (or boyfriends), and what they like, in general, I know many details of their personal lives.
– Can this book be read by anyone else?
– No. I do not give it out to anyone. I made this book for myself. When I travel around the world, I always take it with me, I always keep track of them, add information about their achievements.

– Do the people under your charge have to report to you on a regular basis?
– Well, technically I am not their boss, and when I come to them, we «just chat». Although, by and large, they do of course, provide me with some sort of progress reports.

– Is there any danger that the students that you send to study abroad will not come back?
– They all will come back. We pay for them, a total of one billion dollars. They signed a contract and pledged to return. Among these there are even international students, who are prepared to work in Singapore when they graduate. We are a small country, and if we do not steal brains, we will not survive. What do you think the United States is doing all the time? The same thing, they are stealing talents, and the scale of this theft is not even comparable with ours.

– So, your entire «selected cohort» obtain their education exclusively abroad. What about the National University of Singapore?
– The University of Singapore is good for basic higher education. While my main interest lies in graduates and post-graduates. We annually have about 30,000 graduates. Of these, about 8 percent have the highest scores, and of these 8 percent, a very small proportion, just the «crème de la crème», achieve one hundred percent results. We are investing in them now.

– What about the «quality control» of your charges?
– Our graduate students have publications in international journals. We can judge by these publications. As a rule, such works are of a very high level and meet all international standards. So we do not worry about this.

I have another problem, we need to find a thousand of such young talents, alas, we still do not have enough of our own. Young people in Singapore are still not competitive according to international standards. Thus I must work on “kidnapping”. We attract young professionals in Singapore, guaranteeing them financial support for about ten years.

– How do you choose the people who you want to kidnap? What are the requirements for them?
– First of all they have to be savvy.

– However, this is a very subjective criterion...
– First, this can be determined by the college they graduated from. This is the main indicator, the main criterion. We are looking for graduates of Stanford, MIT, Harvard, Cambridge, and Oxford. If we look at the United States, you will find there many universities, but basically they prepare bachelors and masters, and very few PhDs. These are trained only in the best universities.

– Well, and what if you do not choose the right person?
– I have no room for error. I choose only one thousand, I choose them on my own, and I know my job. We need only the smart ones. They should have some God-given talent.

– How do you deduce this? By their eyes?
– I talk to them. I meet them and ask questions. I travel a lot, I specifically look for talents. I go to Boston, Cambridge. I see these students, have tea with them, and I know how to determine which of them is really clever and smart.
– Are there any regulatory authorities to whom you are accountable?

– I am not being checked, at least, not yet. This is a question of trust and reputation. I have worked with many people. I prepared and taught many people. I do this not for myself, but for the future generations. Some people think that I pet my charges, but I am convinced that they are our future. Some of them will become great scholars, others good managers, and yet others - future political leaders. If you create a new society, you must be willing to invest - and wait.

– Do you have a vision of the overall system to support your graduate students when they return? How will you create that nutrient medium in which the talents and ideas of your beneficiaries will be converted into commercial projects?

– Starting with this year, our students begin to return, all of them will need labs, and they will also need to study business. I will sponsor their education. They will receive MBAs by correspondence (if they engage in full-time education, they will neglect science). In general, I will fund their business training, but they will continue to work in laboratories. This is necessary because scientists are thinkers, not businessmen. They are not trained to conduct business. Therefore, they need training, and again, it all depends on the people, on their character and mentality. Some people are entrepreneurs by nature, others are not. For some you need to create an environment, to support them, and hopefully their business will flourish. Others cannot conduct business on their own, they need additional support, training.

– How much do young scientists earn now in Singapore?

– It depends on the scientist. Young scientists, who return from abroad, will initially receive about six thousand dollars a month. However, their wages may increase, there are no restrictions. This is a real challenge for us - to be an attractive place to live and work, both for our own and foreign experts. We try to do everything to make them feel as comfortable as possible in Singapore.

– Is there a big difference between the salaries of your scientists and officials?

– We pay very good salaries to people in the government. If you are smart enough, you will choose the most talented people and pay them so much that they are able to work honestly.

– What should the salary of officials be to refuse bribes?

– The ministers of our government get two million Singapore dollars per year (about 1.55 million USD at current exchange rates. - «Expert»), but they have no other bonuses or privileges. No houses or cars. That is all they get.

– Which companies will be able to create the basis of the new economy in Singapore?

– The future certainly does not belong to large corporations; it is reserved for small and medium enterprises. The value of large corporations has been declining these days, and it will be even less in the future. Therefore, one of our most important tasks today is stimulating the creating small and medium-sized enterprises, growing «national technology champions». They will be able to provide jobs for more people, especially, when they manage to reach the international level. Therefore, we must first focus on them, they are the foundation. In the last few years, major advances in our economy have been connected with companies having average annual incomes of not more than $10 million.

– In this case, what role in the innovation system of Singapore do you attribute to major high-tech corporations?

– Singapore has practically no high-tech companies of its own, of the international level. However, with the help of various tricks, we managed to win over to our side a huge number of industrial and research units of foreign giants in this global industry. That is, in a certain way, we have already stolen them from other countries.
Generally speaking, theft is a universal economic strategy! All these «stolen» big corporations have come here into our economy and ensured us with quick recovery and prosperity. Yes, now large international corporations are operating in Singapore, primarily because we provided them with significant tax incentives for production. However, in the long run, the availability of highly qualified scientists and engineers should be an even more serious incentive for them, because in the economy of the 21st century, large corporations will go to the place where there are talents. If I run a company, I need talents, and I invest in the country where I can find them in the required quantity and of the required quality. Therefore, those one thousand students, whom I chose and into whom I invest money, no doubt, in a short time, will become for them a very powerful lure.

Written by Dmitry Mindich, Tigran Oganesyan, Anna Nikiforova.
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4. Interview with William Miller, Professor of Management and Computer Science at Stanford University, founder of several companies in Silicon Valley

WHO RUNS SILICON VALLEY

You can have a company with no research, but no one needs research without application to business, believes William Miller, professor of management and computer science at Stanford University, founder of several companies in the Silicon Valley.

There remain very few people who were witnesses and participants in the creation of the Silicon Valley. Stanford professor William Miller is one of those old-timers. He has had a distinguished university career, he serves as a professor of management and computer science, earlier he had combined these posts with that of professor at Stanford University. As it is appropriate for a good professor from California, he has several successful technological start-ups to his name. Finally, William Miller was at the background of several organizations, due to which Silicon Valley has evolved into an organized business community, in the popular journalistic sense. Among these is the Joint Venture Silicon Valley Network - a network organization that has achieved harmonization related to technological legislation in all administrative entities, included in the Silicon Valley. Today, Mr. Miller is engaged in innovation, not only as a practitioner, but also as a researcher and consultant to governments of more than a dozen countries.

We discussed with William Miller what is important, and what is not important, for the creation of an innovative environment, how an entrepreneur from the Silicon Valley sees the innovation policy of Europe and Southeast Asia, what is to be done in this field by Russia.

The state is not an entrepreneur

– Is it possible to describe in a few words the necessary conditions for innovation development? For example: how big should be the part of the state and what exactly it should do?

– There are different approaches to system development. In Asia, you will encounter a much bigger influence on behalf of the state, in the U.S. it is less, and in Finland it is significant. The most important issue for most countries is the right attitude towards risk and failure, cooperation, and the open atmosphere. It is the task of public management to take care of it, to promote it. It is also necessary to create a good IT and technology infrastructure for communications. Another thing that is more important today than it was half a century ago, the presence of a good transport center, because international relations and communication are essential. For example, there is a science park in Korea to the south of Seoul, but it takes an hour to travel from it to Seoul. There is no international airport there. To generate ideas one needs to be accessible, one should be in constant contact with people. Another important point – there is a need for entrepreneurs, willing to take risks, but there is also need for financiers, who will assess the risks, because, as we know, many start-ups fail and close. So there should necessarily be several major successful projects to compensate for the loss of those who will invest in the failed projects.

– How many conditions: we need money, transportation system, savvy people, and a special atmosphere. Where to start, when there is almost nothing?

– In the early stage of the development of the Silicon Valley, Stanford played a very important role. It was a Stanford student who over a hundred years ago founded the first truly significant high-tech company, and several professors, including the first rector of Stanford, invested small amounts into the
company, because they understood that they were investing not in a separate business, but rather in the development of the region. It is important to ensure that institutions have high-tech ideas, but it is no less important to make them understand that they can create companies.

The experience of Taiwan is also very useful, because in the final analysis, it came the closest to the Silicon Valley. They understood that it is necessary that good universities interact with the economy, and with industry. In Taiwan, the engine was the Industrial Technology Research Institute. It is involved in deeply scientific, academic problems, but it closely cooperates with business, and many employees created their own companies based on the institute’s developments, or passed the technology to other companies and helped them develop. That is, the Institute has become a research department for many small businesses, which do not have their own research base. In the end, these companies have opened up new trends in research.

- **What can impede the development of innovation?**

  - Too much government intervention is ruinous, because representatives of the states have different goals, in addition to business, and often they do not have the required experience. They are not entrepreneurs. In Taiwan, the government launched the process, invested in the venture capital fund, but there was not a single state manager in the fund, it was not even a partner. Private sector was responsible for the investment decisions.

  Back to the question of the so-called innovative environment, for example, bankruptcy laws hinder the process. In some countries, if you are bankrupt, you will not be able to get financing, either for a very long time or forever. Of course, entrepreneurs have to take risks, but they cannot risk everything. Here is one bad example in Dubai, they have a prison for debtors, and if you owe money, then you go to jail. The employment law may be a particular problem as well. In some European countries, you need a lot of time to fire a bad employee. In Germany, you will spend two years on this, and it is very bad for start-up companies. Japan has done this work best of all. Previously, there was no limited liability and in order to open a business, it was necessary to pledge all your personal assets. If the company went bankrupt, entrepreneurs lost everything, even their houses, everything. Previously, to open a business they had to invest a significant amount of their own money. Now, they changed the laws and simplified the creation of companies with a small initial capital. Your state may do the same thing, change the law. To do this, it is necessary to examine the existing laws and establish which of them contribute, and which hinder the development - and change the latter.

- **What mistakes were made by the country with which you worked? What challenges did they face?**

  - I can cite the example of Singapore, in many ways it was very successful, but now they are going through hard times, and one of the reasons is that the state controls everything, even if not openly, not directly, but many successful companies were created by the state, and there is a strong relationship between them. They have very few businessmen. In schools they still do not teach entrepreneurship. In addition, it is easier to become a civil servant there, than to risk being an entrepreneur. This problem exists in many countries, Singapore is just one example. Another mistake that is made by many states - they consider that technology is the most important thing. In fact, the most important is business. These countries concentrate all their efforts on research, rather than focusing on the conditions, creating the right environment.

- **What is more important for innovation - large or small business?**

  - Another mistake, and it is not an easy case, is that often the emphasis is laid on attracting large companies. Large companies are important, but what happens when you attract them into the country? I can cite the example of Austin, Texas. At first, they attracted large companies and, therefore, banks
CREATING AND DEVELOPING INNOVATION CENTERS: GUIDE
TECHNOLOGIES AND KEY PRINCIPLES

and universities paid attention only to them, nobody was interested in small business. It was very
difficult to move on to creating and developing a good environment for start-ups, it took a long time to
implement such changes. Even today, their environment and the community of start-ups are good, but
not very strong. Another example is the Research Triangle Park, North Carolina. They attracted large
companies that created jobs. This is a good idea, but now there are practically no start-ups, there is
no corresponding culture.

In general, large companies are important because small companies can work for them, but here in
Los Angeles or San Diego, first appeared the start-ups, and then the big companies to cooperate with
them. Therefore, in a dynamic region, it is better to launch start-ups first; it is important to start new,
young companies.

This happens not only in the United States. It is interesting to compare Taiwan and Singapore. Singapore
has succeeded with large companies and is still very successful. However, now they have little start-
ups. Taiwan is exactly the opposite, there are a lot of start-ups, and then big business followed them.
That is, start-ups allow you to create and develop new industries, brand new activities, while larger
firms generally operate in the existing industries. Besides this, it is easy to see that big companies do
not greatly increase the number of jobs. Initially, of course, they hire new recruits, but then they begin
to increase efficiency. Then, as they work more and more efficiently, they need fewer and fewer people,
while start-ups are constantly increasing staff. Some American companies have existed for quite some
time, Google for example, but still in many ways they are still start-ups. Mainly these are the structures
that increase employment. However, there are not many of them.

– Yet sometimes, such differences are not associated with errors, but rather with the culture
and lifestyle, characteristic of different countries?

– Yes, this largely depends on the culture. Yet the culture is changing. China is one of the best
examples. Three decades ago all worked for the state in some way or another. Companies opened,
but there was no concept of a «start-up». However, after easing in the legislation, the Chinese have
become very entrepreneurial and competitive. We sometimes think that we are inferior to them in this
respect. They have their own problems, but they certainly have created a strong culture of start-ups.
They may withdraw from the university, work for two years in a company and then they are guaranteed
to return to their previously held position. In addition, many professors are now beginning to work either
for companies or open them, or help them to open.

– How long does it take to create such a culture?

– Silicon Valley has been a high-tech region for more than one hundred years. A really good example is
San Diego, they have been quickly changing, largely thanks to the efforts of the University of California.
The university rector had previously taught at Stanford University, and was well aware of how Silicon
Valley worked. Then he worked in public service, led the National Science Foundation. In San Diego, he
appointed a person to create connections between industry, researchers and government. Thus, the
Connect organization was founded, which engaged in establishing links. After that, they were able to
convince city officials to allocate an area for research institutes and start-ups. Starting from scratch,
in 20 years they have become the third biotechnological area in the world. In this case, local authorities
were far more important than the state government or the federal government. Yes, they received
money from contracts with the companies, but the position and the approach of local authorities played
a really important role.

– How much time will Russia require?

– You will develop faster than we have here, because now everything is moving and changing faster.
In just 25 years Taiwan managed to create what we have been creating for more than half a century.
«I did not know»

— So, the most important things are the people who are able to attract investment, to convince the government, who can give rise to truly innovative ideas that can start the whole process - but where do they come from, if none existed before?

— This can be learned, you have to understand - entrepreneurship is learned. I did not know what it is to be an entrepreneur, before I turned 60. Maybe I had some skills and experience, but I opened my first company only at the age of 60. Of course, support, the right mentors and teachers are needed. For example, in the Silicon Valley, the two first entrepreneurs were Bill Hewlett and David Packard, the founders of the Hewlett-Packard Company. They were supported by a very good teacher. If it were not for the teachers, the students themselves would not have created anything.

