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BUSINESS MODELS OF TECHNOPARKS IN RUSSIA

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The working paper is based on research findings concerning the functioning of 35 Russian technology parks in 2013 – the first half of 2015. The analysis of the performance of these technology parks has been carried out on the basis of the CANVAS framework, proposed by Osterwalder and Pine in 2010. The research was conducted in the domain of 9 key blocks business model of technology parks, including infrastructure and services provided, companies' residents, cooperation with partners, including regional and federal authorities, scientific and education institutions, financial and economic indicators of technoparks and key performance indicators used. On the basis of empirical data 7 business models of functioning of Russian technology parks were revealed, including IT-park, university park, 2 types of facilitators of innovation processes in a region and 3 types of entrepreneurial technoparks. The classification allows differentiating the nature and level of support of technology parks as objects of innovation infrastructure. Detailed profile of business models reveals the competitive advantages and weaknesses of technoparks, as well as mechanisms to improve the efficiency of these objects of innovation infrastructure.

JEL Classification: O32, O38, R58

Keywords: innovative infrastructure, technopark, business-model, research and development, regional development, regional innovative system, value creation

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Introduction

The effectiveness of Russian technology parks has recently been quite heavily criticised. According to Russian and foreign researchers, 70% of technology parks in Russia cannot be attributed to innovation infrastructure and function only as business centres. However, the expenditures on establishment and maintenance of technology parks are made from budgets of all levels and reflect the cost of innovation. As a result, the modest success of the Russian economy in science and technology becomes even more dispiriting.

At the same time, the growing number of private technoparks in the country is being observed. Private investors often choose *developer model* in the guise of *innovation* aimed to receive government support and increase the profitability of their own business. In this case urgent need for an objective analysis of business model functioning of Russian technology parks rises. The general purpose of the research is to classify Russian technology parks, according to the value they provide to residents and other beneficiaries. The issue raised in the working paper is of great of interest to those who are engaged in the development of innovation infrastructure facilities in Russia.

Technology parks

The role of science, research, technological and industrial parks consists in providing conducting infrastructure for innovative initiatives in a region. Their presence in the regional innovative system significantly improves the ratio of commercialisation of R&D results. The comparative analysis of life cycle stages of residents in different institutions with innovative infrastructure reveals that science and technology parks work with companies at the most risky stages (Fig.1).

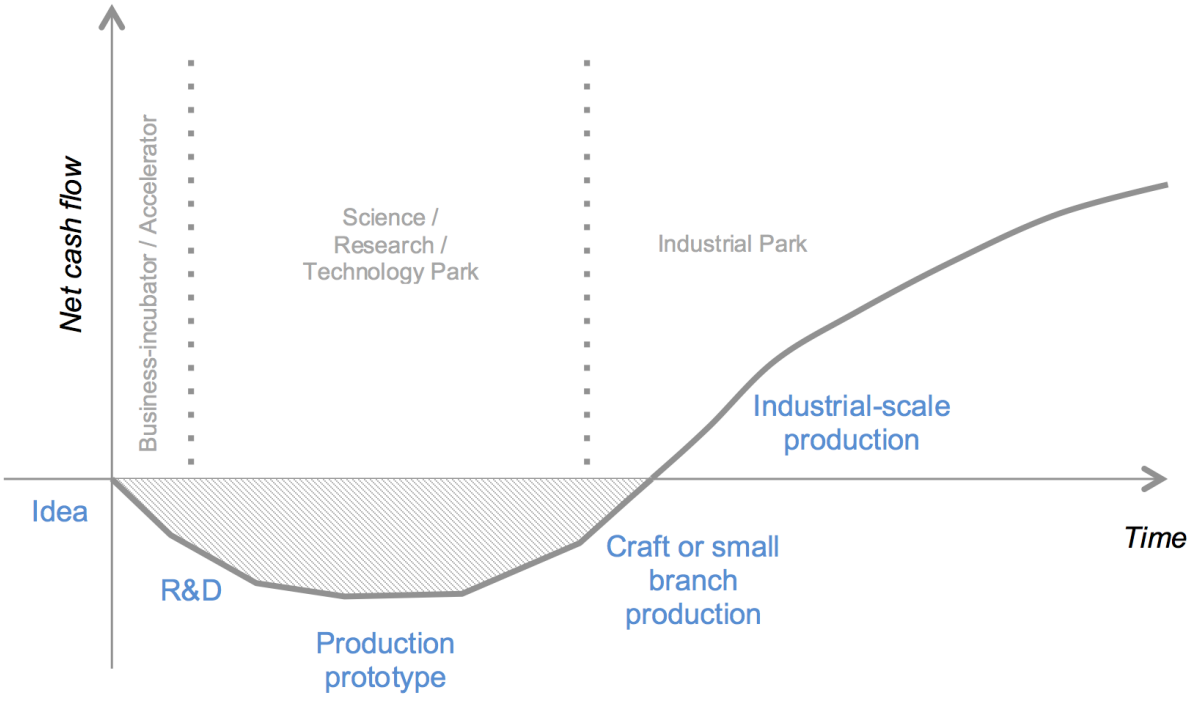


Fig. 1 – Life Cycle Stages of Residents in Institutions with Innovative Infrastructure

Scholars argue about the definition of the term ‘technology park’. Depending on the country the term can encompass developments ranging from research park to business and high technology park.[13] For instance, in the United Kingdom the regularly used term is ‘science park’ and they are generally regarded as having the strongest association with universities. In Australia the most

common term is ‘technology park’. The technology park is supposed to provide access to specialised infrastructure and services for high-tech companies to promote their growth.

The most detailed definitions of the term ‘technology park’ are provided by professional associations and partnerships. Thus, The United Kingdom Science Park Association (the UKSPA), combining the notions of ‘science park’ and ‘technology park’ defines it as ‘a business support initiative whose main aim is to encourage and support the start-up and incubation of innovative, high-growth, technology-based businesses through the provision of: infrastructure and support services including collaborative links with economic development agencies; formal and operational links with centres of excellence such as universities, higher education institutes and research establishments; management support actively engaged in the transfer of technology and business skills to small and medium-sized enterprises’.[14] International Association of Science Parks and Areas of Innovation (IASP) declares that ‘A Science or Technology Park is a space, physical or cybernetic, managed by a specialised professional team that provides value-added services, whose main aim is to increase the competitiveness of its region or territory of influence by stimulating a culture of quality and innovation among its associated businesses and knowledge-based institutions, organising the transfer of knowledge and technology from its sources to companies and to the market place, and by actively fostering the creation of new and sustainable innovation-based companies through incubation and spin-off processes’.[6]

The first attempt to give a definition of the term ‘technology park’ in public official documents in Russia was made in the Executive Order of the Government of the Russian Federation No. 328-r dated March 10, 2006 ‘The State Programme *Establishment of Technology Parks in the Sphere of High Technologies in the Russian Federation*’. The State Programme defined a ‘technology park in the area of high technologies’ as form or territorial integration of business corporations and non-for-profit organisations in the sphere of science and education, financial institutions, enterprises and entrepreneurs inter-acting between themselves, with local governments and producing modern technological and organisational environment with the purpose of innovative entrepreneurship and implementation of venture projects.[4]

In 2010, the Order of the Minister for Economic Development of the Russian Federation No. 59 dated February 16, 2010 ‘On the Measures on the Implementation of Activities on the State Support of Small and Medium Scale Enterprises’ in 2010 defined the term ‘technology park’ as a ‘property complex created to implement activities in the area of high technologies, consisting of office buildings, production premises, engineering, transport, residential and social infrastructure with the total area of minimum 5,000 sq.m’.[8] In 2015 the Federal Agency on Technical Regulating and Metrology (Rosstandart) ratified the national standard of technology parks developed by the non-for-profit partnership Association of Technology Parks in the Area of High Technologies. The national standard defines the term ‘technology park’ as a ‘real estate complex including, innovation, engineering and technological infrastructure facilities providing the full cycle of services on establishment, deployment and development of high-tech companies and managed by a single operator, special-purpose management company’.[7]

Despite the differences in the definitions experts of legislative and executive agencies as well as professional stakeholders of innovation infrastructure facilities share the opinion that a technology park should possess the following elements:

1. a real estate complex including office, production and warehouse premises;
2. engineering, transportation and technological infrastructure facilities;
3. resident companies operating in the area of high technologies;
4. management company, a technology park operator.

