

Development of an entrepreneurship culture in a research focus university



Top 10 institutions worldwide by co-authored publications



CDIO Seminar
Chalmers University
Oct 17 October 2019



We foster elite in science and technology that Russia and the world need

- Completely new
- Funded by Skolkovo Foundation
- English Language, International Faculty and Students
- By 2022: 200 Professors, 1200 Students

- Founding partner: M.I.T.

- **Main Task:**
New Generation of Innovators



Skoltech's Phases of Development

Today



1. Strategic relationship as defined by having: extensive exchange, joint R&D investment & laboratories, global industrial partners, gateway to other institutions
 Source: Skoltech, GCA

Campus development



- ✓ Building completed : 140 000 m²
- ✓ Offices and classrooms have been transferred
- ✓ Student cohort space and library being delivered
- ✓ Started to move research and teaching laboratories
- ✓ Expected completion by 2021 for all laboratories



Skoltech as a part of innovation ecosystem of Skolkovo

SKOLTECH

AMALTEA



RESIDENTIAL FACILITIES



SBERBANK R&D CENTER



FAMILY CAMPUS
(Pre-school and school)



BOEING



SKOLKOVO TECHNOPARK

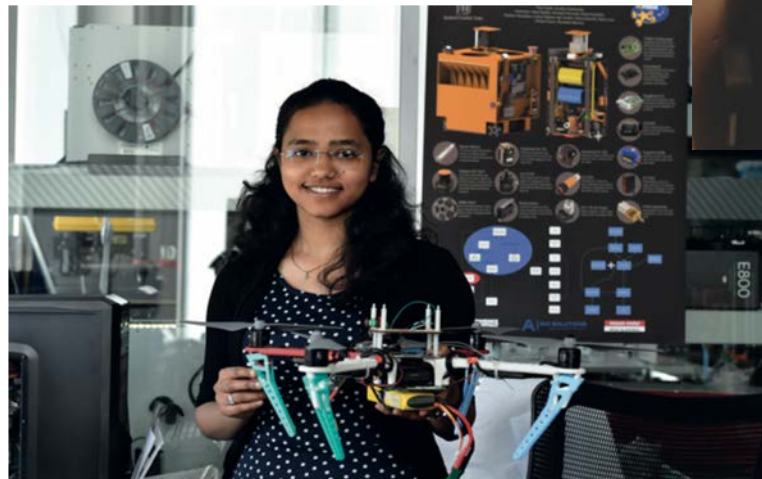


RENOVA LAB



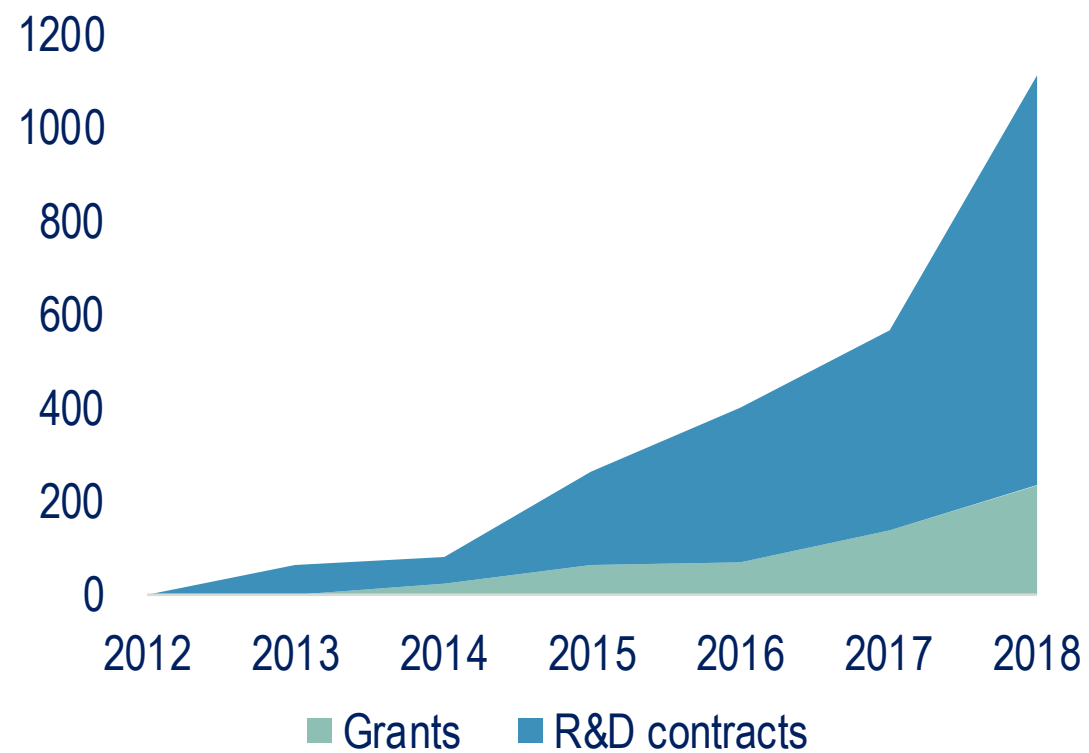
Research Facilities - in-house

- Electrochemical Energy Storage Lab
- IT for Advanced Manufacturing Lab
- Concurrent Engineering Design Lab
- Hybrid Photonics Lab
- Hydrocarbon Recovery Lab
- Intelligent Space Robotics Lab
- Mass Spectrometry Lab
- Energy Systems Lab
- Nanomaterials Lab