— Does the general economic situation affect development of the innovation infrastructure?

— It affects it in two ways. When the economic situation is complicated, investors do not want to take risks, because they do not understand how they will get their money, the IPO market is not very strong, and the flow of venture capital is reduced. Those companies, where managers have a lot of money, are successful now. At the same time, when there is a lot of money, they spend too much, and as a result, they are at a loss when they suddenly are short of money. On the other hand, when the recession started, at least here in the U.S., more companies were established. People are losing their jobs, but they have some ideas, thoughts, and they open up their companies. Many of the really important businesses were created in times of recession.

— How did the current economic recession affect the venture capital investments in the U.S. and around the world? In Asia? In Europe?

— Investors are now less inclined to invest in the early stages, when there are more risks. This trend began to take shape two years ago in Europe, in the USA and in Asia, especially in Japan and Korea. While in China, cities and provinces create local venture capital funds, so there is a much larger supply of venture capital. However, this is a fairly new phenomenon, and their results are not impressive, thus far. People who control these local public funds, lack experience. They invest into projects that are unlikely to ever become profitable.

— What measures should be taken by the government to stimulate the flow of venture capital in the countries where this market is not developed or does not exist?

— In the United States, in the early stages of development, the system of the so-called matching funds investing into small business turned out to be effective. If there are some private funds in such a fund, the state also invests more money into the fund. As a result we get a larger fund, but the main thing is that subsequently the state would not try to run the business, which receives money from the fund. This scheme worked in the U.S. in the early stages of development. We still call them funds for investments into small businesses.

— The world is experiencing a craze of business incubators, science and technology parks; they are opening up everywhere, especially in Europe and probably in Asia. Most of them were created on the initiative and with direct participation of the state. In your opinion, is the role of such tools as technology parks and incubators exaggerated?

— I think that this is a difficult question, because sometimes they work well. I know a few examples. However, I also know cases when such institutions are ineffective. Here in Palo Alto, incubators are not really needed. We can say that we have here a great incubator, one large community. The best option is to create something like that. Nevertheless, sometimes, business incubators help start the process. For example, the state of Santa Catarina in southern Brazil. The state includes the island
bearing the same name, where the regional authorities have opened incubators and technology parks – and these operate quite productively. They are mainly managed by private companies or universities, and government allocates land for them. They managed to create a community of enterprising people, a culture of innovative entrepreneurship. The incubators have had a really important role, because the more experienced entrepreneurs help younger people. Collective learning is very strong there. In general, work on the development of incubators and science parks created the right atmosphere and culture.

– In Europe, very few really large companies that are comparable to Google, Intel and so on, grow from start-ups. How can this be explained?

– Several years ago I studied a technology park near Cambridge. They opened about three thousand start-ups, but there were very few large and most successful ones. I paid attention to the fact that over there, start-ups are usual companies, emerging from laboratory research. In laboratories they often develop devices within their own research, and then it suddenly comes to someone’s mind that this could be a commercial product. They did not plan to create something big and meaningful; they did not intend to change the world. They just took simple ideas and commercialized them. It all turned out well, and there were new businesses. Yet as a result, these companies worked for larger firms. They have almost no relationships; there is little interaction with their business schools. I know that technologically, and in terms of engineering, they are very advanced, but they are not oriented to business. They just carry out their usual research and utilize the results. I also know that Cambridge is not the only one of this kind.

Without government

– How is the Silicon Valley controlled?

– Some people believe that Silicon Valley is just a state of mind, a certain perception of reality. This is partly true. There is a curious fact: there is no central governing body. If you look at the region, which is called the Silicon Valley, you will see 21 separate independent jurisdictions - small towns, counties and so on. We have no central government. However, we have a framework, which helps coordinate various activities in the field of environmental protection, airspace safety, land use and other things. There is a really important organization – the Joint Venture – Silicon Valley Network. They have ensured that all these cities adopted similar rules, so that it was easier for the companies to do business. I believe that these non-profit organizations play an important role in the legislation. It is also important for people to share experiences and knowledge, if we do not talk about commercial secrets. The community organizes events for people to meet and communicate. As a result, there is a constant process of collective learning for all members of the community. One more thing, at Stanford we have the so called programs for branches of businesses, companies pay membership fees to participate in them. At such events, students and teachers talk about research, while business representatives, people from the industrial environment, tell them what to do. It is not just that the Institute conducts research and development work, and then sends the results into production, into business, but also the business has to ask questions, and then there appears mutual interest. Students and teachers master the language of business; they learn to think like businessmen.

– How do you see the prospects of the Valley?

– The Silicon Valley has two advantages. The first — the concentration of venture capital is growing: there is a very strong flow of proposals and ideas. Yet, we do have cause for concern, because of the financial situation in California. The system of the University of California has considerably weakened, so we do not believe that they will provide a steady amount of research and development work. It is very important to maintain this flow of ideas. The second important point is that here we still have a very
favorable business and social environment, and many people come here because they believe that it is easier to start a company, find new ideas, right here. Many people come from Israel, Asia, and there are a few people from Russia. This is very good, this is our advantage, but we are not the only ones, competition is growing. Therefore, we need to maintain good relations with other regions, since innovative products are not created in one place, so it is important to understand what is happening in other countries. We have especially strong ties with Asia, because we are on the west coast of the United States. Many of our companies, when they are created, open their first offices abroad – in Korea or China.

— There have been many attempts to use the experience of Silicon Valley. What are the similarities between successful and unsuccessful attempts?

— I think there are two reasons for failures. First, too much emphasis is laid on research. Second, not enough attention is paid to business issues. In one of my speeches, I turned to the story of a small innovative company, from its inception, growth into a mature company. There are no significant technological solutions, most of the decisions are business decisions. It is important to have trained people, who are able to make such decisions. Any start-up experiences difficulties. It is not technology, but people who solve the problems. So I think that too much emphasis is laid on everything, related to research and development of new technologies, while business ideas, which can bring success, are not supported.

Written by Anna Nikiforova.
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5. Interview with Jae Goo Lee, President of the Korean Innovation Cluster Foundation, head of Daedeok Innopolis (South Korea)

KOREAN INNOPOLIS

*It has become increasingly difficult for South Korea to retain the status of one of the leading suppliers of high technology products to the world market. Primarily this is due to increased competition on the part of China. Koreans see the solution to this problem in the transition from the implementation of foreign technologies to the development of their own*

The share of small and medium enterprises in Korea accounts for 87.5% of all the employed people in the economy and about 50% of the GDP. However, the specifics of the structure of this sector are such that it is poorly suited to the role of a serious consumer or producer of innovation. The fact is that most Korean small and medium-sized companies have just one client, in the direct meaning of the word. A vast number of companies are bound by the contract with one of the chaebols, such as Samsung or LG.

This situation is quite comfortable for small businesses, because it ensures sales of products, irrespective of the short-term situation. However, after spending several years on one contract, the company loses the ability to expand and upgrade, consequently it degrades. As a result, once it discovers that its services are no longer required, as the chaebol finds a cheaper supplier, and since the company has no other customers and it does not know how to search for them, it means certain bankruptcy.

So far, the developed innovation infrastructure does little to address this problem. In Korea, there are several areas that were created in Silicon Valley’s own image and likeness. First of all these are the Daedeok Innopolis in Daejeon and Guro Digital Complex in Seoul. Koreans try to reproduce faithfully the «silicon» success story, accumulating in these areas the important ingredients of an innovative environment: small and medium-sized companies, research centers, and governmental programs to support start-ups. However, there’s no miracle here. According to Matthew Weigand, editor of the Korea IT Times, the country lacks the key element of any innovation system – venture capital. In Korea, there almost are no business angels or classic venture capital funds. They do not exist, because these structures grow out of small and medium-sized companies.

Weak demand for innovation is aggravated by the bulk of problems in the production of new knowledge. Korea joined late in the process of industrialization and instead of developing new technologies it borrowed ready-made ones. According to the research fellow of the Institute of Development of Korea Soo Dzhunge, despite the fact that by the overall intensity of research (R&D costs relative to GDP) Korea is among the leaders of the group, along with Sweden, Finland and even ahead of Japan, the balance of technology trade of the country is one of the lowest among OECD members. In other words, the system does not work for the organization of new research, but rather it borrows other people’s developments and improves them.

The Korean Government hopes to reverse the negative trends and to form a new framework of the national innovation system, in particular, by reformatting the previously created network of scientific and technology parks. We discussed the history of Daedeok Innopolis, the largest network, and its development plans with the President of the Korean Innovation Cluster Foundation Jae Goo Lee.

– *Why did the name of your technology center change several times?*

– In 2005, there were major changes in the government’s science policy. One of the consequences was the change of our name from Daedeok Science Town to Daedeok Innopolis. From 1973 to 2005, we were a purely science park, a research center. However, the government wanted this research to make
money. It was necessary to learn how to use the knowledge and the potential for economic development. Therefore, in 2005, this area was open for businesses. We had the task to commercialize technologies, developed in public research institutes. It was one of the weak points of our national innovation system. We were not very good at turning knowledge into money, at commercializing it. In this respect, we also took measures to reform the management system. Also in 2005, the power to manage the technology park was delegated to the DaeDeok Technopolis agency, and in 2010, this was transformed into the Korean Innovation Cluster Foundation.

— What are the strategic objectives of your fund?

— Our mission is to create a dynamic innovation cluster. Formally the cluster already exists. Research institutes, universities, venture capital firms are concentrated here. When the science park was created, the leading research institutions from the entire Korea were moved here. It was a unique experience, nowhere else in Asia you will see such a number of institutions working in aerospace, biotechnology, space research, nuclear industry, etc. all located close to each other. It is also important that educational institutions are also available here, above all, this is the Korea Advanced Institute of Science and Technology, KAIST, which is known not only for its developments, but also due to the fact that it is the main source of manpower for major Korean companies.

As a result, we managed to create a center with a really powerful research potential, but weakly bound to the key sectors of Korean industry. Since the mid-1990s, we have been trying to somehow eliminate this gap, attracting large companies into the area. However, in reality the issue got moving only in the mid-2000s, after the crisis, when the area began to open for businesses.

— Did the concentration of a wide range of research organizations help to achieve synergy in DaeDeok?

— To a large extent, yes. I will give the example of CDMA mobile communications technology, established in 1995. Its development required the participation of specialists in information technology, physicists, chemists, material scientists. Yet, this synergy did not appear spontaneously. Such a project could hardly be successfully implemented without the state, which at that time set us the task to create advanced mobile communication technologies. However, despite the success of the project, which involved the government, business and academics, the self-sustaining innovative environment did not appear. The gap between big business and science was not eliminated. As a result, Samsung and LG withdrew from DaeDeok most of their research assets, retaining here only the centers of chemical research.

Now we rely on cooperation with small and medium-sized companies, they are mobile and can be much more effective tools for the commercialization of the technologies, developed in public research institutes.

— How did the change of your status and objectives influence the mechanism of technology transfer from public institutions to technology companies?

— I shall repeat that until 2005, we were a purely research organization and were not engaged in technology transfer or commercialization. When we changed our status, businesses flooded into the area. In 2005, 64 technology companies operated in the district, today for more than 1,000 companies are operating in the park. In addition, we have created an investment fund to provide support to companies wishing to obtain the status of residents of the area. This was important because, in accordance with the new rules, scientists of public institutions have the right to create their own start-ups. Previously, scientists in Korea were forbidden to do this. Thanks to our new possibilities, researchers have the chance to implement their developments. Typically, in this case, the scientist receives some kind of vacation for two to three years, and when the commercialization project is completed, the person has the right to return to research work. Today it is one of our core business models, support for scientists, who dared to implement the commercialization of their own developments.
To whom does the right to intellectual property belong in this system, to the researcher, institution, or state?

Theoretically, intellectual property rights are reserved to scientists and research institute. However, the proportions may vary. It depends on many variables, for example, on the total cost for a particular research.

What changes does Daedeok need to achieve your main goal?

First of all this means establishing relationships between business, research institutes and educational institutions. I cannot say we do not have this, or that it is very weak. Rather, it lacks a number of catalysts, required for the formation of an effective innovation environment.

How do you choose projects, which will be supported by government grants?

In the core set of disciplines, we have qualified committees, usually composed of five to seven external experts, scientists and businessmen, who can assess the scientific soundness and market prospects of the proposed projects. They also assess the amount of the requested grant support, and to what extent it meets the parameters of the proposed project. When it comes to more mature projects, the decision to grant support is taken by a special commercialization committee, whose members primarily evaluate the marketing aspects of the new technology or product.

In addition to public resources, do you attract other sources of funding?

At the moment, we do not. We are a state company, and now we are dealing only with budget money. However, in 2012 we will start working with external resources. For these purposes, we shall create a mixed fund, using our own funds and those attracted from abroad, particularly from the budget of the Taejon Region.

What specific development programs are you planning to start or have already started within the transformation of Daedeok?

At the moment, our most pressing problem is to achieve a balance between the cost of research and revenues from its commercialization. Before the launch of the new mixed fund, we need to conduct an audit, in order to re-prioritize and consider the set of projects, given the new requirements. Many of the projects that were started after 2005 will have to be restructured. Some of them did not meet our expectations, and perhaps, we will have to reject them. However, I cannot tell you more about this, because the process is not finished yet.

The second important aspect of our ongoing work is associated with the implementation of the plan for regional development. Taejon is the center of a national network of innovative parks, besides it there are also such parks as Kwangju and Taegu. In the coming years a new business and technology zone will be created in the triangle, formed by connecting these points on the map. This is a large state project, and we are participating in it as one of the developers, we are preparing proposals for the strategy and tactics of the new zone.

Will your branches in Gwangju and Daegu also be reformatted, taking into account changes occurring in Daedeok?

Not all at once. So far, we remain a public entity, and are fully funded from the state budget. However, the government has made it clear that in the coming years, we will have to achieve self-financing. This also applies to technology parks in Gwangju and Daegu, which have been created and funded jointly by the regional authorities and the national government.

The experience of which international technology parks would you like to apply here?

The prototype of our innovation center was the Science City of Tsukuba (Japan) and the Hsinchu Technology Park (Taiwan). However, at the new stage of development we are increasingly focusing on the experience of the Silicon Valley and the French technology park Sophia Antipolis.
— **What are the criteria to evaluate your success? Do you have a formalized system of targets?**

— For many years, our core values were purely quantitative - the number of new participating companies, the amount of technology transfers, the number of employees, patents. However in the new environment, they must be supplemented by indicators that measure the success of our efforts in commercialization and implementation. We are preparing a methodology that will allow us to quantify these processes.