The complexity and diversity of technology parks induce scientists to establish different types of the innovative infrastructure facilities.

The first attempt to classify technology parks was made in 1985 by a German researcher Arlesh. He divided science and technology parks into three groups: research parks, innovation centres and science parks.

Later in 1989, Richard Joseph introduced another concept called 'technology operated companies' (TOC). This concept categorised all types of parks on the basis of their method of formation:

1. Parks developed as a result of newly founded and franchise companies establishment. For example, Silicon Valley , Boston's Route 128
2. Research technology operated companies restricted to park area such as the Research Triangle Park in North Carolina
3. Technology operated companies that provide facilities for high-tech companies such as the Arizona, the Phoenix
4. Technology operated companies established and funded with the state support such as the ones in Houston, Texas by US Ministry of Defense

Significant contribution to the study of the typology of technology and science parks was made by Luis Sanz, Director General, International Association of Science Parks and Areas of Innovation. Firstly the researcher distinguished models of technology parks in 1998. According to the main focus and orientation Luis Sanz identified the following models: the Californian (U.S.), the British, the Japanese and the Mediterranean models. Later he developed two classifications of science and technology parks according to the property-management structure (public, private and mixed model) and according to science and technology park's (STP) activity (specialist and generalist).

One of the most recent classifications of park infrastructure was developed by Byung-Joo Kang in 2004. In the research Kang unites approaches of Lee (1992), Hyun (1996) and Ko (2000) and suggests three development patterns of research parks and one classification of research parks according to their management types.

Tab. 1 – Development Patterns of Research Parks

№	Criteria of Classification	Models of Research Park	Features of Research Park	Examples
1	Physical appearance	Concentrated park	Increasing contacts between researchers	Research parks in New York
		Scattered park	Protecting the individuality of tenant organisations	Research Triangle Park
		Mixed park	Intensifying flexibility in operation and management	General types of research park
2	Spatial magnitude	Building-centred park	Reducing the land price and building rent	Research parks in New York
		Site-oriented park	Providing separate space to individual tenants	Kumamoto Research Park
		Technopolis-type park	Making diverse functions available in the park	Tsukuba Science City
3	Aims and functions	R&D-centred park	Making technologies transferred	Prototype of research parks
		Technology innovation-centred park	Making start-up firms and existing firms innovative	Surrey Research Park
		Technology base formation park	Establishing a technology base by utilising regional technology potential	Kanakawa Research Park

		Industrial restructuring-oriented park	Restructuring industrial composition of the region	Hsinchu Industrial Park
		Multiple objectives performing park	Minimising unoccupancy rate because of easy tenant attraction	Tsukuba Science City
4	Management types	University-based park	Parks are developed with small scale sites or building types because of financial limits	Cambridge Science Park
		Government-led park: 1. Central government 2. Local government	1. Parks are located on a large site to enhance national competitive power 2. Parks are developed to vitalise local economy	1. Sophia Antipolis 2. Shefield Science Park
		Joint partnership park	A foundation owns and operates a park	Majority of parks in Japan
		Developer initiative park	Parks are built by the developers as a way of real estate development	Parks in New York or Tokyo
		Nonprofit organisation park	Park is established to vitalise regional development economy	Research Triangle Park

Source: Byung-Joo Kang *A Study on the Establishing Development Model for Research Parks*, 2004 [15]

Business models

Since the 1990s the term 'business model' has been the centre of generous consideration from academics and practitioners. In spite of the fact that since 1995 more than 2100 articles have been published in academic journals in which the notion of a business model is addressed, experts still argue about definition and key elements of business model.

At a general level, the business model has been referred to as a *statement* [29], a *description* [3], a *representation* [21, 27], an *architecture* [9], a *conceptual tool or model* [24], a method [2], a *framework* [1] and a *set* [26]. [44]

On the other hand, a large number of scientists conduct the researches of business models without an explicit definition of its concept. According to Zott, Amit and Massa one third (37%) of analysed publications do not define the concept at all. Almost one half (44%) explicitly define the term'business model' by enumerating its main components. In every fifth publication authors refer to the work of other scientists in defining the concept. Table 2 summarises some of the most prevailing definitions of the term 'business model' and shows its key building blocks.

Tab. 2 – Business Model Definitions and Its Building Blocks

№	Author(s)	Year	Business model description	Business model components
1	Timmers	1998	Business model is architecture of the products or services and information flow including description of actors, benefits and revenue	· Architecture · Information flow · Benefits to actors · Revenue
2	Mahadevan	2000	Business model is based on the main tree streams including players, revenue and logistics	· Value stream · Revenue stream · Logistical stream
3	Afuah and Tucci	2001	Firms utilise their resource to provide better value to customer and in return gain profit, therefore firms have to perform better than their competitors do	· Linkage · Customer value · Revenue

4	Morris et al.	2005	Present decision variable group which are interrelated with the strategy, architecture and economics for sustainability	· Economics · Operational · Strategic Model
5	Shafer et al.	2005	Explain how values create and capture in a value network	· Strategic Choice · Creating Value · Capturing Value · Value Network
6	Johson, Christensen and Kagermann	2008	Business model is build up with four elements including value proposition, profit formula, processes and resources	· Customer value proposition · Profit formula · Key resources · Key processes
7	Osterwalder and Pigneur	2010	Business model describes the how create, deliver and capture the value by organisation	· Value proposition · Target Customer · Distribution channels · Relationship · Value configuration · Core competencies · Partner network · Cost structure · Revenue model

Source: M. Suleman Sabir, Raja Mazhar Hameed
Theoretical Foundation of Business Model and Their Building Blocks, 2012 [30]

In 2012 M. Suleman Sabir identified 28 key building blocks by reviewing the works of 62 authors on business models from 1996 to 2010. The majority of academics identify cash flows and products/services provided by company as crucial elements of the business model (Fig.2).

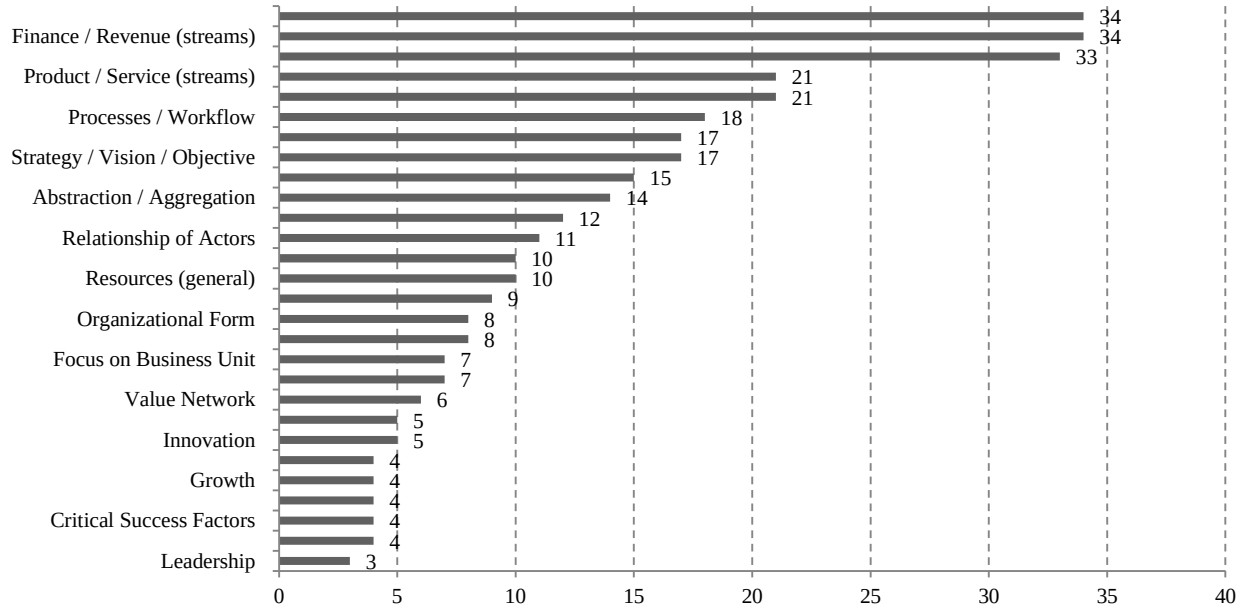


Fig.2 Business Model Building Blocks [30]

Business models of technology parks

The first attempt to analyse performance of technology parks through their business model was made by Aline Figlioli in 2011. The researcher determined that 'the business model establishes how the management of the park creates and delivers value to resident companies and others stakeholders and shareholders'.[12] In spite of the fact that Figlioli did not reveal any

classification or types of business models of technology parks, he identified forms of raising funds for the implementation and maintenance of the park by its management company.