Skoltech Sponsored Projects

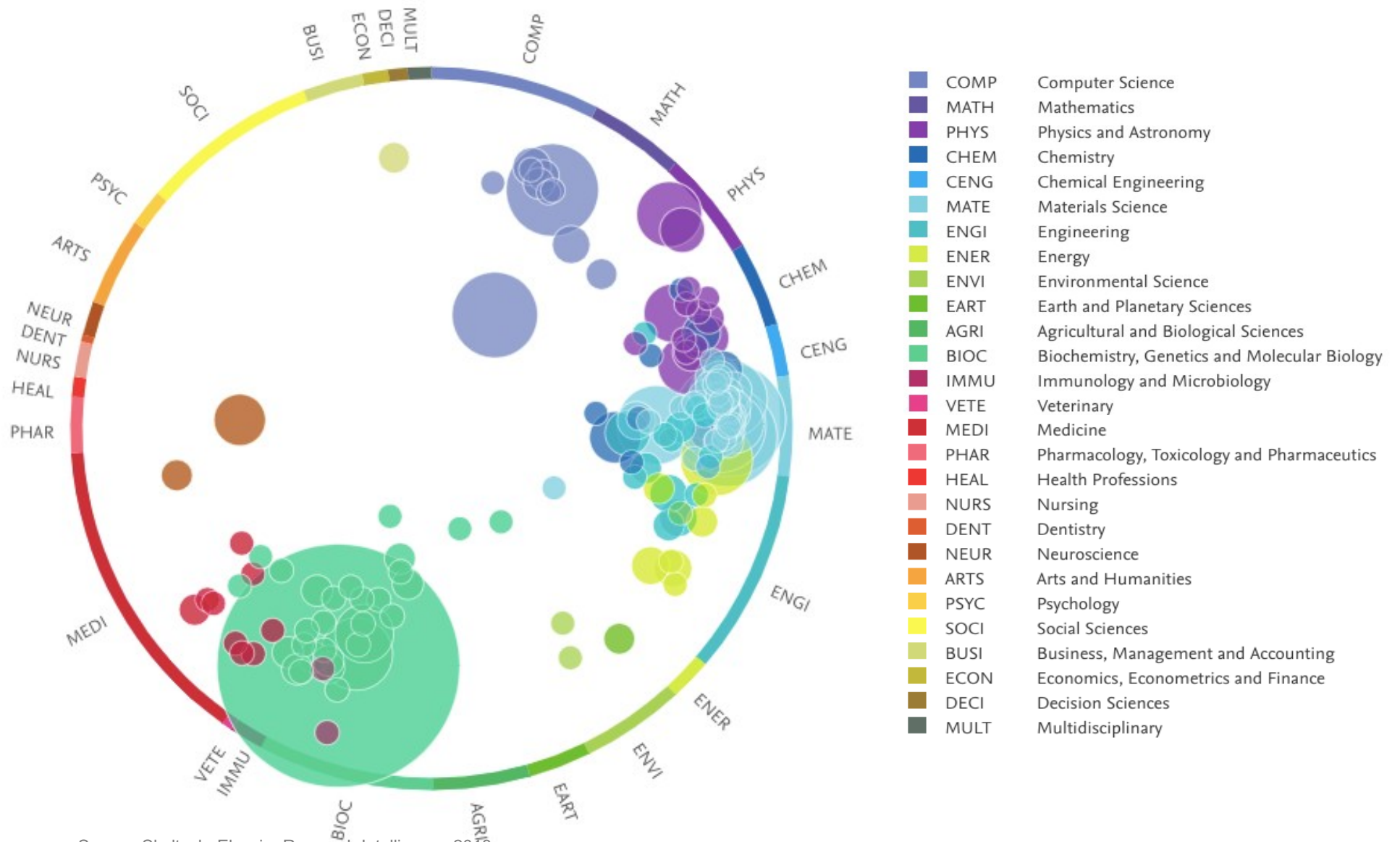
Annual funding, mln Rub



Industrial Partners

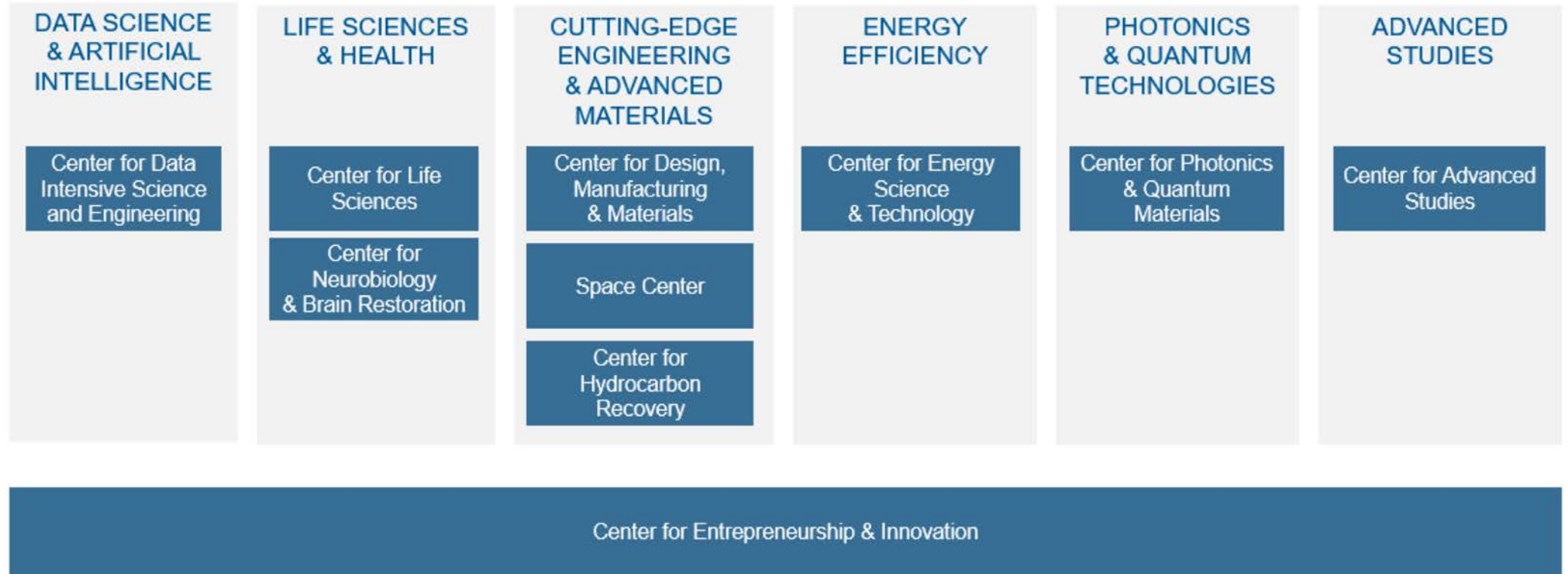


Research Prominence by Topic



Source: Skoltech, Elsevier Research Intelligence 2018