— **What is the future of the participants of your Technopolis - are they acquired by large international corporations, or do they enter the global market on their own?**

— No. We have not had anything of this kind yet. Several of our successful companies were acquired, not by foreign, but by Korean conglomerates. Basically, they retain their independence and built in cooperation ties within Korea, first of all, these are again contracts with the Chaebols.

— **Is the level of «infant mortality» high among the residents of the Technopolis?**

— During the whole history of our existence, there were not more than a couple of obvious failures. However, this does not mean that we have permanent staff members. Companies come and leave. In the latter case, this is most often associated with the need to expand productive capacity. Here, the opportunities are limited, so some are compelled to move closer to the developed industrial zones, next to Seoul or other major cities.

— **How many Korean companies are there among your residents? How widely are foreigners represented?**

— The vast majority of our residents are Korean companies.

— **What kind of support do you offer them?**

— First of all, information and advice. However, this is not mandatory, that is, we do not impose our services to anyone.

— **Then please explain, what makes Innopolis attractive for the companies?**

— Our research park is number one in Korea. It was the first one created, it has the most scientists, institutions, and the national system for mobile communications was created here, as well as the Korean nuclear reactor. In general, Daedeok is synonymous with science in Korea, and it is a great honor for a company to be the resident of this center. We carefully select our residents, and if the company has passed through our filters and received «residency», it obtains a kind of quality certification. In other words, «a company from Daedeok Innopolis» is an upmarket brand, and many are willing to pay for this. We clearly understand that the PR-component has been and remains an important incentive for many companies who came to Daedeok Innopolis after 2005. However, it is also important that businesses, in locating here, are drastically reducing the communication distance with the world of research and scientists, and start to understand how research is conducted, which is really important in different fields of science. There is a mutual enrichment between the business community and the academic world, an innovative environment is being formed.

— **What financial, fiscal benefits do the residents of the area receive?**

— Our rental rates are fully comparable to market leasing rates, and they are actually slightly lower than in other major business centers. In addition, there is a system of tax benefits, separate for Korean and foreign companies. In fact, the forming innovative environment is quite a powerful incentive. For example, at some point many start-ups need to package the technology into some attractive shell, but they cannot do this on their own. Therefore, we have specially invited a few companies, specializing in industrial design. So now all the problems of this kind can be easily solved without leaving Daedeok.
- **How often do area residents use your consulting services?**

  Consulting services cover all the stages of development, starting with the preparation of grant applications, developing a business plan for start-up and the finishing stage of commercialization. Every year we send out our support proposals to the residents and institutions, for example, we partially subsidize start-ups, when they need industrial design services, or when they are preparing to introduce their goods onto the market, for marketing research.

- **Where do you find the experts and consultants, necessary for this work?**

  In 2005, when we began to engage in commercialization, we certainly did not have our own experts, and we had to involve specialists from Samsung and LG. They formed several working groups, which conducted a survey of all the new resident companies to identify their current and potential demand for consulting services and other support. Later, external consultants joined in this work. Now we have already created our own system for providing consulting support, but there are things for which we still attract outsourced talent.

- **Did you attract foreign experts?**

  No, we did not. Not a single one.

*Written by Alexey Zayko.*

*Anna Nikiforova was engaged in preparation of the article.*

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6. Article about the Technopolis network of technoparks (Finland), based on an interview with Pertti Huuskonen, its founder and Mervi Käki, the creator and former CEO of the Technopolis Capital Region (Finland),

WARM FINNISH CLIMATE

Finland is one of the few countries where the creation and management of technology parks became not just a tool to support innovation, but also a profitable private business. The recipe is simple – a favorable business climate, a harmonious system of innovation support, balance between public and private investments into technology parks and a clear understanding of who needs them and why.

Speaking of enterprises, located in technology parks and operated by Technopolis, its founder, Pertti Huuskonen, never speaks of «small innovative enterprises», «commercialization of innovation developments» or «support of innovative projects». He speaks only of «customers».

This word most accurately reflects the key feature of the ideology of the Finnish technology parks. Companies that lease their offices and laboratories are not their charges, who are given a helping hand, but customers, who buy a unique product, offered by Technopolis – the leasing of suitable premises, set of services, and a particular business environment. This is a quality product, and customers are willing to pay a lot of money for it, enough to ensure the Technopolis with an annual profit, and to be able to regularly pay dividends to more than 4 thousand private and institutional investors from a dozen countries around the world, who have bought shares of this management company.

The Technopolis network of technoparks works according to uniform standards, and is the largest in Europe. Currently, the company operates 20 technology parks, located in six cities in Finland. Two more technology parks are located in Tallinn and St. Petersburg. Its customers include more than 950 small, medium and large companies working in ICT, electronics, biotechnology, medical technology, technologies for the forest and food industries, and which provide jobs for more than 12 thousand people. The company operates more than 300 thousand square meters of office and laboratory premises.

However, it is not these figures that make Technopolis unique. Perhaps, this is the only example in the world, where a private commercial enterprise, whose shares are traded on the stock exchange, acts as a key element of the national innovation system. In addition, Technopolis succeeded in what most of its counterparts have failed, it managed to create an efficient and scalable model for managing technology parks - and the key to the secret of its success is the word «customer».

The recipe to overcome depression

Technopolis did not become a private company right at the start. Moreover, it appeared exclusively due to public initiative and the activity of the municipal authorities. Technopolis is of the same age as the Finnish high-tech industry. The homeland of the Finnish technoparks is Oulu, a city in northern Finland, about 600 km away from Helsinki, which in the past 30 years developed from a depressed industrial city to one of the key high-tech centers in Europe.

As usual, it all began with an economic crisis, or rather with a series of crises. In the mid-1950s, the largest Finnish port on the Baltic, and once the most populous city in the country, was losing in the
competition with the industrialized South. Residents, who had moved to regions with more prosperous situation on the labor market, began to flee, and Oulu slowly but surely began to decline.

In order to give the city a second breath, the national government began to invest heavily into the transport infrastructure. In 1959 a University was founded here, which from the very beginning focused on training specialists for industry and applied developments. However, in the first decade of its existence, the university did not improve the situation.

At first the university was in no way remarkable, even on a national scale. Second, it did not solve the problem of job creation and outflow of population, as soon as students received their diplomas they tried to move as quickly as possible to the industrialized south of the country.

Six years later, the university opened an Electro-Engineering Department, which was headed by Professor Juhani Oksman, who in his turn, lured Matti Otala, Chief of the Department of Wireless Communications in Nokia, which at that time was a multi-industry holding company, uniting high-tech and «traditional» industrial directions. Matti Otala was an unusual professor, besides the fact that he was a businessman by birth, which was rare for Finnish universities in general; he also had his own opinion on how the Oulu Region should be developed, and most importantly, he was ready to implement these ideas into practice.

According to Matti Otala, the region's chance was not in the revival of traditional industries, but rather in the development of high-tech industries, most notably microelectronics and IT. He realized that a new wave of technology had begun, associated with the development of these areas, and believed that Oulu could use it. Otala regarded the local University primarily as a tool for regional development. He viewed it not only as a training center for engineers and researchers for high-tech companies of the region, but also as a tool to spread the new technologies.

Such an active social position of the provincial State University professor seems somewhat unusual for our country. It seemed somehow unconventional to his colleagues, as well to Finnish industrialists and bureaucrats of that time. Suffice it to say that at that time the Finnish universities, very often government run, shunned even joint research projects with private companies, not to mention large-scale projects such as the revival of a depressed region. However, Otala and Oksman were able to work a miracle. Through advocacy and debate of electronics development prospects in the north of the country, numerous meetings with colleagues and regional officials, they finally believed in possibility of transforming the center of Oulu into a center of high technologies. Though, it was not easy, since in reality the city more and more resembled a backwater region.

Soon, virtually the entire leadership of the university began to support the ideas Otala and Oksman, they went into action, using their relations and opportunities. The University began to establish contacts with a few high-tech companies, operating in the region and in the early 1970s it launched the first joint research projects of private companies and university laboratories. In 1972, associates managed to convince the officials of the Ministry of Science to open a branch of the VTT National Research Technological Center in the city. This was possible, mainly due to the lobbying work of the Rector of the University of Oulu.

In the same year, a unit of Nokia - Nokia Electronics, specialized in wireless communications, moved from Helsinki to Oulu. At that time, the unit received a large share of revenues from the production of radio equipment for the Finnish army under license from the USA. However, it should be noted that the main impetus for the move of Nokia Electronics to Oulu was not the opportunities, offered by research laboratories and electro-engineering department, and not the fact that VTT opened branches here, but the labor force that was cheaper than in Helsinki.
The role of Nokia for the further development of the region should not be exaggerated, however; already in the 1970s the company became an anchor for the emerging innovation system of the North of Finland. First, Nokia, already at that time was quite a powerful corporation of a national level, and it became one of the major investors into the development of new technologies in ICT and electronics. Second, historically, the corporation made extensive use of outsourcing partners from small and medium-sized companies for production and carrying out of R&D activities. Thus, since the early days of its appearance in Oulu, this company has become one of the largest consumers of goods and services produced by small and medium sized technology companies in the region.

Opening of the VTT Research Center and the emergence of Nokia Electronics in the region was a turning point for the transformation of the depressive Oulu into a center of high technology, which today is called «a phenomenon.» Nevertheless, this was not immediately clear.

Until the mid-1970s, it seemed that the activists of the University of Oulu and VTT were operating in a vacuum. There were not so many enterprises in the microelectronics and ICT industry, with which these research centers wanted to expand cooperation and on which it was planned to make a bid to revive the region. Something vaguely resembling a «cluster» of electronics and ICT companies appeared in Oulu only towards the end of the 1970s, and even then, these were mostly tiny companies that stood unsteadily on their feet.

As for the municipality of Oulu, they favorably regarded the social activity of university professors, however active assistance was provided only in early 1980s. At that time, industrial and innovation policy was regarded by most members of the political establishment of the country as excessive government interference in the affairs of private business. However, over time, the ideas of Oksman and Otala gained more support among city council members and municipal officials, and the number of joint projects of private companies and public research centers constantly grew.

Thus, by the early 1980s, an informal community of researchers, business people and municipal officials was formed in Oulu. They were united by a common idea of region development, and firmly believed that the main driver of this development should be electronic and ICT industries. This is one of the components of the «phenomenon of Oulu», an innovative ecosystem, interweaving personal and business relationships of people, who in one way or another, are involved in the creation of technological businesses and development of new technologies, it was here long before the high-tech industries begun to define the economic shape of the region.

It is extremely important that all these people were well acquainted, they all came from the North of Finland, and most of them went to one and the same school, studied at the same university and even attended the same church on Sundays. Thus, most of the operating managers and owners, operating at that time in the region, or in subsequently created companies in the Electronics industry and ICT (including many of the existing senior managers of Nokia Mobile and Nokia Network) studied at the electro-engineering department of the University of Oulu, or were associated with the Electronics Laboratory of the VTT Center, and, of course, they maintained close ties with their university professors and former colleagues.

**PPP the Finnish way**

However, to make the public initiative turn into a political one, it took another crisis. In late 1970s, the economies of the developed countries were struck by the oil crisis, which led to a prolonged recession. Finland was no exception. Depressed Finnish regions, including Oulu, suffered most of all. From 1975
to 1980, unemployment in the city increased three-fold, many industrial enterprises in the region were either closed, or significantly reduced their production volumes. The crisis did not spare the emerging sectors of local industry: microelectronics and ICT that had had quite good rate of growth. All of this prompted the municipality of Oulu, and officials from Helsinki, to abandon policies of non-interference in the affairs of private business and undertake active action, which meant both direct and indirect investments to support private enterprises. Since at that point it became clear that there were no chances to raise the region, located near the Arctic Circle and poor in natural resources by the revival of traditional industrial production, almost all the efforts were directed at supporting knowledge-intensive industries.

«The municipality of Oulu played a unifying role in the creation of Technopolis and in its overall development. The city became the first partner for companies. It is important that it was a very patient partner,» says Mervi Käki. It should be noted that in Finland the municipalities have always been comparable to the national government by their influence on economic development and in terms of political weight. Local authorities have very wide powers in the field of secondary education, economic and social policy, and most importantly, they have all the necessary resources to implement these. Thus, the municipalities get the lion’s share of income tax. In addition, in Finland the tax on the capital of companies goes to the municipality. Therefore, the well-being of the municipality and its opportunities in this country entirely depend on the creation of new high-paying jobs and attracting new businesses to their regions.

Thus, the first Finnish Technology Park appeared in Oulu, in the first 17 years of its existence it was called the Technology Village. The idea to create in Oulu «something akin to Silicon Valley», in order to facilitate the commercialization of developed technologies in electronics and ICT, first was discussed by regional officials in 1979. However, no specific actions followed these discussions. Finally, in 1981, a special commission for the development of electronics was formed in the region. It included representatives of municipalities, universities and large technology companies.

They were preparing for the opening of the technology park with purely Finnish thoroughness. They studied the experience of American parks, and that of the technology park in Cambridge (at that moment there were only 8 parks in the world), the municipality invited expensive consultants, including those from California, who helped develop the design and the master plan.

The Technology Park was opened in 1982 on the outskirts of Oulu in close proximity to the laboratories of the Electro-engineering department and VTT Electronics. In addition to the municipality of Oulu, the national Regional Development Fund agreed to invest into the creation of the park.

However, the Mayor of Oulu, Ilm Paananen, set one condition, which, as a result, determined the occurrence of the unique business model of the Technopolis. The mayor decided that this should be a joint project of the city and business. He then said, «If the private sector does not invest 50% of the required amount of money, I will not start it.» It was a wise decision. If the mayor had started this project alone, if it were an urban project at 100%, the role of the state would have been too high. The majority of politicians do not understand why the parks are needed, that they should help the company to grow. Development of entrepreneurship and high technology is not the task of the state. It is the task of business and creative people. Therefore, if the state is too actively involved in the production of such things, do not expect it to be successful.»

The balance was not achieved immediately. «When I became the General Director of Technopolis, it took me months to figure out how to manage this kind of company, where half of the owners are politicians, municipal civil servants, and the second half are private companies,» continues Pertti Huuskonen. “After these six months of marking time, I came to realize that the strength and uniqueness of Technopolis is
based on just this combination. This is a pretty tense balance, but it provides special opportunities. On
the one hand, we had a very strong partner represented by the municipality. On the other, the role of
the technology park was defined by business, and its management team was also from the business
environment, they were entrepreneurs, who had their own businesses. Only in this way, when you yourself
know how to run a company, can you help new small and medium-sized enterprises and start-ups.»