In operation phase funding for the maintenance of the park management organisation can be provided from the following sources:

- participation in the real estate transaction as the owner of land plot or premises of technology park;
- providing specialised technological services and cooperation with residents;
- providing general services for its lessees from catering to all types of business consulting.[12]

Later in 2013 a group of Columbian scientists led by Gerardo Angulo Cuentas presented a characterisation of science and technology parks based on their business model. The research was based on the CANVAS framework developed by Osterwalder and Pigneur in 2005. According to Osterwalder and Pigneur a business model describes how to create, deliver and capture the value by organisation.[24]

Adapting this concept to infrastructure projects in innovation segment, it is worth mentioning that the business model of technology park describes the process of creating, delivering and capturing the value that management company creates for its residents, stakeholders and other customers. To answer the question how can science and technology parks be grouped according to their business models scientist have analysed the performance results of 45 technology parks including their customer segments, value proposition, channels, customer relationships, revenue streams, key resources, activities and partnerships.

Using open information sources such as annual reports, conference presentations, magazines, scientific articles, the authors analysed the performance indicators of 45 full members of International Association of Science Parks and Areas of Innovation (IASP). The infrastructure facilities were selected according to each of the regional divisions of IASP, including Africa, Asia Pacific, Europe, Latin America, North America and West Asia.

Based on the methodology and the processed data the analysis of Columbian scientists revealed 8 types of science and technology park according to their business models.

Tab. 3 – Typology of STPs Based on Their Business Model

№	Type of Science and technology park	Description of business model
1	Megaparks	Megaparks are established by state authorities. They are aimed to support regional economic development policies and boost innovation to strengthen the main sectors of the territory. This type of innovation infrastructure facilities provide the widest range of services for the residents.
2	University parks	This type of STPs is founded by university with the main objective to use human resources available in the university community for generating innovative business projects and initiatives.
3	Entrepreneurship parks	This category is represented by parks that are established in public-private partnership model. Their business model is strongly oriented to the promotion of entrepreneurship in every stage of its life cycle, providing a lot of training and support for individuals, scientists and students with new ideas. Management company of STP also offers consulting support to small and medium businesses that at their initial stage aim to accelerate their growth and increase their ability to innovate.
4	Departmentalised research parks	This group integrates in its founding the government and private business. Their focus is on the organisation of research by departments that integrate tangible and intangible resources in one specific area. The departments arise from the need of concentrating actors

		for developing projects that require different types of efforts to be carried out. The group of actors includes scientific institutes, corporations, businesses and government development agencies coming together for common goals.
5	Parks with intensive offer of laboratories and technological support	This category includes parks funded by government agencies with a focus on facilitating research, development and application of new technologies in tenant enterprises. According to its business model the park provides to its residents access to an intensive offer of laboratories with different state-of-art equipment, as well as technological support and specialised technological services offered in R&D centres.
6	Parks with intensive offer of infrastructure	These STPs are formed for providing a distinct atmosphere for technology companies and knowledge institutions. In this case management company puts special attention to the offer of high quality physical infrastructure with a modern urban design complemented with the availability of a set of basic resources needed for the development and daily operation of enterprises.
7	Parks with intensive virtual offer	The key objective of this group of STP is to link and provide value to all participants of innovation activity without having necessarily to be installed in the park. For this reason STP combines two approaches: the virtual and the physical aspect. In this case residents of STP can reach partners and research located in other physical facilities.
8	Ecommunity parks	The parks focus on promoting human development through innovation and technology embedded in a context of openness and scientific and business cooperation. They build an environment that provides through its resources, activities and innovative facilities, welfare and quality of life to all the human talent that works and forms the par

Source: Cuentas et. al.
Science and Technology Parks' Characterization Based on their Business Model, 2013 [7]

One more point of view was represented in a comparative analysis of business models of European science and technology parks conducted by Zielinski, Rogala and Takemura in 2014. Key finding of the research shows the absence of universal business model of functioning of technology parks. The authors analysed the performance of 7 different technology parks in Europe, including the Berlin Adlershof STP in Germany, the Plymouth Science Park in the United Kingdom, the Lahti Science and Business Park in Finland, the Mjardevi Science Park in Poland, etc. and could not formulate a typology of science parks based on their business models. However, the research revealed key success factors and elements increasing attractiveness of parks. The list of success factors consists of 12 elements and includes access to venture capital, an atmosphere of partnership between local administration, business and science, access to enterprise support and specialised pro-innovation services. During diagnostic analysis of aspects that make STPs more competitive, the scientists found out that top-3 rating includes quality of residents, regional differentiation and customer service.

Moreover, Zielinski, Rogala and Takemura were the first scientist who analysed business model of Russian technology parks. One of the seven business models investigated was model of the Technopolis Pulkovo located in southern Saint Petersburg and operated by the Finnish Technopolis Plc – one of the leaders in managing STPs in Europe. According to the research the Technopolis Pulkovo is a perfect example of a business approach which combines setting up a new park and developing the already existing ones. Such business model aims at maximising profit of management company and achieving fast returns.

Methodology

In order to analyse performance of technology parks in Russia and classify business models used by their management companies the research was divided in three stages:

Stage 1. The on-line survey of executives and representatives of management companies of technology parks in Russia. The on-line survey was carried out in September-November 2015 with the support of The Skolkovo Technopark;

Stage 2. The analysis of open information sources, including annual reports and presentations of technology parks, the statements set out on their web sites and other documents generated by administrations. The general purpose of the analysis was to collect data of technology parks, which did not participate in the on-line survey;

Stage 3. In-depth interview with leaders and heads of technology parks aimed to prove or contradict hypothesis revealed after the data analysis.

The questionnaire in online survey was based on CANVAS business models framework and included 50 questions about the functioning of technology parks. The adaptation of CANVAS business model framework to infrastructure facilities is represented in Table 4.

Due to the absence of the official statistics it is impossible to identify the exact number of technology park structures in Russia. The network of technology parks created by The Skolkovo Technopark includes 70 participants. However, only 30 of them can be considered as active participants.

With the support of The Skolkovo Technopark at the first stage of the research 15 responses from technology parks were received. At the second stage of the study the number of investigated technological parks has increased upto 37. It represents 52% of total amount of partners of The Skolkovo Technopark.

Results

Based on the methodology and the collected data seven types of technology parks in Russia were identified according to their business model (Fig. 3).