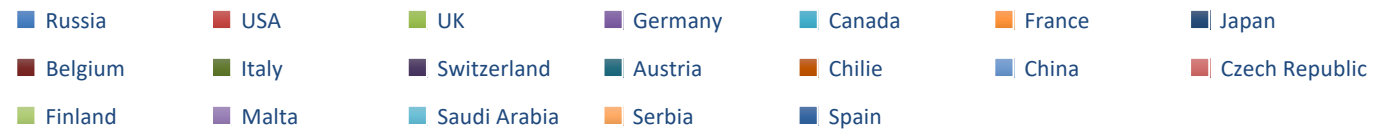
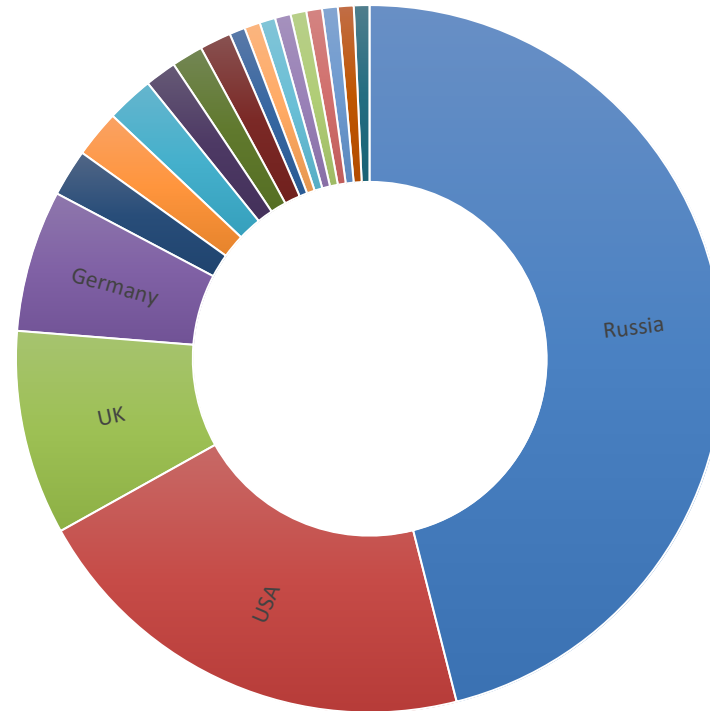
Domains and centers



Faculty

140 faculty members

Faculty hired from



October 2019

CEI

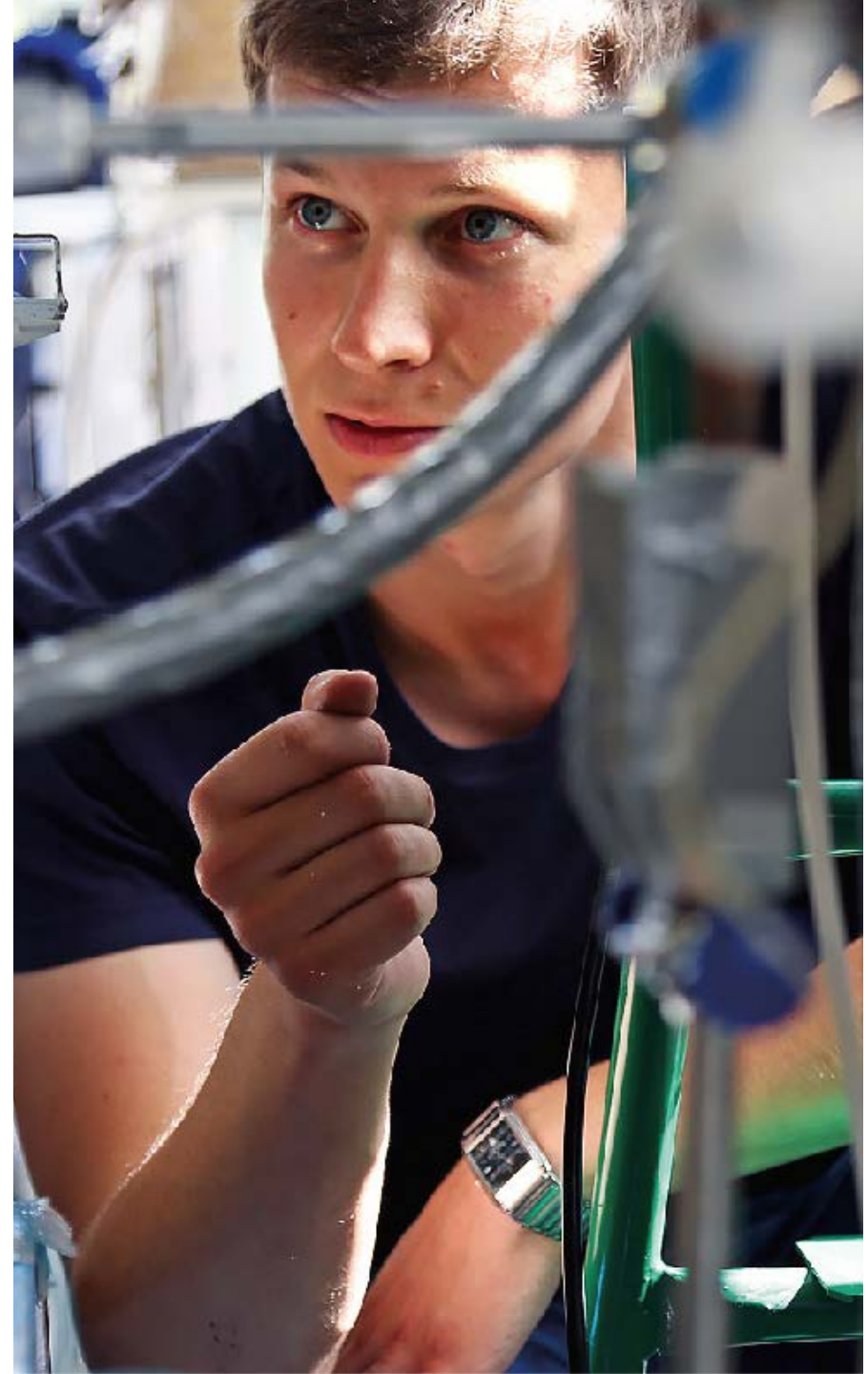
Center for Entrepreneurship and Innovation

What is CEI?