It was not easy to find private investors in the project, which did not promise any commercial impact
even in the medium term. Nevertheless, we found them, the pool of private investors included regional
banks, insurance companies, construction companies, enterprises, one way or another connected with
electronics and ICT, several subsidiaries of the University, and even a media company. The authority of
the mayor also played its part, as well as the foresight of investors, the atmosphere of cooperation and
trust between government, business and research centers that was created in the city.

«The main reason that these companies decided to participate in the project, was that they believed
the project to be successful, and that it would benefit their own businesses. For example, in the case
of banks, if there is more work, more companies, these companies will need more money. It was
interesting for the media, because the higher the income, the more people read newspapers. Construction
companies found that not only the construction of the technology park was good business, but also the
whole infrastructure around it was a profitable business as well. Then of course, electronics companies
understood that the project should help their own business,» says Pertti Huuskonen.

In the early years of the technology park’s operation, the management company had to defend its
independence in decision making. «Our board of directors included only the mayor and several municipal
officials, but mostly these were specialists, experts in business development. None of the politicians was
invited, and they certainly did not like this. However, we told them, «You represent so many different
parties, that if you come to the board of directors, there will be too much politics.» So it would be
much better if the board consisted of businessmen, people from universities, research centers and
representatives of the municipality, the mayor and all those who are responsible for business development
in the region.»

In such a way the Technology Village dissociated itself from the university, even though the activity
of university professors has paved the way for the emergence of the first technology park in Finland.
«If the Finnish state universities took control of technology parks, it would have been a disaster,» said
Pertti Huuskonen. “It is in the U.S., where universities are mostly private, and very independent, that
technology parks are sources of profit for the universities. In our country the university system and the
system of technology parks has a different subordination and operates by a different logic.»

**Service Center instead of a greenhouse**

Originally, it was planned that mainly spin-off projects that originated in the university and in the VTT
Center would inhabit the Technology Village. Initially, it was thought that technologies and easy access
to money for their commercialization was the key to success. However, it soon became clear that
hopes for the companies, started by universities and academic scientists, did not materialize.

«We felt that if a good professor had a great idea, we had to help him start a company. Then we
thought that automatically it would be a good company, but we were wrong. In fact, it is not necessarily
that a good professor will make a good businessman,» says Pertti Huuskonen.

Thus, in the first decade of the existence of Technology Village, VTT gave birth to only about 20 start-
ups, but for the most part these were very small enterprises, engaged in research and development. The
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The vast majority of them did not grow bigger to create their own products and were closed or absorbed by the companies that had already been present in the market. However, to be fair, it should be noted that without these little «professorial» start-ups, in which professionals worked and which owned the rights to developed breakthroughs, it is possible that Nokia would not have become one of the leaders of the global ICT industry in the 1990s. The corporation skillfully took advantage of the intellectual resources accumulated in Oulu in the 1980s.

Companies that originally worked on subcontracts with Nokia Electronics and other large companies, that is, which were engaged in manufacturing and R&D, by order and under control of the «senior partner» and sold 100% of products at fixed prices, were the exception. Some of them, such as SSA and Electrobit, would eventually gain independence and become major international corporations. However, according to Pertti Huuskonen, sustainable core customers of the technology park were businesses, which split off from the existing large and medium-sized companies, which had market relations and were managed by professional managers. In particular, shortly after the opening of the Technology Village, it housed several joint ventures and “sister companies” of Nokia, engaged in the development of cellular technology.

«About 50-60% of success of high-tech companies depends on the ability and experience of the management team, 20-30% - on properly selected market and the presence of demand, 10-20% - on the selected technologies, and only 5-10% on funding. It is possible that for Finland, the dependence on funding is 10-20%, as in California, if you have a good team, well-chosen market and good technology, you can easily find an investor, but we do not have a well-developed market of venture capital investments. Yet, in any case, the basic success factors are good managers and well-chosen market. Avoiding the wrong market is the most important thing, because in this case, you lose everything, even if you have a wonderful technology and easy access to financing,» says Pertti Huuskonen.

This lesson strongly influenced the further development of the service system of the technology parks, managed by Technopolis. The stake was made not on «greenhouses» for artificial breeding of companies, based on breakthrough developments, but on service centers for the existing manufacturing business and promoted projects. The technology park should not replace the entire innovation system of the region; it should make it more dynamic. However, the first and last word must always remain with businesses.

According to Mervi Käki, today, despite the established network of offices of technology commercialization, no more than 4% of the total high-tech start-ups appear within the walls of universities and research centers. The majority (96%) of innovation projects occur in private companies. «It is amazing, but as our research shows, if you go the traditional way, that is you «push» the technology into the market, the entire cycle of project development takes at least 10 years. When it comes to biotechnology and other industries, it may be 15 or even 20 years. However, if the idea comes from business, this period shall be reduced on average by half. Innovation must be born on the market, based on market requirements. Those processes and ideas that arise through force of demand from the market need to be actively developed. Therefore, new companies in Finland appear from the thousands of existing companies in the country.»

How technology parks propagate

By the end of the 1980s, Oulu Technology Park accommodated more than 200 resident companies, so soon the leadership faced the problem of expansion. Then five years later, when the stake was made on ICT, which was made by Nokia and its numerous partner companies of Oulu, turned out effective, the corporation became one of the leaders in the global market for mobile communications equipment and
ICT, and a boom of technology start-ups started in the region, further expansion of the technology park became a pressing need.

Originally the Technology Village (in 1997 the company received a more respectable name of Technopolis) was a non-profit partnership, the city authorities required only the income from rental and related services to cover its operating expenses. However, when the issue of expansion within and outside the region was discussed, the company had to change its business model. The management company, headed by Pertti Huuskonen, decided that the stock market was the most affordable way to find investments for scaling up. The company turned into a joint stock company, and since the share of Oulu was severely diluted, the shares were placed on the Helsinki Stock Exchange. However, in order to attract private and portfolio investors, the Technopolis had to start making a profit.

Virtually, Technopolis had all the prerequisites to become a profitable company. Since the first day of its work, the Technology Village was leasing office and laboratory premises at average rates, in addition, clients paid for the provided package of services. The majority (85%) of the income of the management company came from the leasing of equipment and facilities, 15% from service charges, and this proportion remains actual up to the present days.

The question was only in the scale and coverage of new areas by technology companies that have growth potential. According to Pertti Huuskonen, usually the technology park passes the breakeven point, when its area exceeds 20 thousand square meters, provided that all of these premises will be at least 95% filled with tenants, among which there should be no random companies. However, it turned out that the model, oriented to the specific needs of customers, the companies that already exist in the regional market, can be easily scaled.

In particular, when the company, which was already known as Technopolis, decided to open another technology park in the suburb of Helsinki, near the international airport, Mervi Käki, who led the project, was faced with serious challenges in attracting customers from among technology companies. «ICT companies wanted to work in a different suburban area, because it had a major center of information technology, or directly in the capital city, says Mervi Käki. The city of Vantaa was known as an area with industrial companies, which was not distinguished by its level of technology. Then I decided that I would not focus on the city of Vantaa, I would talk more about the airport and that it was the most industrially developed zone in the country. If you want to do international business, all of that is important. I started to create a technology park, which, in fact, became the center of different events and activities with a good infrastructure, and I decided not to seek start-ups, not to open an incubator, because there was no university. We focused our efforts on more mature companies that want to take advantage of market access, and we began to develop special programs and a variety of services for the development of larger companies.»

«The government and universities, various city councils and regional agencies, ministries try to manage such projects; they try to do things that they do not understand," continues Mervi Käki. "Usually they do not even pronounce the word «customer». That is why they cannot do anything. In fact, if you need a solid long-term project, you need to contact companies and ask «Why are you not growing? Why are you not recruiting new people? Why are you not hiring specialists from the region? What problems are you having? How can we help you in solving these?» Then you can easily decide what role the technology park will play in these processes. Then you create a support system in conjunction with the regional authorities to ensure that businesses prosper, and the technology park grows. In this case, you can build a viable technology park with a stable business environment that will promote economic growth in the region and across the country. However, you should never start with the construction of buildings!»
If you can get good companies into the technology park, you can relax a little, because eventually, you will get good entrepreneurs who, in fact, do most of the work in creating an effective business environment. Success is achieved automatically. It is not enough to have a good business plan and a good master plan. In fact, you need customers who will enjoy it all. This fact is very often overlooked. Often the market is the biggest problem, because if you have enough money, if you have a good master plan, if you have everything, but for the market, then it will not work... However, if you have good companies, good research units and if they grow, which means that when you start the second stage of the project, some of these companies will need additional premises and new laboratories, and then they will move there and occupy their places. I also noticed in practice, that when you are next to several groups of buildings, you can always ensure that the existing companies receive a great level of service and it is much easier for you to attract new good projects,» agrees Pertti Huuskonen.

Social justice against innovation

Of course, Technopolis owes much of its success to the system of support for business innovation that exists in Finland. Over the past 20 years, this system acquired harmonious features, beginning with the creation of the Council for Technological Development and regional agencies that implement its decisions and ending with OSKE network of «centers of expertise” and SHOK centers of excellence, which bring together business and research centers, working in the six priority areas of technological development. A huge role was played by the creation of the National Agency TEKES, which provides grants and concessional funding for research projects and high-tech start-ups (Finland is one of the first countries in the world by availability of grant and equity funding).

However, the Technopolis not only benefits from the created system to support business innovation, but also suffers from its shortcomings. Thus, according to Mervi Käki, a big problem for the Technopolis, and Finland as a whole, is the lack of truly ambitious high-tech projects, which could lay claim to global leadership, as well as lack of private venture capital investments. «In general, I would not say that involvement of finance at the early stages of project development is a big problem in Finland today, but we do not have enough private venture capital investments, primarily foreign and from major foundations. Public funds are working fine, but such funding makes people a little bit lazy. In addition, without major foreign venture capital investors, there is little chance that we will have new international companies in sufficient quantity.»

The main snag is not even that large venture capital investments do not wish to come to Finland. The problem is that we have nothing to offer to such investors. «We have an already established system to evaluate a variety of projects, to identify challenges and commercialize their ideas in different ways. The problem is to find potentially very successful projects, which will also require large venture capital investments and attention, which could turn into first-class international companies. We have to admit that the vast majority of our innovative projects are second or even third-class projects... For example, three men founded a company, which took its place in the market for home goods and services. They deliver fresh bread, manufacture and sell tools and all kinds of stuff like that. Behind it there is a good innovative idea, and products, and services. However they are not very ambitious and they do not want to take risks.»

Partly, the reluctance of major foreign venture capital investors to invest in the Finnish projects is due to objective reasons, in particular, the small size of the domestic market. However, the main cause of underdevelopment of the venture capital industry in Finland lies much deeper, in fact, this is the reverse side of the «standard» social state.
“In Finland we have little encouragement, or rewards for effort,” Mervi Kaki continues. “Even if you get something you cannot show it, because you should not differ from other people. All are equal, all have the same things. Of course, you can buy a Mercedes, but you cannot show it to anyone, because they will look askance at you. Therefore, we do not think about finding something exclusive, or about finding a very good idea and we do not want to make efforts to implement it, we select something mediocre. This applies to venture capital too, especially when it comes to Finnish investors. Even when we try to attract foreign venture capital investors into Finland, we sell them the same average, mediocre projects. We do not say “look, we have unique and exclusive idea, give us 5 million euro. We say, «This is a pretty good idea. Will you give us 200,000 euro?» All get the 200,000 euro, and none of the projects is good enough to go out to the international market.”

Written by Dmitry Mindich.

Anna Nikiforova took part in the preparation of this article.
7. Interview with Anthony Tan, CEO of Hong Kong Science and Technology Parks Corporation

«YOU CANNOT BEGIN TO BUILD A VALUE-ADDED CHAIN FROM SCRATCH»

The Asian financial crisis, which severely shattered the myth of the guaranteed prosperity of the local financial sector and trade, was the godfather of Hong Kong’s innovation system. However, the «storm» in 1998 could not shake the official policy of non-interference in the formation of the national innovation system.

Since the introduction of the index of economic freedom in 1995, every year during the last 17 years, Hong Kong ranks the first. The transfer of the territory to the jurisdiction of China in 1997 had virtually no impact on the basic principles of economic policy of the government of this area, which is continuing the policy of the British administration, in economic management it gives priority to the free market and private sector. The only significant exception was the step in the innovation economy, undertaken by the government to exit from the Asian financial crisis. In 1999, the government created a special fund of 5 billion HK dollars (645 million USD) to support applied research projects, and in 2001, the Hong Kong Science and Technology Parks Corporation, which became the core institution of the local innovation system.

Despite the modest amount of state support, the science and technology business in Hong Kong Park can be considered as quite prosperous. Of the 277 companies that have passed the incubation stage in HKSTP, 216 remained in the market by the end of 2011. This is a very high survival rate, according to the Harvard Business School, since for most sectors, the level of «actual mortality» (i.e. bankruptcy) of innovative start-ups in the first five years of existence ranges around 30-40%.

High viability of Hong Kong graduates of the incubator is associated with successful work in establishing business relations with continental China. The principle «developed in Hong Kong - Made in China» has already been successfully implemented by many of the residents of the Hong Kong Science and Technology Park. In particular, the business of Sensixa, a spin-off of London’s Imperial College, is built according to this scheme. Sensixa develops and manufactures contact sensors that can monitor the level of physical activity and condition of the patient. R&D center in Hong Kong has allowed the company to quickly bring their product to the market in South-East Asia, due to lower production costs in continental China. In 2010, a Bluetooth sensor, developed by the company, was found by the consortium of Bluetooth Special Interest Group, the best development of the year in the world.

For Philips, Hong Kong became a testing ground for the adaptation of its new developments to the Asian market. The activities of the Philips R&D center, which opened in 2004, from the very beginning were focused on home appliances, which are produced at the factories in Shenzhen and Dongguan. In 2010, Philips expanded its presence in the park, moving here the headquarters of its Asian Pacific division.

BYD, the sixth largest Chinese automaker, which also controls a significant market share of rechargeable batteries, has a Research Center in the Hong Kong Park. BYD’s research projects are related to the creation of Chinese electric cars and increasing the efficiency of energy storage. Currently, the company is already producing the hybrid BYD F3DM at its assembly plant in Shenzhen.

Anthony Tan, CEO of the Hong Kong Science and Technology Parks Corporation, told us about the work of the park.
“Our goal is to maximize profits”

— Development in America or Western Europe is driven by demand from large industry. Hong Kong is a very small area. Who buys your innovations? Where is your market? Who are your customers?

— Hong Kong is home to only 7 million people. Therefore, domestic demand for innovation is not very large. However, in our case, this is not important. Our market is the whole of China, even more, the whole of Asia. We are lucky to have a good geographical location - Hong Kong is in the heart of this region. As an example I can give this business model - «Hong Kong-Pearl River Delta»®, which we have been developing in recent years. Within this model, our Science Park operates as an R&D center for the production facilities in Guangzhou, Shenzhen, Zhuhai and other cities in Guangdong.