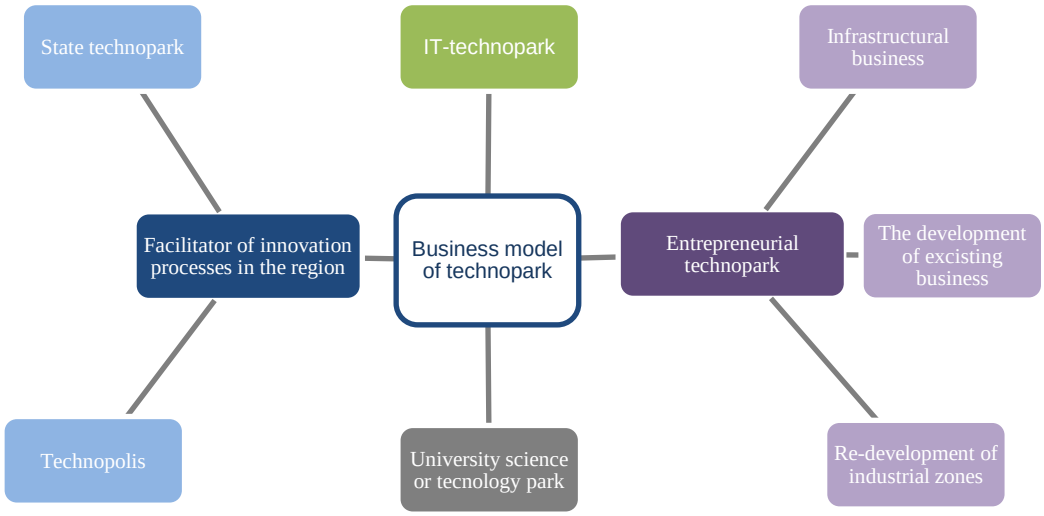


Fig. 2 – Typology of Technology Parks in Russia According to their Business Models

Fig. 3 – Adaptation of CANVAS Business Model Framework to Technology Park Functioning

<table>
<tr>
<td rowspan="2"><u>Key partners</u>
Mechanisms of cooperation with key partners, including:
Federal, regional and municipal authorities;
Business community;
Science and education institutes;
The institutes of development (e.g. ROSNANO, Vnesheconombank, etc.)
Other technology parks.</td>
<td><u>Key activities</u>
Key services provided by management company or third party organisation for residents of technology park.</td>
<td rowspan="2"><u>Value proposition</u>
Key problem of customers which technology park helps to solve</td>
<td><u>Customer relations</u>
Policy provided by management company to each segment of residents, including:
The presence and role of Expert council in the process of accepting new residents;
Requirements to innovativeness of resident’s projects;
Limitation of periods of being a resident of technology parks;
Benefits provided by residents.</td>
<td rowspan="2"><u>Customer segments</u>
The beneficiary of technology park functioning
Portrait of a resident of technopark, including:
The number of residents of technopark in 2013, 2014, 1 half of 2015;
Specialisation of residents;
Distribution of residents according to their size;
Distribution of residents according to the stage of their life cycle;
The number of tenant companies, not engaged in innovation activities.</td>
</tr>
<tr>
<td><u>Key resources</u>
Resources of technology park used for generating value of its residents, including:
Square metres of land plot for technology park;
Square metres of office, production, warehouse and administrative premises of technology park;
Basic infrastructure of technology park
Specialised infrastructure of technology park;
Financial infrastructure of technology park.</td>
<td><u>Channels</u>
Channels to attract new residents used by the management company of technology park.</td>
</tr>
<tr>
<td colspan="3"><u>Cost streams</u>
Maintenance expenses of technology park, including:
The amount of costs in 2013 and 2014;
The expenditure pattern.</td>
<td colspan="3"><u>Revenue streams</u>
Information about the profitability of technology park, including:
The profit of management company of technology park in 2013 and 2014;
Sources of profit;
The rent for the residents of technopark (excluding benefits and incentives) of different types of premises;
The rent of the premises for business incubators and co-working;
The average size of the rental rates for ‘not innovative’ companies;
The pricing mechanism for basic and specialised infrastructure.</td>
</tr>
</table>

Type 1. IT-park

During the process of preparing for the research, this type of business parks was not identified as independent. However, the analysis of functioning of technology parks oriented to IT-projects revealed strong correlation between IT-parks regardless of its property structure, size or location.

This group is represented by the following technology parks: technology park The Navigator Campus in Kazan, high-technology technopark the IT-park in Kazan, high-technology technopark the IT-park in Naberzhnye Chelny, IT-park the FABRIKA in Astrakhan. These technology parks were set up by public and private (50/50) investors aimed to commercialise IT-projects of technology park residents. In this case, business model of these technology parks has strong orientation to residents specialised in IT-sector. However, it should be noticed that IT-sector includes a wide range of technologies: software, robotics, 3D-printing, smart devices, smart house systems, portable electronics, etc.

The majority (60%) of residents belong to micro-companies with annual revenue less than 60 million roubles and number of employees which does not exceed 15 people. Other part of residents (40%) represent small-size companies with annual revenue less than 4,000 million roubles and number of employees less than 100 people. The average amount of no-innovation companies among residents of a technopark is 12%.

Management company provides a wide range of specialised infrastructure to its residents, including hack spaces, co-working zones, data-centres and business incubators. Financial infrastructure of this business model is the most developed comparing with other analysed technoparks. Every analysed IT-park in Russia provides its residents with access to financial resources from its own venture fund or state funding to corporative or private investment/venture fund which management company has strong relations with.

Clear focus of managment company on special needs of IT-companies makes IT-parks especially attractive to start-ups. The average level of occupancy of the premises in these infrastructure facilities overcomes 77%. In this case, management companies do not have necessity to decrease a rent of office premises and they offer prices comparable to the proposals at the real estate market in the territory.

The analysis of revenue streams of IT-parks reveals that management companies use pricing mechanisms for park's premises different from other business models. The size of the rental premises in technopark is formed according to workplaces, rather than square meters. In general, this business model demonstrates the smallest share of lease payments in the income structure. Critics of technopark movement in Russia mostly use this indicator while assignment technopark to business centre. According to this superficial classification IT-parks are in the smallest degree can be attributed to business centres. The share of lease payments in the revenue structure of IT-park the FABRIKA in Astrakhan is 70%, in the Navigator Campus – 40%, in integrated model of high-technology technoparks the IT-park in Kazan and Naberzhnye Chelny this indicator does not exceed 30%.

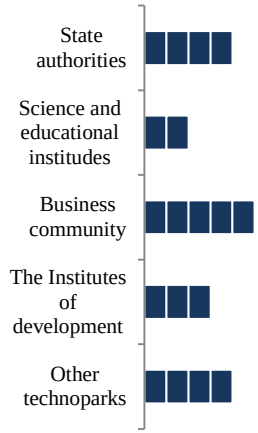
In general, the business model of IT-technology parks in Russia can be characterised as the most satisfying of special needs of innovative companies. The key value formed for the residents is active commercialisation of their projects.

The list of 5 the most distinguishing features of the business model includes:

- developed financial infrastructure: venture fund, close ties with the state and private investment funds;
- wide range of specialised infrastructure: hack spaces, co-working zones, data-centres etc.;
- the share of lease payments in the income structure is less than 50%;
- rent of premises at market rates;
- residents are specialised in 1-2 spheres.

Fig. 4 – Business Model of IT-park in Russia

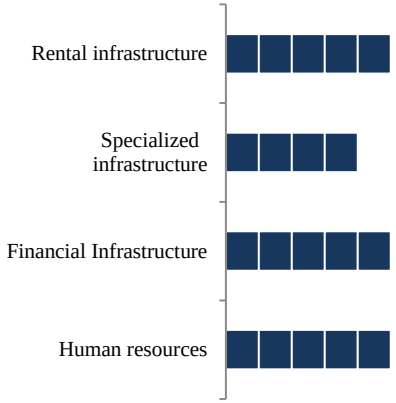
Key partners



Key activities

- Rent of premises;
- Providing specialised services and infrastructure facilities
- Financing of project residents
- Maximum involvement of residents in providing services to other residents

Key resources



- Focus on hack spaces, co-working zones, data-centres and business incubators
- Venture fund, close ties with the state and private investment funds

Value proposition

Commercialisation of IT-project residents

Examples

Technology park The Navigator Campus in Kazan, high-technology technopark the IT-park in Kazan, high-technology technopark the IT-park in Naberzhnye Chelny, IT-park the FABRIKA in Astrakhan

Customer relations

Market level rents
The absence of benefits to residents

Channels

- Exhibitions / Conferences
- Education programmes for start-ups

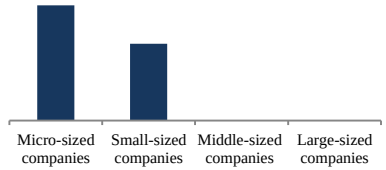
Customer segments

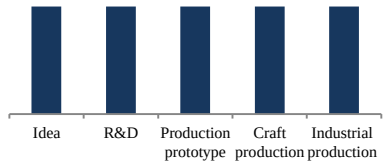
Direct beneficiary

Technology park stakeholders – private investors and regional authorities

Residents

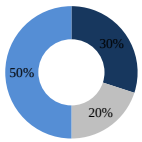
Specialised technology park (1-2)
~ 12% of the residents are not innovative companies



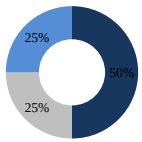


Cost streams

~ 50 % - communal expenses
~ 20 % - wage costs
~ 30 % - other expenses



Revenue streams



- 30-70 % - profit from lease payments
- + % - economically efficient
- Rub/workplace /month - pricing rates
- Prices /club system mechanism for infrastructure facilities

Type 2. University park

Technology parks with this type of business model are founded by a university to facilitate its innovation activity. The business model of University park can be illustrated by performance of the Scientific and Production Association Technopark of Aviation Technologies, Technopark in Moskvorechie (MEPhI), Science Park of Moscow Energy University and the majority of science and technology parks set up by universities. However, it is worth mentioning that performance of the largest university science park – Lomonosov Moscow State University Science Park cannot be attributed to university park business model. The results of the science park achieved during 25 years significantly contrasted with the performance of other university parks.