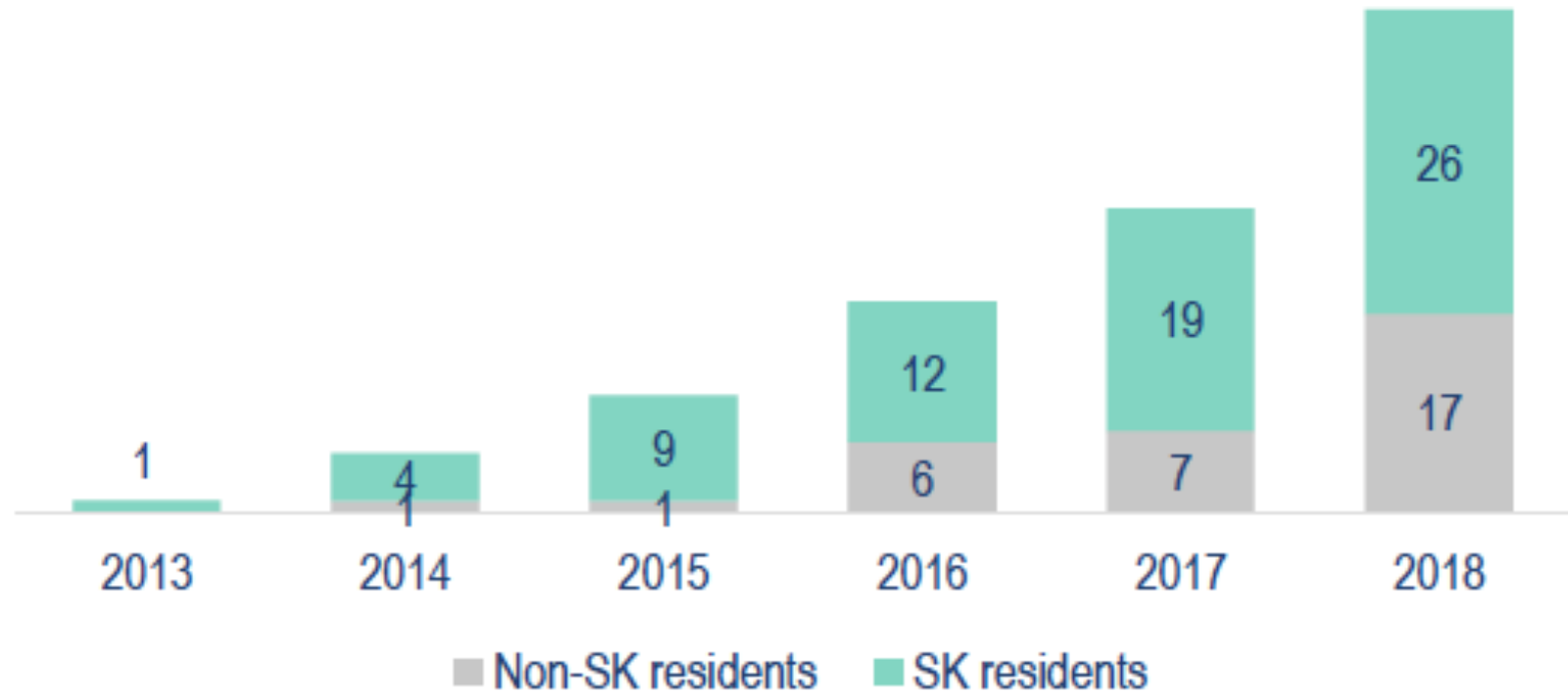
- Skoltech founded the Center for Entrepreneurship and Innovation (CEI) in order to instill a culture of innovation and entrepreneurship in its educational and scientific activities
- The goal of CEI is to commercialize science and technology developed by Skoltech's faculty, students and partners

CEI FUNCTIONS:

- Conduct cutting-edge research on Entrepreneurship and Innovation (E&I)
- Education: in E&I course offerings
- Innovation assistance
- Mentoring and catalyst programs
- E&I workshops and events
- Knowledge transfer office
- Skoltech Translational Research Innovation Program



Skoltech enterprises cumulative



Education – At a Glance

1000 students

600 MSc

400 PhD

Gender Ratio

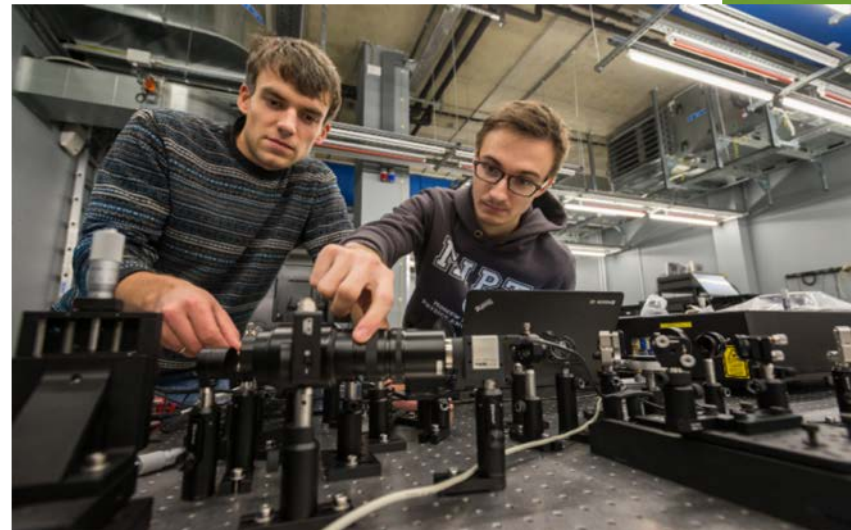
68% Male

32% Female

16% International Students

140 Faculty

200+ Courses



GLOBALY COMPETITIVE

Programs content

- blend of fundamental, innovation & business-oriented elements, soft skills training

International accreditation

- PhD Life Sciences (European Association for Quality Assurance in Higher Education) in 2019
- other PhD programs by 2021

INTERNATIONAL EXPERIENCE

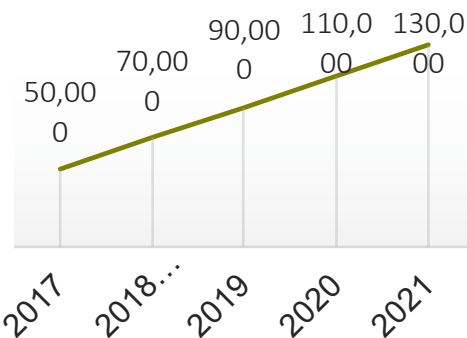
Academic mobility

- intense academic mobility to leading international universities

Multicultural environment

- 20% of international students
- rich student life, networking opportunities

LEARNING COMMONS



Full-text documents' downloads from library databases

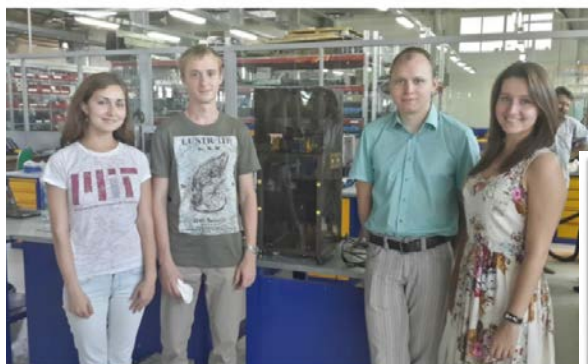
DIGITAL RESOURCES & TOOLS

- expansion of e-library and virtual resources, access to scientific databases
- professional software
- online course catalogue, LMS, SIS