— Hong Kong Science and Technology Parks Corporation of was established in 2001. Why not earlier or later?

— Due to historical circumstances, Hong Kong became known primarily as a commercial and financial center. Up to this day, our position in both these areas is rather strong. However, if you want to have a stable, growing and sustainable economy, you have to work on the development of innovation and technologies, even if you specialize mainly in financial and commercial businesses. You cannot be quite competitive with only a favorable geographical position and an illustrious history. It simply does not work. For development you need technology. However, we must recognize the immediate impetus for the adoption of this new philosophy was the shock of the late 20th century, especially the Asian economic crisis in 1998, when we lost more than 5% of our GDP in one year.

Who suffers more than others in times of crisis? The sphere of finance and trade. If you do not diversify your economy, you will inevitably suffer. That is why we had to seek new approaches to economic development, and we were lucky to have what was needed to start. The fact is that Hong Kong has eight world-class universities. Of these eight, six are scientific institutions. Three of these six are permanent members of top 50 universities in the world - the Chinese University of Hong Kong, Hong Kong University and the University of Science and Technology. Annually, all the universities in Hong Kong train about 78,000 graduates, of whom at least 37% are engineers and experts in the field of natural sciences. This is a powerful resource, but in the late 1980s, Hong Kong’s business shifted all their production to the mainland, and this resource was underutilized. So the choice was quite obvious – stability and balanced development could be achieved by diversifying the economy through the creation of specialized jobs for our graduates.

— How close is the relationship between you, the Science and Technology Corporation of Hong Kong, and between these universities and research centers?

— I think we have established very close ties. They must exist, because when you develop innovation and technologies, you have to create a community and knowledge environment, and ensure that the academic community plays a very important role. Therefore, we closely collaborate with universities. We also closely collaborate with companies; many of them are small and medium businesses.

— Do you have joint programs?

— Yes, certainly. There are agreements on sharing and development of the laboratory complex, in particular, with the Chinese University, with the Baptist University, with the University of Science and

* Low-lying areas in Guangdong Province along the Pearl River Delta (Zhejiang) in the place of its confluence with the South China Sea. When the reforms began in China, this area became one of the leading economic and industrial centers in continental China, the world's assembly shop. Since 1980, the region’s GDP grew by more than 187 times and amounted to 689.2 billion in 2010.
Technology. In addition to this, with a number of universities, we have common research programs in key areas, such as wind energy technologies.

– What was the role of these universities in the creation and development of your research and technology park?

– I guess I should speak about the history of our creation. Hong Kong Science and Technology Parks Corporation was established, as it was already mentioned, in 2001 in the form of a public corporation. This is a fairly common format in the British Commonwealth, of which Hong Kong was a member. Typically, these structures are, in fact, semi-state organizations, founded by the government, where it controls 100% of the shares. However, we are not civil servants. In fact, we are managed by an independent board of directors. Of the 16 members of the board, only one is a state representative, the remaining 15 are independent directors. In general, we are not directly controlled by the state. In this we differ from, let us say, the U.S., where almost all parks have been established either by universities or with their direct involvement.

– To what extent this management structure is adequate to the strategic objectives of the park?

– It is quite adequate. You know how the state operates... It is not always perfect and effective in its work. With this in mind, our legal status and management structure protect us from external interference. In addition, it is set forth in our founding documents that we are a commercial organization, focused on making a profit. Thanks to this, from the very beginning our work was not built on the model of a state agency that distributes budget grants, but rather as an active participant in the market of high technologies. We had to find ways to generate revenue and use it for support and development of innovative technologies. In other words, we operate entirely on commercial principles, and I always tell my subordinates that our goal is to maximize profits.

– What additional factors would you identify as crucial for the formation of Hong Kong's innovation system?

– Hong Kong is a unique place. Due to this we have certain advantages over the innovation parks in other countries. It is a little bit easier for us to attract companies and talented people. To ensure success in such a long-term project like ours you need to make a strong start, to lay the foundation for further development. It is extremely difficult to achieve this without involving large corporations that already have advanced technologies and experience in creating them, at present it is probably impossible. You cannot start from scratch building a value-added chain. In fact, you certainly can do it, but in this case, it will take you a very, very long time. Therefore, the main task of almost all innovation parks in the initial stage is to attract TNCs, in collaboration with which you can then help other companies build and develop technological clusters, create a value-added chain. It is impossible to quickly develop an innovative economy, relying only on itself. If you do not have any breakthrough discoveries, or if you do not produce unique things, there is no other way.

– Where did you find the initial capital to build the infrastructure, to run other operations and services? How is your Science and Technology Parks Corporation funded today?

– We got the money and land from the government. I will not go into unnecessary details, but the leadership of Hong Kong sought to demonstrate its commitment to innovation and technology. That is why the state allocated us a very good piece of land right next to the harbor. If this land had been sold to private developers for construction or other purposes, it would have brought hundreds of billions of dollars, and the state would have received this profit very quickly, but the choice was made in favor of our project.

– Was this land given to you free of charge and without any conditions?

– The land was given to us as a contribution to the authorized capital of our company. We are a commercial organization and the government does not give us, let us say, any annual budget. We must
make money from our activities, using the authorized capital and the assets, transferred to us on its account. In addition to the land, the state also funded the construction of the first stage of the technology park. So we had a start and we could enter the market. Then we worked on our own, we borrowed, expanded, extinguished the loans from the profits and reinvested in new construction.

– Does the State offer some regular support to science in Hong Kong? Are there any incentives, tax breaks, etc.?

– We do not have any privileges. Hong Kong is an area with low taxes. We have a 15% tax on personal income, 16.5% is corporate income tax, and this is the maximum. Therefore, with regard to tax benefits, we do not have them and we do not need them. Of the most important measures of state support, there is only the program of co-financing of research. The state has funds through which it subsidizes individual research projects. For example, if a company wants to invest millions of dollars in some research and if it is ready to carry out these studies in the local universities or research centers, the state will allocate the same amount.

– Compared to other developed countries, this approach looks very austere. How effective is it?

– The Hong Kong government believes in this policy, but I do not. Innovative technologies really need government support to run these processes and to organize such a system. Without state support and a special policy, it will not work out. Do you understand? That is why the state should develop this policy, and it should demonstrate commitment to innovation and provide funding for these purposes, at least at the initial stage.

«Residents do not need beautiful buildings»

– Given the lessons learned, what mistakes would you try to avoid, if you were to build a Science Park again?

– I think we learned some valuable lessons. First, there is the problem of «the fog of the war»; the course of real events is not predictable. What you originally plan may fail, and the result will differ from the target. In our case, when we built the science park, it concerned the timing and type of companies that we hoped to attract. A similar situation existed in the selection of research areas and types of services that we were going to offer to our clients.

When you start a project of a science park, it may turn out that your equipment is not exactly what the real resident companies need. If this happens, once again review your ideas about what type of technology companies you want to have in your park.

Another common type of error is associated with the planning of infrastructure. You cannot build a standard office, not connected to the specific technological needs and potential residents. At the first stage, because of a series of blunders, we failed to provide our customers with appropriate facilities for small laboratories. However, we learned as we grew, we began to understand what type of infrastructure was required. The resident company does not need a beautiful building, the correct environment -functionality is more important for it.

Another important lesson is related to the formation of clusters. If you’re not doing this specifically, they will not appear. Initially, we assumed that we had to provide the companies with the necessary physical and tangible assets, and all would work out. Nothing of the kind happened. The assets are just one element. The second essential element is service. You must have a clear understanding of what services different types of companies may need in certain periods of their development and you should be prepared to provide these services or to ensure that residents receive them through partnerships, cooperation and other ties. So you need to immediately start building such things as community and
informal networks. We did not understand at first the importance of these particular issues. We must learn to focus, and not on material or physical side of affairs, because success is ensured not only by the tangible assets. The success is achieved through knowledge, services that we offer to these companies. This is a very important aspect.

– How would you assess the situation with the venture capital market in Hong Kong?

– Hong Kong is a financial center. We do not suffer from lack of money, but unfortunately, we have a distinct lack of venture capital funds and business angels, because there are too many opportunities in Hong Kong, more precisely, in China and in Asia. Typically, money is invested in an already established business, in companies that are already formed and have a foothold in the market. It is quite difficult for us to convince private investors to invest in funds of business angels and other venture capital funds. The problem is that they are interested in quick guaranteed profits, and so far quick profits are provided by other, less risky types of business, they do not show much interest for our business.

We are forced to compete for investment with banking, trading, electronics manufacturers, etc. Clearly, their predictability and rate of turnover is much higher, so in this situation we are forced to seek non-standard arguments to convince investors.

First of all, we are concentrating our efforts on entrepreneurs, manufacturers of original equipment, who in the past 30 years have accumulated a lot of money. Adding their contributions to the venture fund, in 5-7 years they will get 4-5 companies that will work for them. In fact, this is almost like a pension fund, you know? At the same time, we are trying to work on improving the system of venture capital investments, to increase their volume, to teach our financial community, to impress it on all investors in Hong Kong.

– Typically, a multi-level environment, including TNCs, start-ups, medium-sized technology companies, is formed in the technology parks. How do you build relationships with these different types of companies?

– On a practical level, we see no difference in dealing with TNCs or start-ups. You have to get it right, we are not blind. However, for us both are customers, and second, they are equally important to the success of the park. So in regard to access to physical assets and laboratories there is no differentiation. Differentiation begins in services that we provide. It requires manual adjustment to the individual needs of each company. A special Business Development Group, which is constantly in contact with the residents, is responsible for this part of the work. This group has to review their current and future needs and prepare service packages for them, ranging from support in the technological field to organizational issues of product development and promotion, advertising, etc. etc. etc. We have programs to suit companies of all weight classes and in all the fields.

– Does consulting and other services provide a substantial share of income of Hong Kong Science and Technology Parks Corporation?

– No, the main source of income is rent for the premises in the technology park. We also manage three industrial complexes. This is our income. We do not charge fees for counseling, except for the use of laboratory services. We try to keep the minimal tariff for the laboratory services, so that it would be enough to cover the costs. Our task is to help create a technological cluster in Hong Kong. Therefore, we aim to support applied research and development, in which companies coming here are engaged, and for this we provide them with a number of services to make them prosperous. We do not provide services for a profit.

– What about the rent? How high is it? Is it below market prices?

– It is a bit below the market rates, and this is also part of our policy to support resident companies.
You mentioned that when you were starting out, big business played a huge role. Now you are trying to focus on small and medium-sized businesses, on small innovative companies. What kind of business: small, medium or large is more important to you? What business has a significant impact on your growth now and in the earlier periods of your development? What trends do you have?

In the beginning, when you are just starting out, TNCs are required to build the technology park and to create a technological cluster. However, it is important to understand that most corporations are not purely centralized structures. They have different business units. You need to carefully analyze what kind of businesses are interesting to you, and assist them in developing applied research and developments in the direction of the company.

Regions such as ours, with only 7 million people are unable to attract such companies as BASF, so that they open a full-scale R&D center. Let us start with the fact that none of the TNCs is doing so now. They no longer create universal centers that deal with all research that interests them. At the end of the last century, major TNCs began to actively break up their research centers to smaller, more dynamic and specialized divisions, moving them into areas where they can conduct the necessary research with minimal costs. So for us, the challenge is not to bring, conventionally speaking, BASF, but the fact that BASF placed in our park, for example, its research in the field of photovoltaic thin films.

If you are aiming not just at a large corporation as such, but at the specific research interest of the corporation and you have a good set of conditions for their conduct, you have a good chance that it will become one of your residents, as it happened with DuPont in our case.

That is what we do, and that is what I am negotiating with corporations. We focus on specific technologies. For example, we actively solicit companies to conduct research in our laboratories in the field of ecologically clean technologies. As you know, Hong Kong is in the tropics. In addition, the buildings are very compactly arranged, and the equipment for research in clean technologies, solar panels can be placed on the outside of buildings, where they absorb the sun’s rays and convert them into electricity. In general, there are all the necessary conditions for such projects, plus our service.

"You definitely need a niche"

Today there is a huge variety of science parks in the world. Which of them do you consider the best, the most efficient in Asia and around the world, in general?

In fact, it is very difficult to say. All the science parks are different. However, I think that one of the most successful is Hsinchu, Taiwan. They started from scratch, but managed to gain a foothold in the development of semiconductors, electronics, ICT, etc. I think this is probably one of the most successful examples. Of course, there are others. Now everyone is talking about Singapore. Yet, I think that they do not have good results, so far. The state has invested a lot of money, but Singapore has many of the problems we have. This is a small country with a small market, etc.

Is the competition between different innovation centers high now?

Everyone knows that in the 21st century the development of the country, its prosperity can be achieved only through innovative technologies. Therefore, all are actively involved in it. There is no doubt that the competition is very high. So you have to find your niche. Otherwise, you will not be able to avoid competition. Now everyone is trying to attract investments, but not everyone succeeds.
— In fact, there are different opinions on this issue. Some people believe that there is more cooperation than competition among various innovation centers, especially in Europe, but you believe that competition is extremely tough.

— You know, as I have already said, competition among them exists. This is inevitable. So you definitely need a niche. Occupying it, entrenching yourself in it, you can already afford to seek opportunities for cooperation and combination, to position yourself in relation to other innovative regions, that may seek cooperation.

— Yes, but, in fact, you just simply use your competitive advantages.

— That is true.

— Do you not think that competition among different technology parks can lead to their greater specialization?

— I do not think so. As I said, each of us must find their niche. What is so special about us? Why do we attract talented people? These are our universities, those studies that are conducted in Hong Kong. All of this demonstrates our advantage, and at the same time, I do not think any of us will one day decide «That is all, we are going to stop working in a specific direction,» because we cannot know who will win and who will lose in the long run. Therefore, you have to engage in different directions, but you need to find a niche, a separate area where you know you have strong competitive advantages, due to the available resources, due to the land or whatever uniqueness. Then you should invest more resources in the creation and development of this sector, but not excluding others.

— What are the basic principles of managing this «portfolio» of different directions?

— Essentially, you need to define several broad technology clusters. Then, within each cluster you analyze, in which of them you have something unique, there is a technology development that will allow you to become a world leader and then create a list of priority technologies. The next step is the development of research and commercialization programs. You need companies and universities to rally around your unique technology, to concentrate the resources and develop them until you reach the industrial stage. Simultaneously, you can engage in and support other research, but the focus should not be lost. If one or two of these six will be recognized in the entire world, it is already a success, and then you can move forward.