Classic university park business model in Russia demonstrated the effect of inseparability. The performance of science or technology park is integrated into the activities of university to such an extent that the park cannot exist without it. For example, all premises infrastructure provided by management company is university property. Due to inefficiency of the business model a university in most cases co-finances the costs of the STP.

The residents of university parks in 88% of cases are micro-sized companies developing projects at the beginning stages of life cycle. In most cases university parks belong to generalist and do not establish requirements for a particular specialisation of residents.

The use of the premises of the university allows management companies to set the rent for their premises below the market level. Moreover, the majority of services provided are free for residents. This fact affects the revenue structure of technopark – 99 % of which consist of rental payments.

The infrastructure and services provided in STP can be characterised as less specialised for start-up needs. The majority of management companies confine themselves to letting of premises and provision of a minimum set of consulting services. Often consulting includes preparing an application for a grant or a specialised context.

Therefore, accommodation in this type of technology parks can be rational for companies interested in establishing direct link with the university. For example, for the implementation of joint research projects or attracting young scientists and post-graduate students.

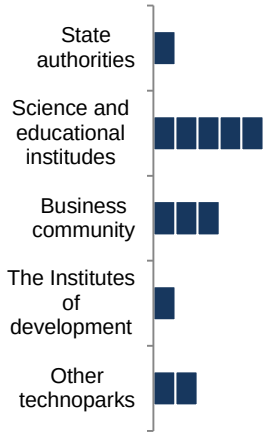
In general, university park business model in Russia can be characterised as less economically efficient and dependent on the founders. The key value formed for direct beneficiary – the university – consists in facilitating innovation and research activity of the university.

The list of 5 the most distinguishing features of the business model includes:

- the effect of inseparability;
- the share of lease payments in the income structure is up to 99%;
- limited list of services and infrastructure provided;
- the majority of services are free for residents;
- co-financing of operating costs of the technopark.

Fig. 5 – Business model of University park in Russia

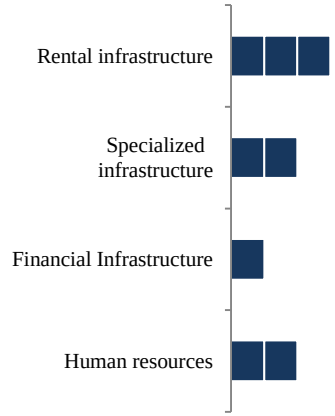
Key partners



Key activities

- Rental of premises;
- Business consulting;
- Rental of equipment and infrastructure of university;
- Packaging projects for grants and tenders

Key resources



The effect of inseparability

Value proposition

Facilitating innovation and research activity of the university

Examples

The Scientific and Production Association Technopark of Aviation Technologies, Technopark in Moskvorechie (MEPhI), Science Park of Moscow Energy University

Customer relations

The rental rates below market level

The majority of infrastructure and services are free for residents

Channels

- Students, post graduate students , young researchers
- Spin-off residents of the TP

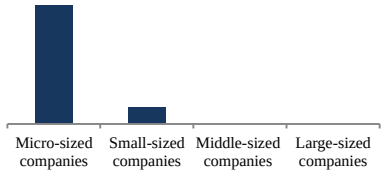
Customer segments

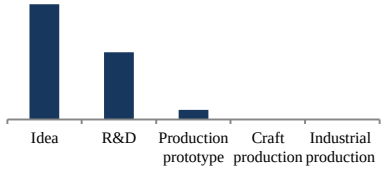
Direct beneficiary

Administration of the University

Residents

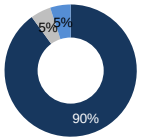
Generalists – wide specialisation



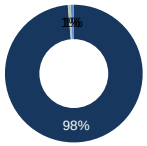


Cost streams

~ 90 % of costs are financed by university



Revenue streams



- ~ 99% - revenues from lease payments
- - % - For the most part are not profitable

Facilitator of innovation processes in a region

The next big group of technology parks represents facilitators of innovation processes in a region. All infrastructure institutes in this category were found to aim to facilitate innovation activity in the region and support its economic development. In spite of one general goal technology parks in this group differ from small technoparks with 687 sq.m of premises and 6 residents (e.g. Independent establishment of the Yamalo-Nenets Autonomous District The Okruzhnoi Technology Park Yamal in Salekhard city) to technopolises with 500,000+ sq.m available premises and with more than 255 residents (e.g technopolis The Himgrad). In this case business model *Facilitator of innovation processes in the region* was divided into two groups – Technopolises and the state technology parks.

Type 3. Facilitator of innovation processes in the region: Technopolis

The business model of technopolises in Russia can be illustrated by the performance of technopolis The Himgrad in Kazan, technopolis The Moscow in Moscow and partly by The Skolkovo Technopark in Moscow according to the results achieved by 1 July and the strategy of further development.

All the analysed technopolises were founded by the state authorities. They aim to facilitate innovation development of the region. The size of investment in the establishment of these facilities exceeded 1.5 billion roubles and will be substantially increased for further development of the technopolises in 2016-2018. The list of investors includes government authorities, the institutes of development, Russian corporations and companies of residents. The rental policy of technopolises proposes the leasing of office space, production and warehouse premises for long term. In these conditions, residents invest in specialised equipment facilities for conducting innovative activities, including clean rooms, laboratories and other manufacturing facilities. Some of these objects remain in the technopolis as 'inseparable improvements' even in the case of disposal of a resident.

This type of innovation infrastructure facilities provides the widest range of both basic and specialised infrastructure for innovative companies. The infrastructure of technopolis includes office and production premises up to 400 sq.m with highly developed engineering infrastructure, logistics centres, data-centres, customs posts, temporary storage warehouses, conference hall, meeting rooms, congress and exhibition centre, business incubator, engineering and co-working centre, clean rooms, centre of scientific equipment and pilot-scale equipment, hack space, centre of prototyping, design and technology bureau, etc.

All Russian technopolises can be attributed to semi-specialised infrastructure facilities operating in 2-5 different spheres. However, the last position in the list of specialisations of projects in which technopolis is interested in is 'Other'. In this case it can be assumed that residents of technopolis can operate in different fields. In general, the majority (60%) of residents belong to middle-sized companies at mature stages of the life cycle of innovation projects. One third (35%) of residents' projects are at 'Industrial production' stage and 30% at 'Craft production' stage. Only 2% of residents operate at the first 'Idea' stage. It is worth noting that technopolis is one of the few business models in which a list of the residents includes foreign companies or their subsidiaries. High-tech projects in technopolis are the least risky for foreign investors in comparison to other objects of innovation infrastructure.

The confidence of foreign investors can be partly explained by favorable terms of the policy pursued by management companies. The residents of Russian technopolises receive significant package of benefits including the rental rates below market level, tax benefits, the possibility of concluding a lease agreement for up to 10 years, etc.

In general, the business model of technopolis in Russia can be characterised as the most capital-intensive in terms of creation and the most stable for medium and large companies at the

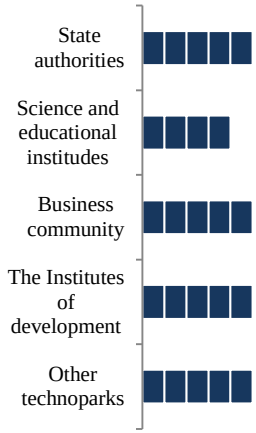
production stages of their project life cycle. Technopolis business model generates two types of value for its beneficiaries: for regional authorities – enhancing the innovative activity in the region, and for its residents providing the most favorable conditions for the development of projects.