Skoltech Industrial Immersion

The program is aimed at solving technical problems in the company by Skoltech graduate students for two months. A group of students works under the supervision of a professor, postdoctoral student or graduate student of Skoltech, functioning as external technical consulting, solving the specific problem of the company.

- Group projects of 3-8 students
- Duration of the project 2 months (June, July)



Industrial Immersion 2019

8

Tracks

137

Companies

48

Group projects

315

Students

226

Projects

21,2%

Share of group projects

93% in Russia,
7% all over the
Globe



International Experience

411 students in 2018 in **34 countries** at over **80 host universities**



Sergey Shmakov (Skoltech PhD 2017)
National Institutes of Health (NIH,
Bethesda, USA) Director's award 2016
for CRISPR-Cas research



Deutsches Zentrum
für Luft- und Raumfahrt
German Aerospace Center



Learning Outcomes based on CDIO syllabus

- 1. Disciplinary Knowledge and Reasoning
 - Mathematics and science
 - Applied science and engineering
 - Innovation and entrepreneurship
 - Interdisciplinary thinking
 - Contemporary methods and tools
- 2. Thinking Beliefs and Values
 - Cognition and modes of reasoning
 - Attitudes and learning
 - Ethics, equity and other responsibilities
- 3. Relating to others: communications and collaboration
 - Communications and working in international settings
 - Teamwork
 - Collaboration and change
- 4. Leading the Innovation Process
 - Making sense of the global, societal, environmental and business context
 - Visioning – inventing new technologies
 - Visioning – conceiving and designing
 - Delivering on the vision – implementing and operating
 - Delivering on the vision – entrepreneurship and enterprise

Engineering/Science +
Leadership + Innovation

Educational Programs Portfolio

Target Domains	MSc programs	PhD programs
Life Sciences and Biomedicine	Biotechnology	Life Sciences
Data Science and AI	Data Science	Computational and Data Science and Engineering
	Computational Science and Engineering	
Cutting-edge Engineering and Advanced Materials	Space and Engineering Systems	Engineering Systems
	Advanced and Digital Engineering Technologies	
Energy Efficiency	Petroleum Engineering	Petroleum Engineering
	Energy Systems	
	Materials Science	Materials Science and Engineering
Quantum Technologies	Photonics and Quantum Materials	Physics
Advanced Studies	Mathematical and Theoretical Physics	Mathematics and Mechanics



Masters Program

- Innovation workshop for all – one month at the beginning
- 6 credits – other Innovation course
- 50% courses – 50% research or innovation project
- Early research or innovation experience – 6 credits
- Industrial immersion – 2 months – June-July after 1st year
- International mobility
- Individual study period – ISP - January



PhD Program

- 4 + 1 years
- 2 technical courses (12 credits) – highly flexible
- Philosophy – 6 credits
- Pedagogy – 3 credits + 3 credits TA
- Entrepreneurship and Innovation – 6 credits
- Research methodology – 3 credits
- Possible to have a start-up and complete a PhD degree at the same time - experimental



Skoltech Innovation Workshop Project Fair @ SkT·IND

Skoltech

Dmitry Kulish, Professor, Director of the IW



Innovation Workshop

- Start from a guess (hunch)
- Manage random cross-disciplinary team
- Build the tangible prototype
 - Parts
 - Tangible (things)
 - Non tangible (Excel and documents)
 - People
 - Team
 - Mentors
 - End users
 - Suppliers
- Obtain feedback from your end user
- Produce the next hunch
- Iterate



Innovation Workshop at MIT

Over 62 people from 15 MIT labs and departments contributed to the delivery of the workshop

- Intensive month-long program for Skoltech students
- Develop an experiential learning curriculum
 - Hands-on, team-oriented activities
 - Fuses multiple MIT approaches to innovation
 - Reconciles technology & vehicles (company, startup, paper, grants, ...)
- Empower students and develop the student culture of Skoltech
 - Intensity, curiosity and adventure, centers on innovation, founded on firm disciplinary fundamentals
- Refine a *Mens et Manus* (Hand and Mind) approach to innovation



Teaching Innovation

➤ THEORY

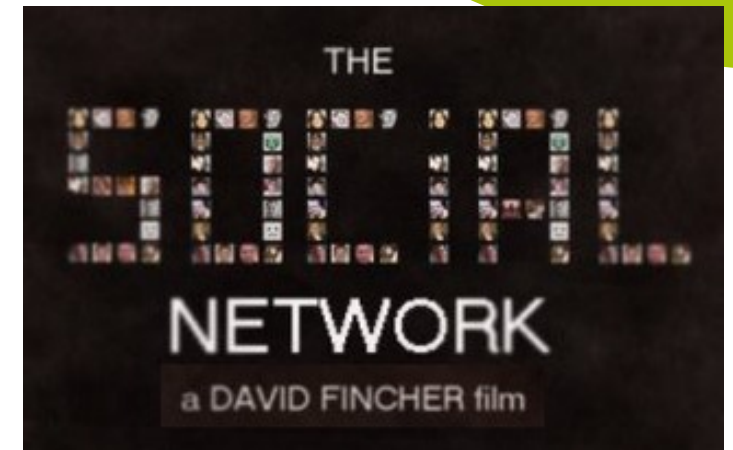
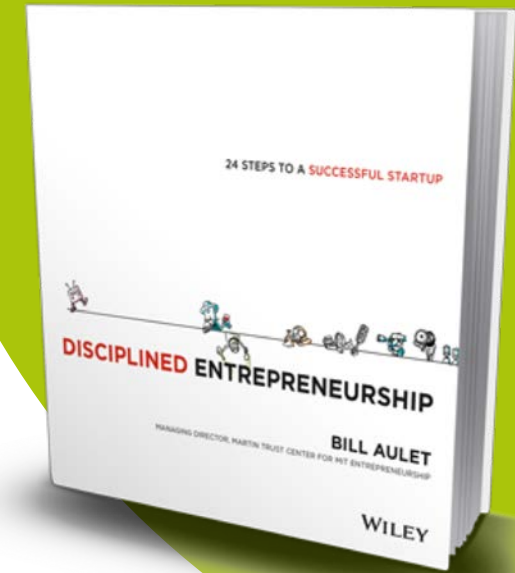
- Cookie cutter step-by-step manuals
 - Distract students from starting by overloading the end and flooding action in theory