— If you do not mind, I would like to ask about your participation in the company’s profits. Herbert Chen from the Science Park of Tsinghua University told us that when they launched the system to support start-ups, they tried to maximize the share of the technology park in the new start-ups.

— Until recently, we had no stake in these companies. However, again, we need funds to help new start-ups. So, in fact, now the board is considering the proposal to introduce such a practice. However, like Herbert, we understand that our share should not be large. Now we are discussing the possibility to fix the maximum stake in start-ups in the amount of 5%.

— How does the current financial and economic crisis, experienced by almost the whole world, affect Hong Kong, in general, and your technology park, in particular?

— Every time a recession begins, the number of applications for start-ups grows.

— Why is this happening?

— Due to the fact that there are less opportunities and people try to create their own companies.

— Do they lose their jobs and open up businesses?

— Exactly. Given the limited opportunities they have to open their businesses, find new ways of investing. On the other hand, in the crisis the available funding is reduced. In such situations, like it was
two years ago, when the crisis began, we really had to help some of our companies. Not only in terms of the lease. In general, we may have to provide anti-crisis assistance.

— When we began our conversation, you mentioned that in Hong Kong you have about 80,000 graduates annually, and one of the reasons to create your scientific park, was to solve the problem of unemployment...

— No, it is to create new employment opportunities. It is not a problem of unemployment, but in science and engineering graduates. Without employment opportunities that we created, they still would have been able to find a job; they would have become bankers or engaged in trade. However, then they would not have used those investments, which the society invested into their training. Our scientific and engineering schools are good, but the graduates cannot find suitable jobs where their skills are needed. That is what we want to do. This is our «harvest», what we have sown, and we want to help these graduates to continue growing.

— Did you solve this problem?

— I do not think we have solved it. We did not create a sufficiently large number of jobs to get a significant effect. So we need to continue working in this direction. However, I can say one thing - many of our best specialists will leave and work in the U.S. and Europe, and this has a good side, too. About 50 companies from more than three hundred are created by our people, who have returned from abroad. Most often these are Chinese Americans, who worked in Silicon Valley or in some major international companies in the U.S., and then returned to open a business here. This means that they see opportunities here. Using this, we will create an innovative ecosystem, and then we shall create more jobs for our experts. Yet I must say that during these ten years, we have made a significant contribution to solving this problem.

Written by Alexey Zayko.

Anna Nikiforova was involved in preparing the material.
8. Article about TusPark Science Park under Tsinghua University (Beijing, China) based on the interview with Herbert Chan, senior vice-president of TusPark

GROWING TOP- DOWN

Beijing TusPark is the largest university research park in the world. As well as the entire national innovation system of China, it did not start growing from the bottom, the way it happened in the U.S. Silicon Valley, but it was created and developed under the strict guidance of the Chinese government.

Beijing TusPark is the largest university research park in the world. Its total area is over 800 thousand square meters; it has more than 500 resident companies, a network of 30 business incubators, situated in the largest cities of China, in total more than 40 thousand people work in it. Even more important is the fact that it, in fact, is the nucleus of the Zhongguancun Science Park, the extent of which is almost cyclopean: more than 230 square kilometers, about 20 thousand companies and about a million people.

In China, they like to tell that the «electronic street» in Zhongguancun was spontaneously formed in the early 1980s. The country’s first shops, selling computers and software opened mainly in the area of the Peking University, and the first local programmers appeared there. This is a true story, but it is often repeated to set off the other. Zhongguancun Science Park did not start growing from the bottom, as the U.S. Silicon Valley. It was created at the top and develops as a national project under the strict guidance of the Chinese government.

How to light the «Torch»

Technology parks are molds of the national innovation system. Chinese people engaged in high technology eight years after the beginning of market reforms initiated by Deng Xiaoping. The state program of science and high technology development, the so called «863 Program» (named by the date of adoption: the third month of 1986) was approved in 1986. The priority sectors included: microelectronics and computer science, aerospace, fiber-optic technology, genetic engineering and biotechnology, energy-saving technology, and medicine. Two years later, China started the implementation of research and production program «Torch», oriented on the commercialization and industrialization of high technologies.

In the same 1988, the first technology park - the Beijing Experimental Zone to develop high technology (it was later renamed into the Zhongguancun Scientific and Technological Zone, or abbreviated as Z-park) was established by the decree of the State Council of China.

Zhongguancun Science Park has become a priority governmental project. It had not only to attract foreign investment, to stimulate high-tech development and create favorable conditions for their commercialization, but also to become a pilot project of its kind. After Beijing, the network of technology parks should expend across China. There are more than 130 parks in the country now.

Originally, the zone of the technology park covered an area of 100 square kilometers. The Science Park was not accidentally located in the northwest of Beijing. More than a hundred research institutes and laboratories, as well as the strongest universities of China - Peking University and Tsinghua University are situated here. They became the support elements of the Technopark: universities provided academic developments, companies that promoted them and qualified personnel for the high-tech business.

In twenty years the territory of the technology park has doubled (now it is 232 sq. km.). However, the project is developing so quickly, that all the same there is no room. Often residents place their
main office with the developers and vendors in the technology park, while the production is located outside of the park.

**The linkage of the city and park**

Zhongguancun has its success stories. For example, Founder (information technology) achieved a turnover of 6.5 billion dollars. The turnover of Lenovo, which in 2005 bought the IBM division of personal computers and laptops, is more than 14.9 billion dollars. As well as in South Korea, universities or the Academy of Sciences are often among the founders of the major high-tech companies. For example, Founder “comes” from the Peking University, and Lenovo from the Academy of Sciences of China.

Today we can safely say that the Zhongguancun is a successful project. Only in the first six years the technology park counted more than 2.5 thousand innovative companies, and the amount of income of the companies exceeded $2.5 billion. Today there are more than 22 thousand companies, according to official figures; their total turnover is 80 billion dollars. In the past decade, the GDP of the technology park grew steadily by more than 25% per year.

Zhongguancun is located in the city. Incidentally, this is a very typical trend for science parks created in last quarter of the century. Half a century ago, science parks, as well as university campuses, were often carried outside of the city. However, later the idea of a “science park in the city” became increasingly popular. Employees of the technology parks are not divorced from life; it is easier to establish relationships between innovators and financiers. In addition, the Science Park is the main enterprise, revitalizing the city.

Interestingly, from a spatial point of view, Zhongguancun is not a single area, it is a set of fragments. Historically, it all started with a zone in the north-west of Beijing - now this part is called the Haydan sub-park. However, apart from it, Zhongguancun includes nine scientific sub-parks and 17 science parks under universities. All of them are located in different parts of the city. As a rule, large sub-parks have their own specialization: software and electronics, new energy and industrial design, new materials and biotechnology, medicine, digital media, creative industries and others. In addition to these large enclaves, Zhongguancun includes many small ones, sometimes consisting of only a few buildings, scattered throughout Beijing.

When creating the Zhongguancun Science Park, authorities had three goals. The first was to create a cluster of high-tech business, which would provide jobs and be the locomotive of the economy. The second, to work out new economic and financial mechanisms. Zhongguancun was in the vanguard of the new economic policy: technology parks were the next stage of Chinese reforms after the establishment of free economic zones.

The third, the new park had to become a center of information of all China, the center of specialists training and writing of national programs. In addition, from the very start, it was planned as a pilot project to be duplicated. Subsequently, following the example of innovative programs in Japan and France, networks of specialized technology parks were set up all over China.

By order of the State Council of China, a committee to manage the zone was formed, which was supervised by the administration in Beijing, as well as a company to develop the territory, which deals with infrastructure and allocates land plots, constructs buildings. A business incubator was created. The administration selects the companies with the most interesting projects, which receive, for a year or two, fully equipped offices with furniture and office equipment for free. About four thousand high-tech companies per year are created in Zhongguancun today.
Pragmatism rather than illusions

The Chinese did not re-invent the wheel, but adapted the successful mechanisms. They introduced special administrative and tax treatments with benefits for the residents of the science park. The conditions for the residents are clearly stipulated, thus a company that wants to erect a building, can exactly calculate the budget needed to connect to the networks, for example. Each year, the administration produces thick reference books in English, which contain all sorts of information for residents: from the terms of tenancy and proposals for recruitment to the energy tariffs. Zhongguancun provides an unusual benefit for Chinese workers: residence in Beijing.

The clarity of the rules does not negate China’s individual approach to key clients. Companies, in which the administration is interested, can be provided with ultra-profitable conditions.

As the technology park developed, the services for companies developed as well. Twenty years ago these were centers, where the start-up companies could obtain legal, accounting and marketing services. At this stage, financial services (grants and guarantees to banks from a special fund) are very relevant, as well as consulting services for companies preparing for their IPO. In 2009, the Chinese government reported that at that time there were 113 companies in the technology park, their shares were traded on exchanges, and the gross amount of funds, accumulated through the mechanism of IPO, had exceeded 14 billion dollars.

The staging of project development is interesting. When creating the science park in 1988, the Chinese did not flatter themselves with the state of their science. Therefore, there was built a long-term program to catch-up with the high-tech sector. In the first stage, when there almost was no high technology, the involvement of Western companies was of great importance. Working for them, former Chinese students could gain valuable experience. Foreign companies, in their turn, were interested in localizing their products to enter the vast Chinese market.

In the second stage there began to appear strong Chinese engineers and companies. China began to look for, and find niches, in the global division of labor in which it could succeed. So, now, China has a very strong position in the segment of clinical trials for global pharmaceutical corporations. Catching up with India, China is actively developing offshore programming. At the same time, Zhongguancun does not rely on winning over famous European and American scientists. China prefers to develop projects of the «second wave» ambitious young scientists.

The current stage is defined by the Chinese government as the transition from the duplication and contract work to the production of their own original innovative products and bringing them to the world market under their own brands. At the same time, the structure of industries is changing too. If previously the lion’s share of the business and development concerned IT, now other sectors such as biotech, development of new materials and alternative energy are the rapidly growing ones.

Herbert Chen, senior vice president of TusPark explains why for the Chinese innovation system the main problem is not money, but the national mentality

— What factors do you consider critical to the development of the innovation environment in China?

— Time is now the main scarce resource in terms of development of the innovation system of China. Time is required to introduce changes in attitudes, legislation, management system, and in business psychology. I will bring as an example the government’s initiative to stimulate the growth of small and medium-sized companies. This is a very good initiative, designed for a long-term effect. However, for the present it is making no progress, and challenges to its implementation are focused not at the level
of the highest political administration, where they understand the importance of encouraging business, but at the regional and local level.

Second complex problem is funding. Venture business in China is underdeveloped so far. The problem is not so much in money, but in psychology. It is very difficult for the Chinese to accept that money may be lost, and no one is to be blamed for it, no one will go to jail, or will be disgraced for life. This is a violation of the laws of social physics, absurd from the standpoint of millennial rule of common sense. However, the experience of other countries, where the state plays a key role in supporting the innovation economy, such as in India and European countries, suggests that this obstacle can be overcome. The psychological barrier disappears once positive implications of the new policy become obvious. However, it takes time and we in China, so far apparently, have not accumulated a critical mass of success stories of innovative start-ups to change the attitudes to venture capital and investment in innovation.

The third most acute problem for us is also associated with culture and psychology. Science, innovative business, has long gone out of the heroic period, when success depended on the exploits of the separate pioneers. Now it is a team business, in which one must play the role of general director, manager of the business, in general, and the other has to be responsible for the research, the third to be just an assistant or consultant, etc. In fact, this should not be a problem; I know that the world considers China to be a country with very strong collectivist traditions. However, this is only half of the truth. The second half of it lies in the fact that this has always been forced collectivism, imposed by external circumstances, and not grown from within. As compensation, the psychology of the Chinese has formed a reference behavioral model of a leader, chief. Anyone who failed to become a leader is considered a loser, a wimp. As soon as the compulsion weakens, ambitions come to the surface and now we are just going through this step. No one wants to be second, but first, the most important, the CEO (chief executive officer). On the one hand, this is good; it makes the process dynamic, but on the other hand...

At first, it is very difficult to create a workable team because everyone wants to be the chief, at the next step, if you managed to balance the internal corporate hierarchy, there is a problem, associated with the distribution of income and external funding. I know dozens of start-ups, which died while their managers were excitedly discussing among themselves about the division of the first profits. These were companies with excellent technology, very promising, and what happened to them is a real tragedy for us.

The next trap is attracting foreign investors. In the conditions when the philosophy of venture capital has not yet taken roots, the investor always comes to the company not just as a co-owner, but also as a manager, and the struggle for power breaks out again. To avoid this, many companies avoid attracting investment, but in the end, they lose the ability to rapidly develop and get stuck at the level of family firms, and finally withdraw. For me, it is evident that culture will gradually change, excessive ambition will calm down, and after all, the Chinese are a very practical people. However, this again, will take time.

– How much time will these changes require?
– Fifty years, maybe less. We are talking about the psychology of the largest nation in the world, it is difficult to predict exactly.

Written by Alexey Zayko.
Anna Nikiforova was involved in the preparation of the article.
Annex B

METHODOLOGICAL PROCEDURES OF THE PROJECT
(RATING METHODS, DATA ACQUISITION METHODS)

1. General principles of formation the list of leading innovation managers of the world. The list of leading innovation managers of the world

In 2011, the rating agency “Expert RA” and the Skolkovo Innovation Center conducted a large-scale research to form a list of the most authoritative innovation managers of the world. The listed people (see Table 1, in alphabetical order) are not the world celebrities such as Bill Gates and Steve Jobs, but leading managers, scientists and officials who succeeded in creating the most favorable conditions for introduction of innovation in different countries of the world.

Among the main criteria for candidate selection were - contribution to one or another innovation area or project, being quoted or written about in leading business and scientific periodicals, receiving high appraisals from leading experts and journalists, demand for the candidate today (participation in significant state and corporate consultative bodies engaged in the development of innovative infrastructure), scientific and entrepreneurial experience, and having received significant prizes and awards.

An important role in forming the list belongs to the contribution they made into transformation of the regional economy (or even the whole country’s economy). For example, Tony Tan and Philip Yeo have created Singapore innovation infrastructure from the scratch, diversified the country’s economy so that now it occupies leading positions in global ratings of innovative-developed regions. Another prime example is the ordinary province of Skone in the south of Sweden, where thanks to the efforts of Sven-Thore Holm, who had created a well-developed innovation environment in this region, the government managed to overcome the economic recession and virtually solved the unemployment problem.