The list of 5 the most distinguishing features of the business model includes:

- the highest capital intensity while creating the object of innovative infrastructure;
- semi-specialised type of innovation infrastructure;
- the most wide range of infrastructure and services for innovative companies;
- residents - medium and large companies, including foreign enterprises;
- strong ties with all types of partners, including the state authorities, science and education institutes, business community, the institutes of development and other technoparks.

Fig. 6 – Business Model of Technopolis in Russia

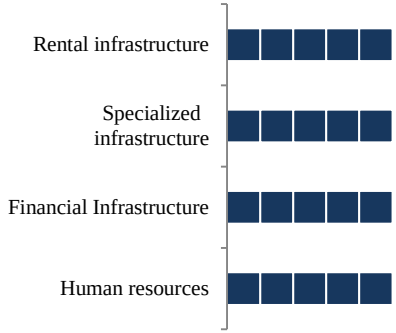
Key partners



Key activities

- The widest list of services and infrastructure provided including logistics centre, data-centre, customs posts, temporary storage warehouse, etc.
- Active involvement of residents in the provision of services to other companies

Key resources



Value proposition

For regional authorities: facilitating the innovative activity in the region,

For residents: providing the most favorable conditions for the development of projects.

Examples

Technopolis The Himgrad in Kazan, technopolis The Moscow in Moscow and The Skolkovo Technopark in Moscow (partly)

Customer relations

- The rental rates are below market level
- Lease benefits for small innovative companies within 3 years
- Tax benefits
- The signing of the lease agreement for up to 10 years
- Investments of residents in equipping production facilities of technopolis (inseparable improvements)

Channels

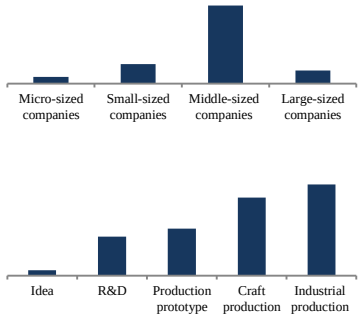
- Exhibitions, competitions and educational programmes for start-ups
- Specialised events at universities
- Active advertising campaign

Customer segments

Direct beneficiary
Regional and state authorities, middle-sized and large resident-companies

Residents

- Semi-specialised (4-6 basic specialties + 'other')
- Anchor residents
- Foreign companies resident
- Focus on medium-sized enterprises



Cost streams

Significant expenses for the development of technopolis

Revenue streams

- Rub. / m2 / month – pricing rental rates mechanism
- Rub. / workplace / month – rent mechanism for co-working or business incubator premises
- Low profitability of services – much of the infrastructure is free of charge

Type 4. Facilitator of innovation processes in a region: the state technology park

The next type of technology parks classified by business model is represented by the largest number of participants. The second wave of the technology park establishment in Russia was triggered by the adoption of a number of federal laws in the area of innovations in 2006-2008. Due to the Strategy of Innovative Development of the Russian Federation, the Programme of the Development of Technology parks in the Area of High Technologies and other legislative acts in 2006 Russian regional authorities started to establish technology parks. Unfortunately due to the absence of understanding of the basic principles of the establishment of the innovation infrastructure facilities and errors made at the stage of their organisation design a large number of regional technoparks do not meet the requirements applied to objects of innovation infrastructure.

Direct analysis of this type of business model reveals that all technoparks were founded by regional authorities with substantial budget investments. The general aim of their establishment was the same as in technopolis business model – facilitation of innovation activity in the region. Compared to the previous model the state technology parks have a much smaller size of land plot and premises and a less developed infrastructure. The average size of land plot is 1.9 hectare, the average area of buildings ranges from 12.000 to 22.000 sq.m.

The majority (88%) of residents belong to micro-sized companies. At the same time it is worth noting that residents are distributed fairly evenly across the stages of life cycle of their projects.

Budget funding of these facilities allows the management company to set the rental rates below the market level. Moreover, management company provides lease benefits for small innovative companies within 3 years. However, state technology park business model is the only one which in some regions limits the term of the resident's staying in technopark.

The analysis of income structure of technoparks with this model shows that the share of lease payments is 70%, and in some objects this indicator reaches 94%. This statistics can be partly explained by the fact that most of the services and infrastructure provided by the management company is free to the residents. Most of these technoparks are at a minimum level of economic efficiency or unprofitable. In the last case, the management company of technology park covers its operating costs from state budget financing.

Nevertheless, some state technology parks, for example technopark The Storgino or high-technologies technopark The Ugra, demonstrate fairly stable performance indicators, as well as positive dynamics of the development. In this case, state technology park business model needs a deeper study and analysis and potential division into two sub-categories: self-subsidising technoparks and regionally funded technology parks.

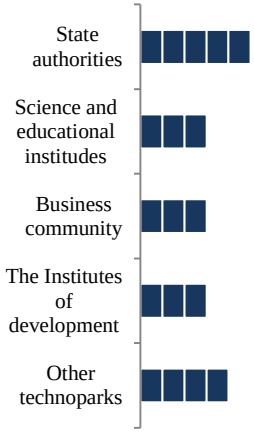
At this stage of the research it should be concluded that state technopark business model occupies a middle position in a comparative analysis of commercial attractiveness to start-ups and economic efficiency of technology parks in Russia. The key value formed for direct beneficiary – the regional administration, consists in facilitating innovation activity of the region.

The list of 5 the most distinguishing features of the business model includes:

- focus on micro-sized companies;
- residents nave more than 6 specializations;
- fairly evenly distribution of residents across the stages of the life cycle of their projects;
- low economic efficiency;
- a high proportion of lease payments in the income structure.

Fig. 7 – Business Model of State Technology Park in Russia

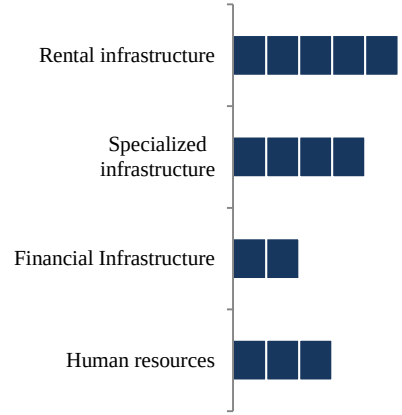
Key partners



Key activities

- Rental of premises;
- Consulting;
- Hosting the events;
- Most of services are provided by the management company forces (not by service companies or residents)

Key resources



Value proposition

Facilitating innovation activity of the region

Examples

Technopark The Strogino in Moscow, technopark The Zhigulevskaya Dolina in Toliatti, The West-Siberian Innovation Centre in Tumen, technopark The Mordovia in Saransk, The Kuzbass Technopark in Novokuznetsk, technopark The Rameev in Penza

Customer relations

- The rental rates are below the market level
- Lease benefits for small innovative companies within 3 years
- Tax benefits
- Limit of term of the resident's staying in technopark (in some cases up to 3 years)

Channels

- Encouraging residents of the business incubator;
- Special events at universities;
- Advertising campaign

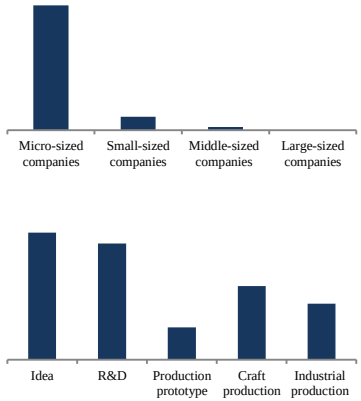
Customer segments

Direct beneficiary

Regional authorities

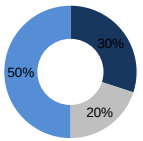
Residents

- Generalists (up to 6 areas of innovation)

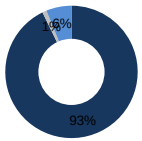


Cost streams

The higher the proportion of wage costs compared to other models



Revenue streams



- State co-financing
- 70-94% - profit from lease payments
- Rub. / m2 / month – pricing rates
- Infrastructure and services for the most part are free of charge

The last big group of technology parks in Russia categorised by the business model is represented by infrastructure facilities founded by or with participation of private capital for commercial purposes. A difference in their KPIs allowed identifying three subcategories of this model.