➤ MINDSET

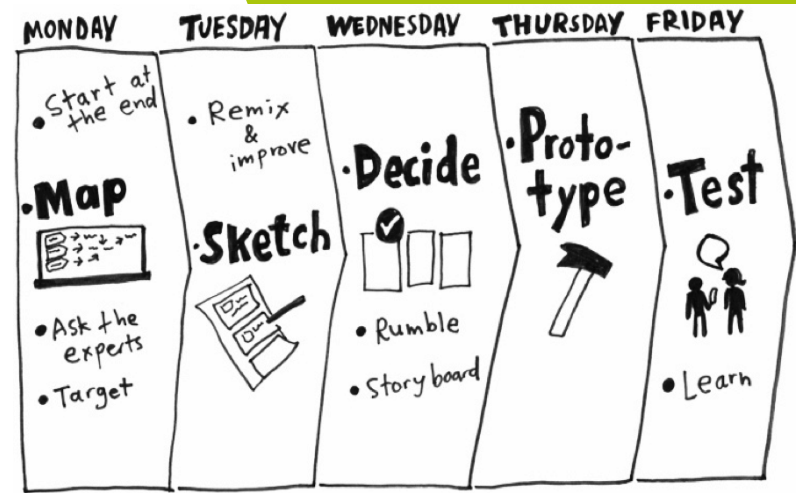
- Biopics and Tony Robbin's of the world
 - Do not stick: story in hindsight is always more pretty than in reality

➤ BOOTHCAMP = MINDSET + THEORY THROUGH EXPERIENCE

- Popular for SW
- Tricky to organize for HW



Problem focus + Agile style



- **INNOVATION = NOVELTY + IMPACT**
- **ENTREPRENEURSHIP = INNOVATION + MONEY**

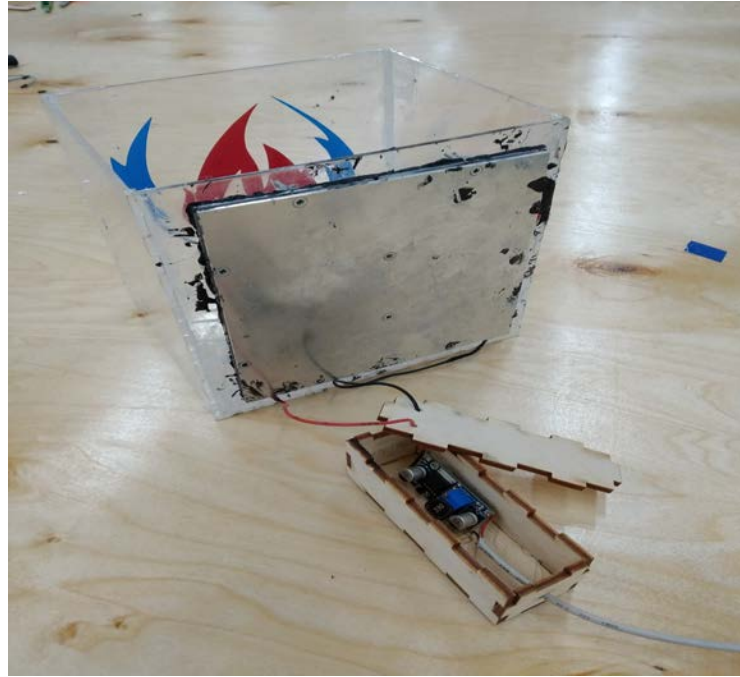
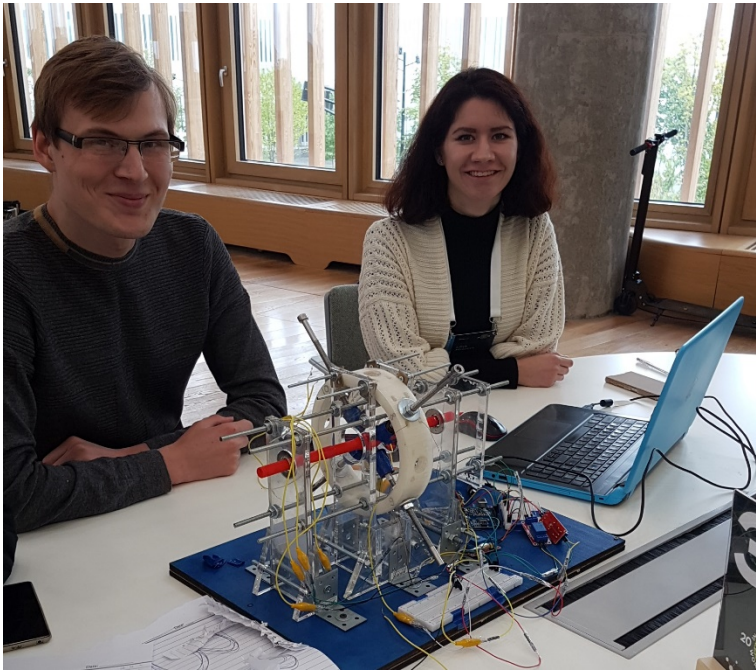
THE STUDENT TEAM JOURNEY SUPPORTED BY THE IW TEAM playing the roles of:

- Tony Robbins
- Prof Dumbledore
- R2-D2

The IW 4-week structure

- Start in the lab
- Go out to talk to real world and show what you've got
- Come back to the lab to implement learnings

	WEEK 1 HUNCH	WEEK 2 PROBLEM	WEEK 3 PROTOTYPE	WEEK 4 ITERATION
PROJECT WORK	Quick Success	<ul style="list-style-type: none">• Meet the Team• SkT IW Project Fair• Speed Dating	<ul style="list-style-type: none">• Mentors & TAs• Prototype• Interview User	<ul style="list-style-type: none">• Mentors & TAs• Iterate
SEMINARS	Elevator Pitch	<ul style="list-style-type: none">• Problem Statement• Prototyping	<ul style="list-style-type: none">• Delivery model• Gantt chart	
FRIDAY PRESENTATION AND PUB		QUICK FAILURE	DRY RUN	THE FINAL CUT