<table>
<thead>
<tr>
<th>Person (Name)</th>
<th>Countries where projects have been realized</th>
<th>Merits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paulo Arruda</td>
<td>Brazil</td>
<td>Famous Brazilian innovative researcher and entrepreneur, pioneer in genetics</td>
</tr>
<tr>
<td>Wang Yangyuan</td>
<td>PRC</td>
<td>Head of a number of research centers in the PRC, architect of innovation policies in microelectronics, The person who founded and continues to develop the microelectronic industry of the PRC More than 40 years of experience in semiconductor industry, Director of the Microelectronics Research Center, Beijing University.</td>
</tr>
<tr>
<td>Joseph Vardi</td>
<td>Israel</td>
<td>The most successful venture investor in Israel, one of the chief innovative managers of the Israeli hi-tech industry, one of Israel’s most prominent innovation entrepreneurs and venture capitalists.</td>
</tr>
<tr>
<td>Peter Dobson</td>
<td>Great Britain</td>
<td>Initiator and director of Begbroke Science Park (Oxford), National advisor on nanotechnology to the Research Councils, the UK</td>
</tr>
<tr>
<td>Kazuo Inamori</td>
<td>Japan</td>
<td>Founder of Kyocera, Kansai Cellular Telephone Co., KDDI Corporation and several venture companies</td>
</tr>
<tr>
<td>Philip Yeo</td>
<td>Singapore</td>
<td>Coordinator of Singapore government policy in the field of innovation development, Chairman of the board of directors of SPRING, Council for Standards, Improved Efficiency and Innovations.</td>
</tr>
<tr>
<td>John Kao</td>
<td>The USA, Finland, Singapore, Ireland, United Arab Emirates</td>
<td>International advisor BASF, Nike, Intel, Nissan, PricewaterhouseCoopers and others, as well as for governments of Finland, Singapore, Ireland, United Arab Emirates and the USA.</td>
</tr>
<tr>
<td>Mervi Kaki</td>
<td>Finland, Poland, Cyprus, New Zealand, Russia</td>
<td>A partner, managing director and chief advisor at InnoPraxis International Ltd. Former CEO of Technopolis Capital Region, Former Member of the Board of Technopolis Ventures Business Incubator, Previously held managing positions at Technopolis PLC.</td>
</tr>
<tr>
<td>Mei Meng</td>
<td>PRC</td>
<td>Founder and President of Tsinghua University Science Park (TusPark), Director of TusPark Development Centre, Chairman of TusPark Co. Ltd. Permanent Board Member of the Chinese Association of University-based Science Parks.</td>
</tr>
<tr>
<td>Person (Name)</td>
<td>Countries where projects have been realized</td>
<td>Merits</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>William Miller</td>
<td>The USA, Singapore, Malaysia, South Korea, Japan</td>
<td>One of the founding fathers of the Silicon Valley, advisor on innovation policy in South Korea, Singapore, Malaysia and Japan, co-director of Stanford Programme on Regions of Innovation and Entrepreneurship.</td>
</tr>
<tr>
<td>Nagesha Murthy</td>
<td>India</td>
<td>One of the founding fathers of the IT cluster in Bangalore, prominent Indian innovative entrepreneur and software engineer, Co-founder and former CEO and currently Chairman Emeritus and Chief Mentor of Infosys, Bangalore, India.</td>
</tr>
<tr>
<td>Shiv Nadar</td>
<td>India</td>
<td>One of the founding fathers of the IT industry in India, founder and chairman of HCL Technologies, founder and chairman of the Shiv Nadar Foundation, founder of the Shiv Nadar University.</td>
</tr>
<tr>
<td>Nandan Nilekani</td>
<td>India</td>
<td>Prominent Indian entrepreneur, head of the Government of India's technology committee, IASBP, Co-founder and former Chairman and CEO of Infosys technologies, a global IT services company, Co-founder of India's National Association of Software and Service Companies (NASSCOM) and the Bangalore Chapter of The IndUS Entrepreneurs.</td>
</tr>
<tr>
<td>Se-Jung Oh</td>
<td>South Korea</td>
<td>President of the National Research Foundation of Korea, advisor to the Government of Korea on science and technology policies, Member of the Korean Academy of Science &amp; Technology and the Presidential Advisory Council on Education, Science and Technology, Republic of Korea.</td>
</tr>
<tr>
<td>Gilbert Pastor</td>
<td>France</td>
<td>Vice-president for Economy and Innovation at Montpellier Agglomeration, business and innovation center which is the first French business incubator and the 2007 Best Business Incubator that has created more than 470 companies, President Delegate to Economic Development and Employment, Montpellier, France.</td>
</tr>
<tr>
<td>Carlota Perez</td>
<td>Venezuela, PRC, Brazil, Netherlands, Spain</td>
<td>Venezuelan economist and expert on technology and socio-economic development, International consultant in innovation development to multilateral organizations, including the OECD, the UN, Technology to Taiwan and Development, UNESCO, UN Industrial Development Organization, the UN Development Programme and the World Bank as well as to private companies.</td>
</tr>
<tr>
<td>Fernando de Castro Reinach</td>
<td>Brazil</td>
<td>One of the founders of the biotechnology industry in Brazil, a well-known researcher and entrepreneur in biotechnologies and genetics, famous venture capitalist. Has coordinated a great number of research groups and labs.</td>
</tr>
<tr>
<td>Tony Tan</td>
<td>Singapore</td>
<td>Former Deputy Chairman of the Research, Innovation and Enterprise Council, Former Chairman of the National Research Foundation (2006-2011), Former Minister for Education, Minister-in-charge for NUS and Nanyang Technological Institute, Author of the One-North innovation business park, President of Singapore since 2011.</td>
</tr>
<tr>
<td>Anthony Tan</td>
<td>Hong Kong</td>
<td>CEO of Hong Kong Science and Technology Parks Corporation, About 40 years of experience managing and building large organizations in Asia-Pacific and globally for DuPont, covering product lines from chemicals to synthetic fabric and fibers like Tyvek and Lycra, used to work in R&amp;D and production for DuPont in the US as well as to be involved in the development of new products/businesses in electronic imaging and medical products.</td>
</tr>
<tr>
<td>David Frohman</td>
<td>Israel</td>
<td>Founding father of Israel’s high-tech, significantly influenced the computer memory industry, developer of EPROM, Founder, former Vice-President and first general manager of Intel Israel.</td>
</tr>
<tr>
<td>Julian Webb</td>
<td>Australia, New Zealand, PRC</td>
<td>Managing Director of GREEDA Projects Pty Ltd., a network of entrepreneurship, innovation and SME development consultants in Australia and internationally, Leader in the small business development and business incubation industries since the 1980s, Has established a big number of business incubators in Australia and internationally Asia Region Facilitator for the World Bank’s infoDev Incubator Initiative.</td>
</tr>
<tr>
<td>Chang-Gyu Hwang</td>
<td>South Korea</td>
<td>National Chief Technology Officer and the Secretary General, the head of Office of Strategic R&amp;D Planning in Korea, Former advisor to Samsung Electronics on R&amp;D of Samsung Electronics' future technologies, Former technical consultant at Intel and Hewlett Packard.</td>
</tr>
<tr>
<td>John Hennessy</td>
<td>The USA</td>
<td>President of Stanford University, pioneer in computer architecture, RISC (Reduced Instruction Set Computer) technology, member of executive bodies and a top manager for a number of internationally renowned hi-tech corporations (Google Inc. and others).</td>
</tr>
<tr>
<td>Sven-Thore Holm</td>
<td>Sweden, Russia, PRC</td>
<td>General Director of Lundavision AB, founder of Idea Research Park in the city of Lund (Sweden) where over 10,000 jobs have been created since 1984.</td>
</tr>
<tr>
<td>Pertti Huuskonen</td>
<td>Finland, Poland, Cyprus, New Zealand, Russia</td>
<td>One of the ideologists of Finland’s innovation policy and the country’s first technoparks. One of the founders and chairman of the board of directors at Technopolis PLC.</td>
</tr>
<tr>
<td>Russell Hancock</td>
<td>The USA, PRC, Taiwan, Great Britain, Spain</td>
<td>One of the founders, chairman and CEO of analytic center, Joint Venture: Silicon Valley Network, international advisor on regional development, consultant to high tech companies, former member of the Board of Directors of New California Network.</td>
</tr>
<tr>
<td>Herbert Chen</td>
<td>PRC</td>
<td>Vice President of Tsinghua University Research Park (Tsinghua University Research Park, Deputy Director of the Tsinghua University Science Park Development Centre in Beijing, President of the Asian Pacific Division of the International Association of Science Park.</td>
</tr>
<tr>
<td>Chin-Tay Shih</td>
<td>Taiwan</td>
<td>Founding father and a pioneer of Taiwan innovation development, Advisor on science and technology to Taiwan’s Executive Yuan, Former chief of the Taiwan Institute for Industrial Technology Research.</td>
</tr>
<tr>
<td>Yigal Elich</td>
<td>Israel</td>
<td>Founding father of the Israeli venture capital industry and prominent Israeli venture investor, Former Chairman of the Israel Venture Association, Vice-President of Israel National Council on R&amp;D.</td>
</tr>
</tbody>
</table>
2. Methodology for forming the effectiveness rating of innovation development centers. Innovation development centers effectiveness

**General approaches to forming the rating**

**Methods of collecting information**

The formation of the primary data on innovation centers (further the IC) was carried out by way of desk research on the basis of analytical publications and interviews in authoritative foreign periodicals (The Economist, FT, WSJ, The Wired), reports and research dealing with innovation infrastructure and national innovation system analyses published by leading foreign research and consulting companies (BCG, KPMG, WB), publications in specialized summarized science periodicals dealing with the analysis of the practices of leading innovation centers.

Interviews published in specialized and popular periodicals also became a source of data. Additional information about special features of organizational structure and current activities was collected directly from the innovation centers.

In addition, additional information and expert opinions on the effectiveness of several well-known innovation centers were obtained by way of personal and in-depth written interviews with leading managers who created the major and the most successful innovation centers of the world.

The primary data array included information about 47 major centers of the world, of which the 35 most successful and effective were selected according to the following criteria: contribution to economic development, being known and referenced in publications, level and importance of the companies working in the center, size of innovation center, availability of venture capital, dynamics of development, and availability of information.

**Definition of the term “innovation development center” includes:**

- Existence of innovation business development nucleus, that greatly differs from the average density indicators of technology companies, number of technological start-ups, dynamics of innovation companies’ development.
- Definable geographical boundaries of the innovation business development nucleus (possibility of localization).
- Definable time of formation.
- Well-established innovation ecosystem (infrastructure, instruments of support, well-established horizontal ties, specific business models, points of attraction of private venture capital) that has significant qualitative or quantitative differences in comparison with national innovation systems of the corresponding countries.

**Goals of the rating**

To construct a coordinate system for assessment of the effectiveness of major world innovation centers, that makes it possible for the innovation centers that are created in our country to define their place in the world and their global competitiveness. To form theoretical basis for determination of the innovation infrastructure development strategy in Russia and for objective estimation of the results already obtained.
Methodology of forming the rating

Forming the rating (ranging from “the most effective” to “the least effective”) has no sense as the initial conditions for the creation and the aims of innovation centers often cannot be compared. So the sense of idea of “effectiveness” gets lost. Neither the special characteristics of IC current financing activities, nor its relative size are the criteria for assessment of an IC’s effectiveness. Therefore in this rating the IC effectiveness is estimated irrespective of their relative size, forms of their organization or financial self-sufficiency. Such sorting of ICs into groups, according to special characteristics of financing and size permits us to compare the effectiveness of ICs. At the same time, the rating shows current effectiveness as well as the dynamics of development demonstrated by the IC over the past 5 years.

Description of the rating scale

All the ICs that received an effectiveness rating are divided into the following groups according to the criteria set out below.

According to size (criteria Nos. 1 – 4) into:
1. Regional (index R) – the score regarding the criteria weight is from 0 to 0.4
2. National (index N) – the score regarding the criteria weight is from 0.4 to 0.8
3. Global (index G) – the score with the criteria weight is from 0.8 to 1.225

According to the degree of financial self-sufficiency (criterion No. 14) into:
1. ICs having considerable financial dependence on support of third organizations (index .org).
2. ICs having considerable financial dependence on support of state and municipal institutions (index .gov).
3. ICs having financial self-sufficiency and self-recoupment (index .mkt).

Each IC is set the current effectiveness rating according to criteria №№ 6 – 14:
1. Low effectiveness – the score regarding all the criteria is from 0 to 0.3.
2. Middle effectiveness – the score regarding all the criteria is from 0.3 to 0.7.
3. High effectiveness – the score regarding all the criteria is from 0.7 to 1.

Each IC according to criteria Nos. 6 – 14 (the current effectiveness rating) and criterion No. 16 (development dynamics) is set according to one of the criteria of total effectiveness ratings set out below (see Table 2):

<table>
<thead>
<tr>
<th>Effectiveness</th>
<th>Dynamics</th>
<th>Negative</th>
<th>Stable</th>
<th>Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td></td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Medium</td>
<td></td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Low</td>
<td></td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 2. Total effectiveness rating
EXAMPLE: Rating \textit{N.gov4} is given to a national IC considerably dependent on direct financial support of the state or municipal authorities, showing high effectiveness according to the criteria set out below, but not having either marked positive development dynamics over the last 5 years or showing medium current effectiveness and positive development dynamics over the last 5 years.

Criteria for setting IC effectiveness rating

IC size and effect

1. \textit{Influence of the companies founded in the IC on the economic structure:}
   a. Regional – 0
   b. National – 0.5
   c. Group of countries – 1
   d. Global economy – 1.5

   EXAMPLE: activities of Montpellier IC considerably changed the structure of Languedoc Region’s economy by way of starting new tech companies and attracting transnational companies, though they had no considerable effect on the changes on the national or global economies.

   EXAMPLE: Intel and Google, founded in Palo Alto, changed the structure of the global economy.

2. \textit{Level of innovations introduced in the IC}
   a. Only improving innovations – 0
   b. Improving innovations and breakthrough innovations within the country – 0.5
   c. Breakthrough innovations in the global economy – 1

3. \textit{Business size of the companies working in the IC}
   a. only start-ups and SMB – 0
   b. only start-ups, SMB and big national business without TNC of the global level – 0.5
   c. all levels – international corporations, national big business, SMB and start-ups – 1.