Type 5. Entrepreneurial technopark: Re-development of industrial zones

Re-development of industrial zones model started to gain widespread popularity in Moscow in 2013-2014, after the adoption of a number of government measures on stimulation of the development of innovation infrastructure facilities [32,34]. After assigning the appropriate status a technopark management company is entitled to a number of benefits and privileges for itself and its residents. Many industrial enterprises in Moscow take this opportunity to re-equip manufacturing premises of closed factories to technoparks.

Their business model is based on providing access to office and production premises with developed engineering infrastructure to companies interested in developing business in Moscow. Due to the fact that all of these technoparks are at the beginning stage of their development and have not completed the investment stage, all of them do not meet requirements applied to objects of innovation infrastructure. Moreover, by December 2015 some of these technoparks are 100% business centres. As a result up to 98% of profit comes from rent payments. The list of services provided by the management company is limited to consulting and basic rental services - provision of parking, catering, etc.

Business plans of technology parks with this business model presented to the regional authorities are targeted at creation of technology parks focused on residents at production stage of life cycle operating in 3-6 fields.

In order to support these projects, it is worth noting that at the moment the largest object of industrial innovation infrastructure in Moscow has developed from an industrial zone of Automobile Plant of Lenin Komsomol (the AZLK) into Technopolis Moscow.

In general, according to the results achieved the business model of technoparks established as re-development of industrial zones hardly meets the requirements applied to objects of innovation infrastructure.

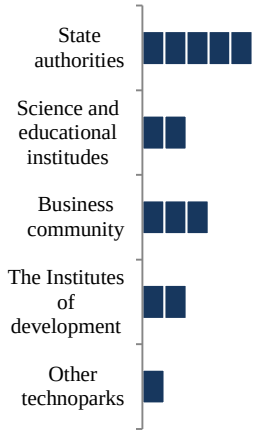
The key value formed for owners of industrial zones is the improvement of commercial attractiveness of the real estate industry.

The list of 5 the most distinguishing features of the business model includes:

- the initial stage of the development of technology park;
- good power and water supply;
- up to 100% of revenue is formed by rent payments;
- focus on middle-sized companies at production stages;
- low commercial attractiveness for high-tech companies.

Fig. 8 – Business model of Entrepreneurial technopark: Re-development of industrial zones

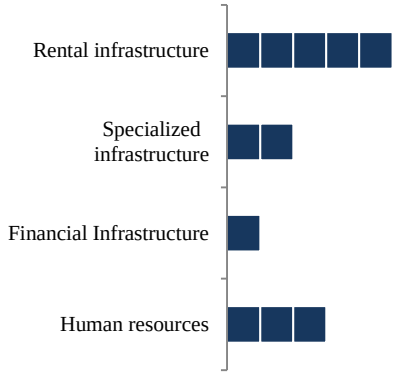
Key partners



Key activities

- Rent of premises;
- Consulting.

Key resources



- High power-supply capacity of the buildings, access to water-supply, water-disposal and other public utilities

Value proposition

The improvement of the commercial attractiveness of the real estate complex.

Examples

Technopark "VIZBAS"
Technopark "Elma"
Technopark "Calibr" (Moscow) etc.

Customer relations

- Market level rents
- Tax benifits (in Moscow)

Channels

- Open days;
- Exhibitions, competitions and educational programs for start-ups;
- Active advertising campaign.

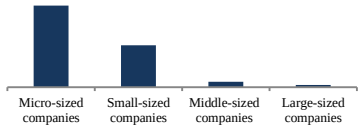
Customer segments

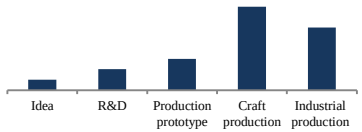
Direct beneficiary

The owners of the real estate complex

Residents

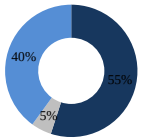
- Semi-specialized (3-5 basic specialties)
- High proportion of not innovative companies in the structure of residents
- Anchor residents
- Growing proportion of residents in the production life cycle



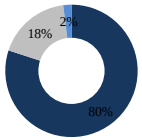


Cost streams

The high proportion of utility costs and other expenses



Revenue streams



- Rub. / M2 / month - pricing rental rates mechanizm
- ~ 80% - profit from lease payments
- ~ 18% - profit from providing the rental infrastructure and services - parking, catering, communal services

Type 6. Entrepreneurial technopark: The development of existing business

The key difference of the business model 'Entrepreneurial technopark: The development of existing business' from the previous one is that this type of technology park is organised by private investors on the basis of existing industrial enterprise. The general purpose of technopark establishment is a developing of existing business. This development can be achieved in two ways: by increasing the use of available office or production premises and by implementation of joint innovation projects with resident companies. The following technology parks can illustrate this model: technopark The Safir, technopark The Ricor, technopark The Kosmos-Neft-Gas or technopark The Varyag.

The Sapfir technology park was established on the basis of the existing defence research and production company The Sapfir specialising on the manufacture of radiation-resistant microelectronics devices and chips. In the conditions of reduced profitability from the core activities due to the growing competition PAO The NPP Sapfir management made a decision to establish an innovation infrastructure facility which will enable improvement of the utilisation efficiency of existing production and office premises.

The technology park was established in 2015 by Russian technological holding group The Rikor. It includes an R&D centre in Moscow and its own production facilities in Nizhniy Novgorod region. However, it is worth mentioning that apart from the improving utilisation efficiency of the available premises, the project initiators set the target to develop the existing business in the area of electronics, IT and digital media, also with the help of joint projects with the residents. Currently the technology park residents are the holding group subsidiary companies – The Rikor IMT, The Rikor IT and The Rikor Robotics. However, the technology park development strategy provides for attraction of as many as 40 residents by 2024. For their deployment the construction of The Rikor Research and Technological Hi-Tech City with the total area of 40,000 sq.m is planned.

In general, this business model is focused on small- and middle-sized companies operating in the same sphere as the head enterprise. However, the technology parks set up to increase the use of available business premises are less demanding in this respect.

The management company offers market level rents of office and production premises to the residents. However, Moscow parks provide a range of additional tax incentives to their tenants. In some cases, the technology park is a subdivision of the parent company and all of its income and expenses are accounted in gross figures of the head company.

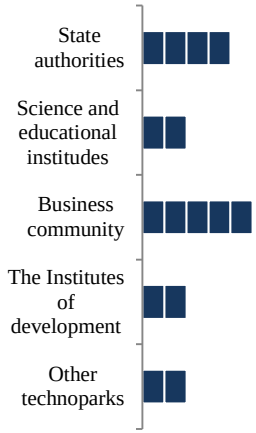
The key value formed for owners of a *parent company* is the development of an *existing business.*

The list of 5 the most distinguishing features of the business model includes:

- High power-supply capacity of the buildings, access to water supply, water-disposal and other public utilities;
- Market level rents;
- Attracting residents with a focus close to the specialisation of the parent company;
- Focus on increasing the use of available office or production premises;
- Potential of implementation of joint innovation projects with resident companies.