- **48 PIECES OF WELL-DEMANDED ENGINEERING**
- produced 1 (one) week ago
- by the team that met 3 (three) weeks ago
- and stopped fighting 2 (two) weeks ago
 - Rocket science
 - Electrochemical engineering
 - Brain-comp interface
 - SW + CV + AIML
- **and 20 more !!!
IW Fair @ SkT ID**

Active Learning – Examples

Independent Study Period

40 courses (mostly student-led): (1) professional hard skills; (2) E&I and soft skills; (3) enjoyable active learning

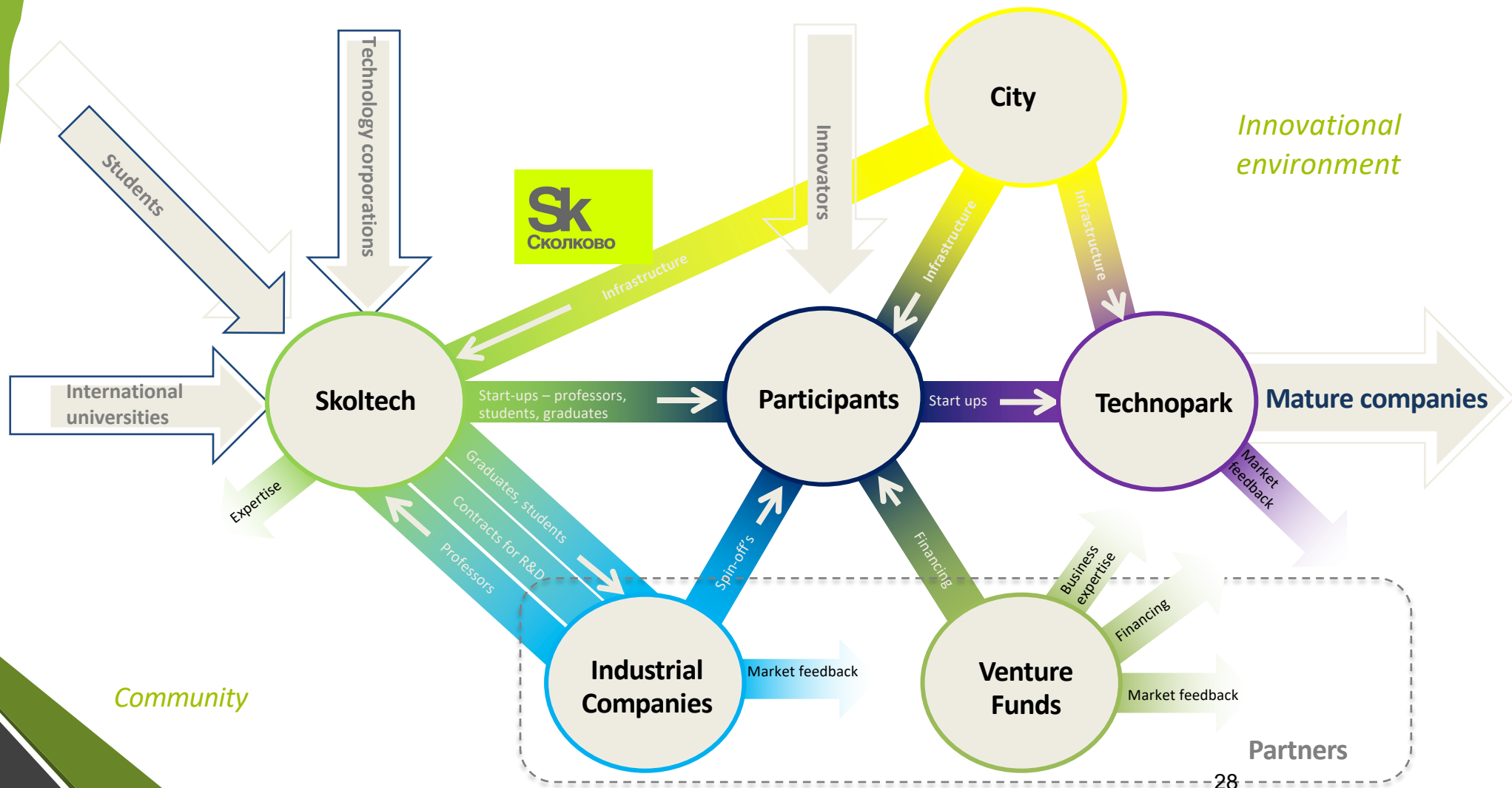


Innovation Workshop

Intense course to foster innovators, focusing on team work, group projects and sparking entrepreneurial instincts