4. \textit{Influence of the model of innovation business support and development created in the IC (to what extent the created model or its key elements are scaled or reproduced outside the IC)}
   a. Regional – 0
   b. National – 0.5
   c. Group of countries – 1.0
   d. International – 1.5
Effectiveness of current activities

5. *Contribution to job creation*
   a. Effect of the companies working within the IC structure on the regional labor market is not noticeable – 0.
   b. Companies working within the IC structure provide less than 10% of jobs in the region – 0.5
   c. Companies working within the IC structure provide more than 10% of jobs in the region – 1.0

6. *Effectiveness in creating high-tech start-ups*
   a. Relative number of start-ups created annually
      i. The number of start-ups created annually does not exceed 5% of small and medium size tech companies within the IC structure operating at the beginning of the year – 0.
      ii. The number of start-ups created annually is from 5% to 15% of small and medium size tech companies within the IC structure operating at the beginning of the year – 0.5.
      iii. The number of start-ups created annually exceeds 15% of small and medium size tech companies within the IC structure operating at the beginning of the year – 1.0.
   b. Percentage of start-ups, continuing operations three years after company registration (survival rate)
      i. Less than 30% – 0
      ii. From 30% to 60% – 0.5
      iii. More than 60% – 1.0
   c. Success stories
      i. Not one of the companies started within the IC managed to become a big company of a national level, there are no cases of companies started within the IC being taken over by a transnational company – 0
      ii. Among the companies started within the IC, there are companies that managed to become a big company of a national level, there are cases of companies started within the IC being taken over by a transnational company – 0.5
      iii. Among the companies started within the IC, there is one or several companies that became international corporations – 1.0

7. *Effectiveness in use of regional personnel and technological potential*
   a. relations with big universities / research centers are limited – 0
   b. cooperation with big universities / research centers is not on a continuing basis – 0.5
   c. close and systematic cooperation with big universities / research centers is on a continuing basis – 1.0
8. **Influence on the regional scientific potential**

a. Weak effect – IC practically has no effect on subject matter and size of scientific research financing in the region – 0

b. Notable contribution – well-developed universities and research centers had appeared in the region before the IC, however at present the IC has significant influence on research subject matter selection and research programs financing – 0.5

c. Significant contribution – the IC development went ahead of the regional higher education and research centers development, the IC provides the regional higher education and research centers with scientific and teaching personnel, the IC considerably defines the direction of curricula in university centers and the research subject matter, the IC is an important investor in university research projects – 1.0

9. **Effectiveness in attracting external (outside the IC) personnel for the innovation business (highly skilled workers, innovation companies managers, entrepreneurs with experience of starting tech businesses)**

Percentage of external projects in total number of companies working in the IC:

a. Less than 10% – 0

b. From 10 to 20% – 0.5

c. More than 20% – 1.0

10. **Effectiveness in the use of instruments of state/municipal/public support of innovation business – density and availability of support instruments in comparison with the average level in the country**

a. Only some of national and regional support institutions are represented in the IC – 0

b. All national and regional support institutions are represented in the IC, availability equals the country average – 0.5

c. All existing national and regional support institutions are represented in the IC, there are also institutions orientated exclusively to the IC, availability of support instruments is much higher than the country average – 1.0

11. **Effectiveness in attracting private venture capital (creation of stable investor pool, orientated mainly to innovation companies of the IC, investment sufficiency for innovation business development in the IC)**

a. Stable pool of investors (venture capitalists and business angels) orientated to the IC’s innovation companies is not created, there is private capital deficit at all or some stages of innovation companies’ development – 0

b. Stable pool of investors is created, however there is private capital deficit at some stages of innovation companies’ development – 0.5

c. Stable pool of investors is created, there a is no deficit of private investments – 1.0
12. Recognition of global leadership in certain high tech sectors
   a. The IC is not a recognized as a leader in development of any high tech sector – 0
   b. The IC is a recognized leader in development of one high tech sector – 0.5
   c. The IC is a recognized leader in development of several high tech sectors – 1.0

13. PR effectiveness
   1. International renown
      a. Links only in one language (English or other e.g. Korean, Chinese, etc.) – 0
      b. Many relevant links in Google in English and other languages, including Russian – 1.0

   2. References in authoritative publications (The Economist, Times, Scientific American, Wired, Nature, etc.)
      a. There are no references – 0
      b. There are references – 0.5
      c. IC is already a part of existing rankings of innovation centers - 1

   3. Organizing by the IC of conferences and other events for experience exchange
      a. There are no significant events or they are held very seldom – 0
      b. Regional events – 0.25
      c. National events – 0.75
      d. International events – 1.0

Self-sufficiency of the IC

14. Financial self-sufficiency of the IC
   a. IC having significant financial dependence on the support from third organizations (e.g. University IC, North Carolina) – more than 20% of the expenses for the IC operating activities, directed to the support of innovative business, are met by third organizations.
   b. IC having significant financial dependence on the support from the state and municipal authorities – more than 20% of the expenses for the IC operating activities, directed to the support of innovative business, are met by the state/municipal budget.
   c. IC having financial self-sufficiency and self-recoupmment – less than 20% of expenses for the IC operating activities are met by the state/municipal budget or third organizations (more than 80% are financed from the incomes of the IC management company, that are related to the main activities of the managing organization, e.g. leasing), or the IC does not have any managing organization or integrated operating expenses.
Development dynamics of the IC

15. Development dynamics for the past 5 years (changes in number of companies working within the IC, number of start-ups created annually).
   a. Negative – decrease in any of the enumerated characteristics by more than 10% – 0
   b. Stable – changes in the enumerated characteristics are less than 10% – 0.5
   c. Positive – increase in the enumerated characteristics by more than 10% – 1.0
<table>
<thead>
<tr>
<th>№</th>
<th>Name of the innovation center</th>
<th>Country</th>
<th>Year of foundation</th>
<th>Efficiency</th>
<th>Self-sufficiency</th>
<th>Scale - scope</th>
<th>Dynamic of development</th>
<th>Assigned rating</th>
<th>Number of registered companies</th>
<th>Number of companies</th>
<th>Steady, growing together</th>
<th>Overall volume of investments / Annual aggregate income of residents (million USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>India Silicon Valley, Bangalore</td>
<td>India</td>
<td>1990s</td>
<td>0.905</td>
<td>0.74</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>130</td>
<td>20,000+</td>
<td>5,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>2</td>
<td>Idaho Research Park</td>
<td>Sweden</td>
<td>1983</td>
<td>0.8925</td>
<td>0.68</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>3,000</td>
<td>20,000+</td>
<td>100</td>
<td>140,146</td>
</tr>
<tr>
<td>3</td>
<td>Yokohama Research Park</td>
<td>Japan</td>
<td>1987</td>
<td>0.91</td>
<td>0.74</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>154</td>
<td>250+</td>
<td>300</td>
<td>40,146</td>
</tr>
<tr>
<td>4</td>
<td>Kyoto Science and Industrial Park</td>
<td>USA</td>
<td>1980</td>
<td>0.925</td>
<td>0.74</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>450+</td>
<td>1,200</td>
<td>1,200</td>
<td>38,452; 301,050</td>
</tr>
<tr>
<td>5</td>
<td>Karolinska Institute, Stockholm</td>
<td>Sweden</td>
<td>1985</td>
<td>0.925</td>
<td>0.74</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>440</td>
<td>300,000</td>
<td>300</td>
<td>94,770; 94,770</td>
</tr>
<tr>
<td>6</td>
<td>Handu Science and Industrial Park</td>
<td>Taiwan</td>
<td>1980</td>
<td>1.25</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>215</td>
<td>250,000+</td>
<td>250</td>
<td>300,000</td>
</tr>
<tr>
<td>7</td>
<td>Berlin Adlershof Technological Park</td>
<td>Germany</td>
<td>1981-1992</td>
<td>0.925</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>8</td>
<td>Technopark Salzburg</td>
<td>Austria</td>
<td>1983</td>
<td>0.91</td>
<td>0.74</td>
<td>G.mkt5</td>
<td>Positive</td>
<td>G .mkt5</td>
<td>450</td>
<td>100,000</td>
<td>100</td>
<td>40,146; 384,525; 94,770</td>
</tr>
<tr>
<td>9</td>
<td>Silicon Valley Palo Alto, San Diego, Sh. San Francisco</td>
<td>USA</td>
<td>1983</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>170</td>
<td>5,000+</td>
<td>5,000</td>
<td>140,146; 384,525; 94,770</td>
</tr>
<tr>
<td>10</td>
<td>Silicon Valley, California</td>
<td>USA</td>
<td>1983</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>150</td>
<td>5,000+</td>
<td>5,000</td>
<td>140,146; 384,525; 94,770</td>
</tr>
<tr>
<td>11</td>
<td>Tsukuba Science City, Japan</td>
<td>Japan</td>
<td>1985</td>
<td>0.925</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>12</td>
<td>Tsukuba Science City, Japan</td>
<td>Japan</td>
<td>1985</td>
<td>0.925</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>13</td>
<td>Austin Science Hill, Texas</td>
<td>USA</td>
<td>1983</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>14</td>
<td>Shanghai Zhangjiang High-tech Park</td>
<td>China</td>
<td>1992</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>15</td>
<td>Montpellier Agglomeration</td>
<td>France</td>
<td>1986</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
<td>16</td>
<td>Cambridge Science Park</td>
<td>Great Britain</td>
<td>1970</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
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<tr>
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<td>Leeds Biomedical Park</td>
<td>Netherlands</td>
<td>1984</td>
<td>0.86</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
</tr>
<tr>
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<td>1992</td>
<td>0.91</td>
<td>0.74</td>
<td>G.gov5</td>
<td>Positive</td>
<td>G .gov4</td>
<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
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<td>0.74</td>
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<td>G .gov4</td>
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<td>3,000+</td>
<td>3,000</td>
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<td>120</td>
<td>3,000+</td>
<td>3,000</td>
<td>139,146; 384,525; 94,770</td>
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<tr>
<td>№</td>
<td>Name of the innovation center</td>
<td>Country</td>
<td>Year of foundation</td>
<td>Efficiency</td>
<td>Scale – scope</td>
<td>assigned rating</td>
<td>Self-sufficiency**</td>
<td>Dynamics of development</td>
<td>Assigned name</td>
<td>Number of registered companies</td>
<td>Overall volume of investments / Annual aggregate income of residents*** (million USD)</td>
<td></td>
</tr>
<tr>
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<td>1980</td>
<td>0.5</td>
<td>0.49</td>
<td>Positive</td>
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<td>Positive</td>
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<td>22</td>
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<td>2002</td>
<td>0.635</td>
<td>0.625</td>
<td>Positive</td>
<td>N .gov</td>
<td>Positive</td>
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<td>Finland</td>
<td>1986</td>
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<td>0.56</td>
<td>Positive</td>
<td>N .mit</td>
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<td>0.345</td>
<td>0.345</td>
<td>Positive</td>
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<td>1990</td>
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<td>N .gov4</td>
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<td>1972</td>
<td>0.25</td>
<td>0.4375</td>
<td>Stable</td>
<td>N .gov4</td>
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<td>N .gov4</td>
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<td>France</td>
<td>1990</td>
<td>0.345</td>
<td>0.6425</td>
<td>Stable</td>
<td>N .gov4</td>
<td>Stable</td>
<td>N .gov4</td>
<td>3 300</td>
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<td>28</td>
<td>ZIRST Technological Park, Grenoble</td>
<td>France</td>
<td>2000</td>
<td>0.475</td>
<td>0.475</td>
<td>Stable</td>
<td>N .gov3</td>
<td>Stable</td>
<td>N .gov3</td>
<td>11 000</td>
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<td>Portugal</td>
<td>1991</td>
<td>0.5</td>
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<td>Stable</td>
<td>N .gov3</td>
<td>Stable</td>
<td>N .gov3</td>
<td>250</td>
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<td>Turkey</td>
<td>1990</td>
<td>0.65</td>
<td>0.65</td>
<td>Stable</td>
<td>N .gov3</td>
<td>Stable</td>
<td>N .gov3</td>
<td>2 000</td>
<td>240</td>
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<td>0.45</td>
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<td>0.35</td>
<td>0.52</td>
<td>Stable</td>
<td>N .gov2</td>
<td>Stable</td>
<td>N .gov2</td>
<td>40 338</td>
<td>1006</td>
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<tr>
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<td>Oxford University Begbroke Science Park</td>
<td>Great Britain</td>
<td>1995s</td>
<td>0.635</td>
<td>0.325</td>
<td>Stable</td>
<td>R .gov3</td>
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<td>4 000</td>
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<td>Korea</td>
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<td>0.365</td>
<td>0.3075</td>
<td>Positive</td>
<td>R .gov3</td>
<td>Positive</td>
<td>R .gov3</td>
<td>3 000</td>
<td>7</td>
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<td>Transilvania Science and technology park</td>
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<td>1990</td>
<td>0.365</td>
<td>0.3075</td>
<td>Positive</td>
<td>R .gov3</td>
<td>Positive</td>
<td>R .gov3</td>
<td>3 000</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

* By scale, innovation centers are divided into groups: "R" Index, regional; «N» Index, national; «G” Index, international.
** By grade of their financial self-sufficiency, innovation centers are divided into groups: N .gov Index – innovation centers having significant financial dependence on support of third organizations; N .mkt Index – innovation centers having significant financial dependence on support of state authorities; R .gov Index – innovation centers having significant financial dependence on support of municipal authorities; R .mkt Index – innovation centers having significant financial dependence on support of self-supporting innovation centers.

*** Asterisk specifies the index of aggregate incomes of residents of an innovation center for the accounting period.
3. SORTING OF INNOVATION CENTERS ACCORDING TO SELF-SUFFICIENCY, EFFECTIVENESS AND DYNAMICS INDICES

Size of the circle shows the scale of IC activities (see Chapter 1)

1. Zhongguancun Science Park
2. Shanghai Zhangjiang Hi-Tech Park
3. Hong Kong Science and Technology Park
4. Biopolis (One North)
5. Hsinchu Science and Industrial Park
6. Daedeok Innopolis
7. India Silicon Valley Bangalore
8. Silicon Wadi, Israel
9. Technopolis Duku (Finland)
10. Otaimi Science Park (Finland)
11. Montpellier Agglomeration
12. ZIRST Technopark, Grenoble
13. Sophia Antipolis
14. Technopark Campinas
15. Digital Port (Brazil)
16. Tsukuba Science City
17. Kyoto Research Park
18. Berlin Adlershof Technology Park
19. Cambridge Science Park
20. Oxford University Bbegbroke Science Park
21. Ideon Research Park
22. Technoparc Montréal
23. Innovation Place Research Park
24. Leiden Bio Science Park
25. Silicon valley (USA)
26. Research Triangle Park North Carolina
27. Austin Silicon Hills
28. Kendall Square (Massachusetts)
29. National Technology Park
30. Technology Park Bentley
31. Madrid Science Park
32. Symbion Science Park
33. Yokosuka Research Park
34. METU-Technopolis
35. Tomsk science and technology park (Russia)