Fig. 9 – Business model of Entrepreneurial technopark: the development of existing business

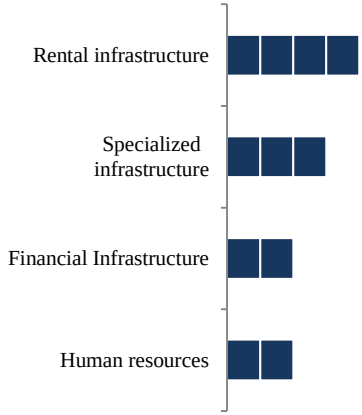
Key partners



Key activities

- Rental of premises;
- Consulting;
- Rental equipment of operating enterprise

Key resources



- High power-supply capacity of the buildings, access to water-supply, water-disposal and other public utilities
- Equipment of operating enterprise

Value proposition

The development of existing business of head company

Examples

Technopark "Sapfir", Technopark "Ricord", Technopark "Kosmos-Neft-Gaz", Technopark "Varyag" (Moscow)

Customer relations

- Market level rents
- Tax benifits (in Moscow)

Channels

- Conversion of existing lessees to residents of technopark
- Attractiveness of spin-off companies of residents

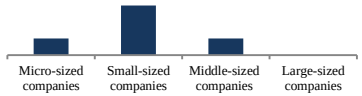
Customer segments

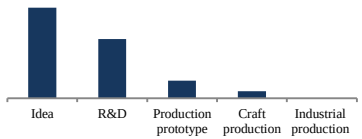
Direct beneficiary

The private owners of the real estate complex

Residents

- Semi-specialized (3-5 basic specialties)
- Specialization of residents conforms to specialization of head company
- High proportion of not innovative companies in the structure of residents
- Subsidiaries are residents of technology park

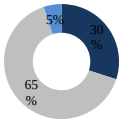




Cost streams

<20% of the cost amount belong to the costs of the Technopark. Other expenses are expenses of the parent company

Revenue streams



- Rub. / M2 / month - pricing rental rates mechanizm
- <30% - profit from lease payments
- > 65% - profit from core busines

Type 7. Entrepreneurial technopark: Infrastructural business

This group of technology parks was established in Russia primary by government with the support of institutes of development (The ROSNANO, The JSC, The Vnesheconombank public corporation, etc.). The stakeholders define this business model as research, development and application of new technologies oriented.

Government co-financing allowed the management company to set rents below the market level, as well as provide benefits to special groups of residents. For example, technology park The Idea in Kazan 60%/40% discount on rent for micro- and small-sized innovation companies during the first and the second years of their residency.

Substantial investments in the establishment of technology parks allowed to create the profile infrastructure for high-tech start-ups, including laboratories, engineering centres, centres of collective use of equipment, etc. In this case, the management company provides a wide range of specialised services to residents including business development consulting, financial modeling, staff recruiting, accounting and law consulting, marketing services, education services, patenting services, fund-raising, etc.

The majority of residents belong to micro- (44%) and small-sized (46%) companies. However, in spite of the small size the residents of this type of technology park implement projects at developed stages of life cycle (Prototype production and Craft production). It is worth noting that the technology park also has anchor residents represented by large companies. In general, technoparks with this business model are generalists and attract residents without strict requirements to the field of activity.

Less than 70% of profit in this business model is formed by rent payments. Technology parks belonging to this group demonstrate positive economic efficiency and stable commercial attractiveness. The average level of occupancy of premises in the technology parks of this type is up to 90%.

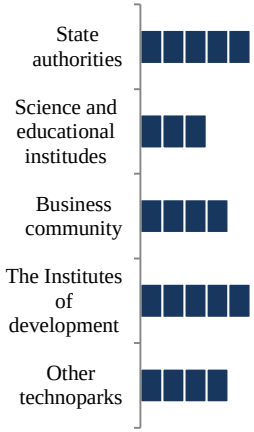
In general, the business model of 'Entrepreneurial technopark: Infrastructural business' in Russia can be characterised as economically efficient and attractive to high-tech start-ups. This group of technoparks generates three types of value: for regional authorities – facilitating the innovative activity in the region, for institutes of development participated in a park establishment the technopark facilitate research, development and application of essential technologies and for start-ups – providing a good opportunity to commercialise their projects.

The list of 5 the most distinguishing features of the business model includes:

- Intensive offer of laboratories and technological support;
- Focus on residents at production stages of life cycle;
- Strong ties with all participants of innovation sector of Russian economy;
- Providing rents below the market level, as well as benefits to special groups of residents;
- Economic efficiency and commercial attractiveness to start-ups.

Fig. 10 – Business model of Entrepreneurial technopark: the infrastructure business

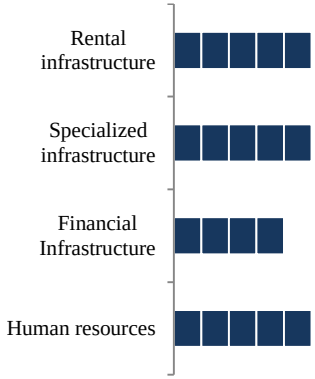
Key partners



Key activities

- Rental of premises;
- A wide range of of specialized infrastructure and services
- A wide range of additional infrastructure: hotels, gyms etc.

Key resources



- Office premises are less that 60%
- ~5% are science and research premises

Value proposition

For regional authorities – facilitating the innovative activity in the region,

For institutes of development – facilitating research, development and the application of essential technologies and

For start-ups providing a good opportunity to commercialize their projects

Examples

Technopark "Idea" (Kazan), Technopark "Sarov", (Sarov), Technopark of Novosibirsk Academpark (Novosibirsk)

Customer relations

- The rental rates are below market level
- The lease benifits for small innovative companies within 3 years
- The occupancy of the premises is more than 90%

Channels

- Conversion of existing lessees to residents of technopark;
- Attractiveness of spin-off companies of residents;
- Exhibitions, competitions and educational programs for start-ups;
- Specialized events in universities;
- Active advertising campaign.

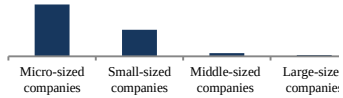
Customer segments

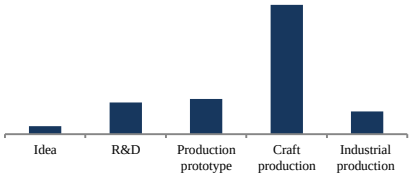
Direct beneficiary

The regional authorities, the institutes of development, residents

Residents

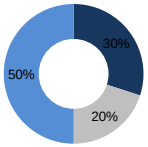
- Generalists (5+ fields of specialization)
- ~ 5% of residents / tenants are not innovative companies
- Remote residents
- Anchor residents



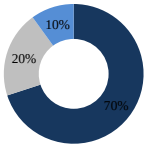


Cost streams

- ~ 30% - utilities
- ~ 7% - wage costs
- The high proportion of other expenses



Revenue streams



- Rub. / M2 / month - pricing rental rates mechanizm
- <70% - profit from lease payments
- Positive economic efficiency
- Infrastructure and services in the most cases are free of charge
- The high proportion of other income

Conclusion

Technopark movement in Russia was subjected to considerable criticism from both the academic community and practitioners. Most critics drawn parallels between technology parks and business centres and refer to low key performance indicators of the national innovation infrastructure. The results obtained in the research dispel the myth of the total inefficiency of Russian technoparks. The analysis of functioning of 35 technology parks reveals 7 types of business models used by management company of technoparks.

The university park business model can be considered the least profitable. However, the model facilitates innovation and research activity at the university and involves talented students and young scientists in generating new business.

The research revealed 3 business models with the average level of economic efficiency and low commercial attractiveness to high-tech start-ups: 'Facilitator of innovation processes in the region: the state technology park', 'Entrepreneurial Technopark: redevelopment of industrial zones', 'Entrepreneurial Technopark: redevelopment of industrial zones' and 'Entrepreneurial Technopark: The development of existing business'. Some representatives of these business models do not meet all requirements applied to objects of innovation infrastructure. Anyway, management companies of the technology parks form value for different types of beneficiaries. In particular, improvement of commercial attractiveness of the real estate complex, development of existing business and even facilitating of innovation activity of the region.

The most attractive to high-tech companies and, as a result, profitable are companies applying the business models of 'IT-park', 'Technopolis' or 'Entrepreneurial Technopark: Infrastructural business'. All infrastructure facilities with these business models significantly enhance the innovative activity in the region and provide the most favourable conditions to their residents.

By applying CANVAS framework developed by Alex Osterwalder and Yves Pigneur the research contributes to diversity analysis and studies of technology park business models in Russia. The typology sketched in the research correlates with the results obtained by a group of scientists from the University of Magdalena and Industrial University of Santander, Columbia.

However, the research 'Business-models of Russian technology parks' identifies technology park business models in the most accurate way. All previous research in this field has been carried out on the basis of secondary information available through the web.

The author's research is the first attempt to identify business models using the data collected from management teams of technology parks. An online survey, conducted with the support of The Skolkovo, allowed collecting data about customer segments, value proposition, distribution channels, customer relationships, profit streams, key resources, activities and partnerships.

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