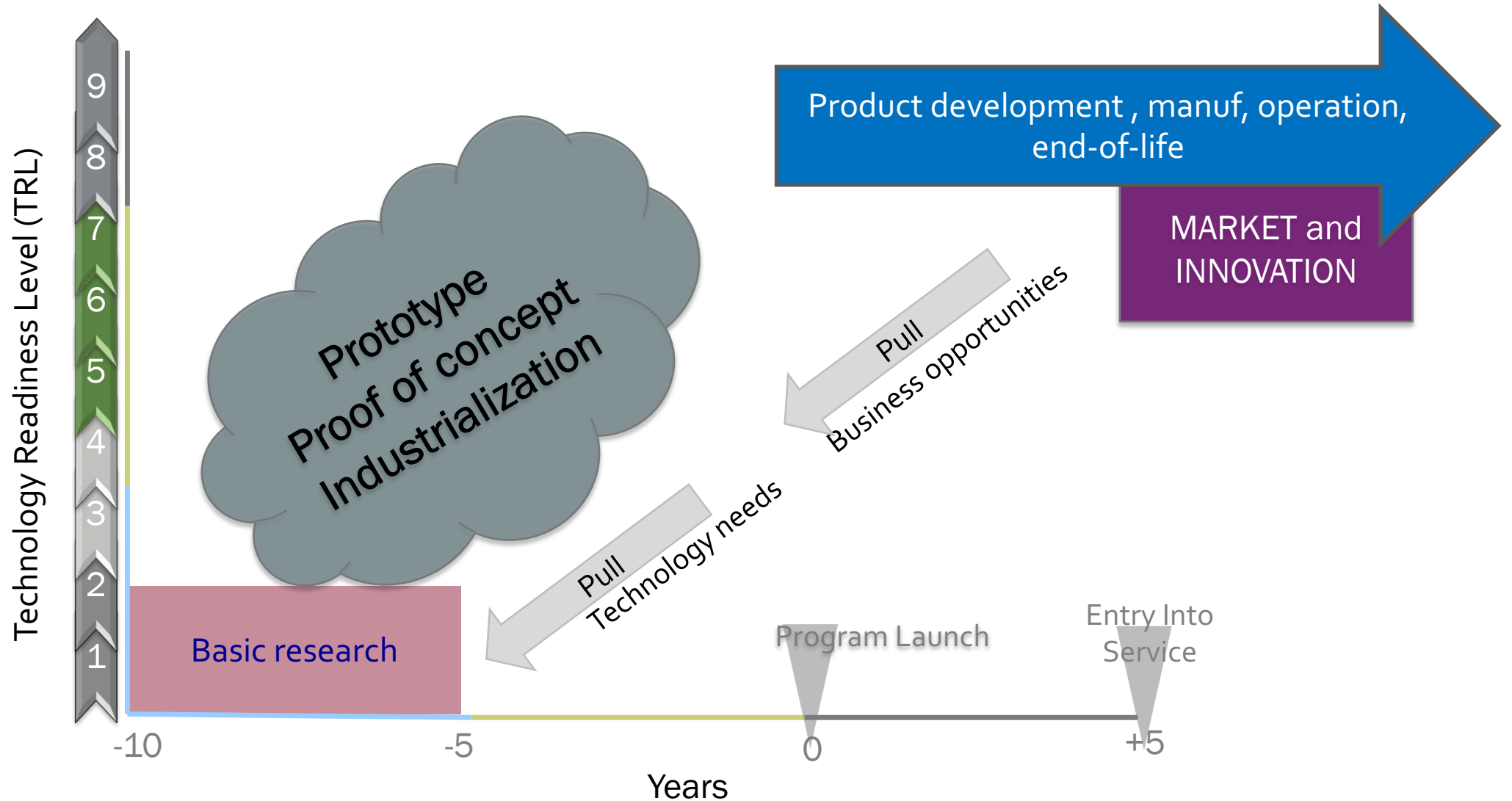
Skoltech is a Partner in Developing the Skolkovo Innovation Ecosystem



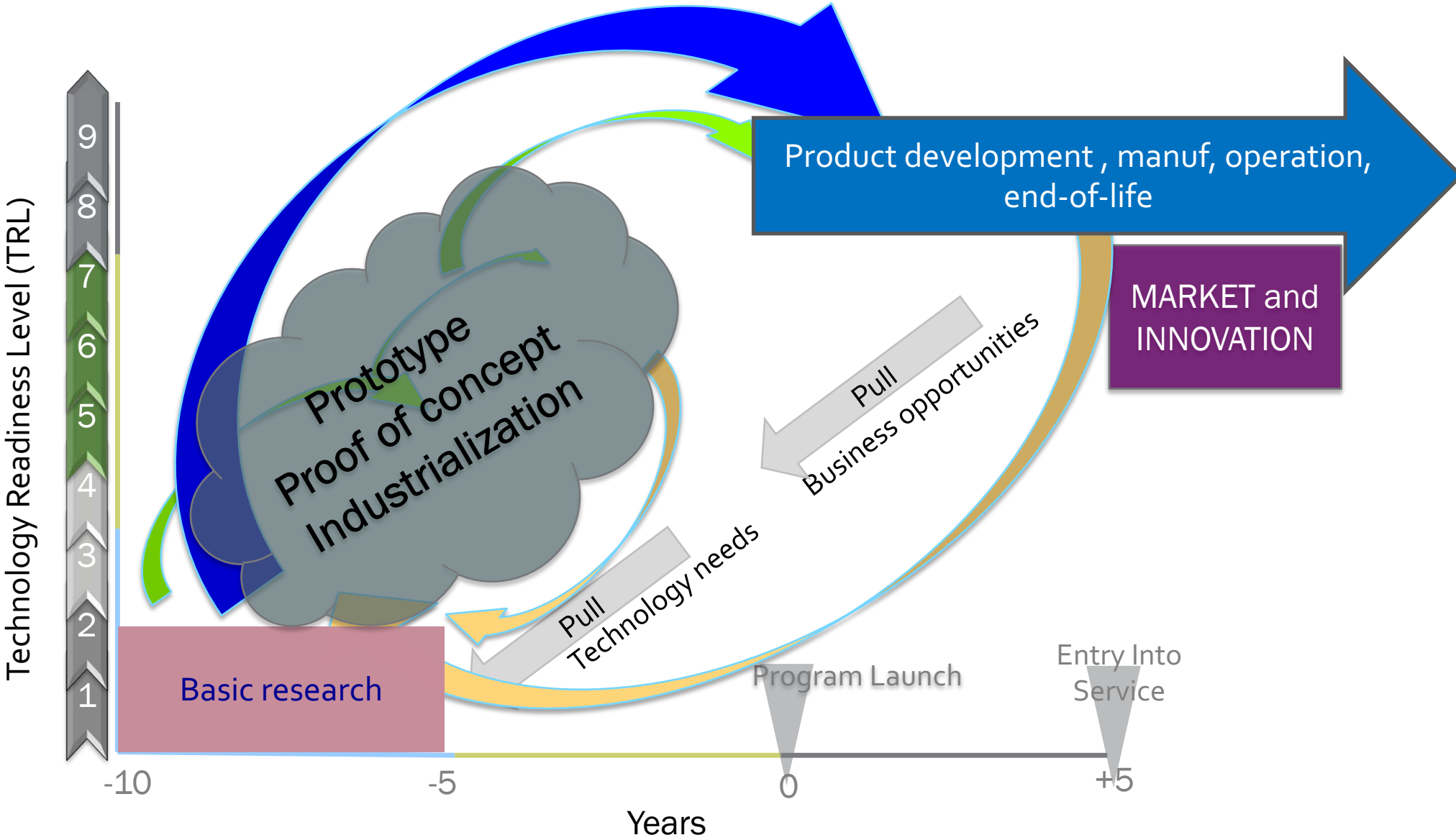


Lessons learned

Bridging science and innovation – another view



Vortical innovation



Questions or comments?

