Rosatom partnership with
SKOLKOVO Moscow School of Management

From **Invention** to **Innovation**:

Atomic Intrapreneurship at Rosatom

Application for EFMD Excellence in Practice Award 2016

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Rosatom, one of the world's leading and largest firms in the nuclear energy industry, started its strategic transformation in 2011. The tremendous scientific accomplishments of Rosatom scientists have built a formidable intellectual foundation. To fully capitalize on its immense potential and achieve global technological leadership the company initiated a program of innovative development aimed at facilitating the commercialization of inventions across the multiple sectors in which it operates. The challenge faced by the leadership team of Rosatom was twofold: first (a) to create a comprehensive system of innovation management and then (b) to develop effective "change agents", able to successfully initiate and implement high-potential innovative projects.

The overarching objective of the joint strategic initiative between Rosatom and SKOLKOVO Moscow School of Management was to embed innovation into the business DNA of the corporation. This would be achieved via a new culture that linked intrapreneurship with the firm's R&D capabilities. The executive education program jointly created by Rosatom and SKOLKOVO thus focused on the development and implementation of innovative projects targeting organizational change and the commercialization of internal technological know-how.

The joint initiative targeted existing hard and soft barriers to change. The hard challenges faced by Rosatom concerned the development of an internal organizational structure that favored innovation, while the soft challenges related to empowering its brilliant scientists and engineers via entrepreneurial and managerial skills.

During three years (2012-2015) a total of 146 high potential leaders from every division of the corporation underwent the program. Three cohorts were designed to create teams of future leaders that would define and implement the innovation vision.

The key results of the initiative:

A The creation of the innovation management system:

- Blueprint of internal processes to facilitate innovation all the way from project idea to implementation
- Innovators' community of practice involving more than 500 members
- Science platform facilitating external cooperation with universities and research centers
- New revenue sources from implemented projects

B The transformation of Rosatom innovation culture meant:

- Awareness and facilitation of corporate intrapreneurship
- Developing a critical mass of change agents to cascade the new innovation culture across all company levels

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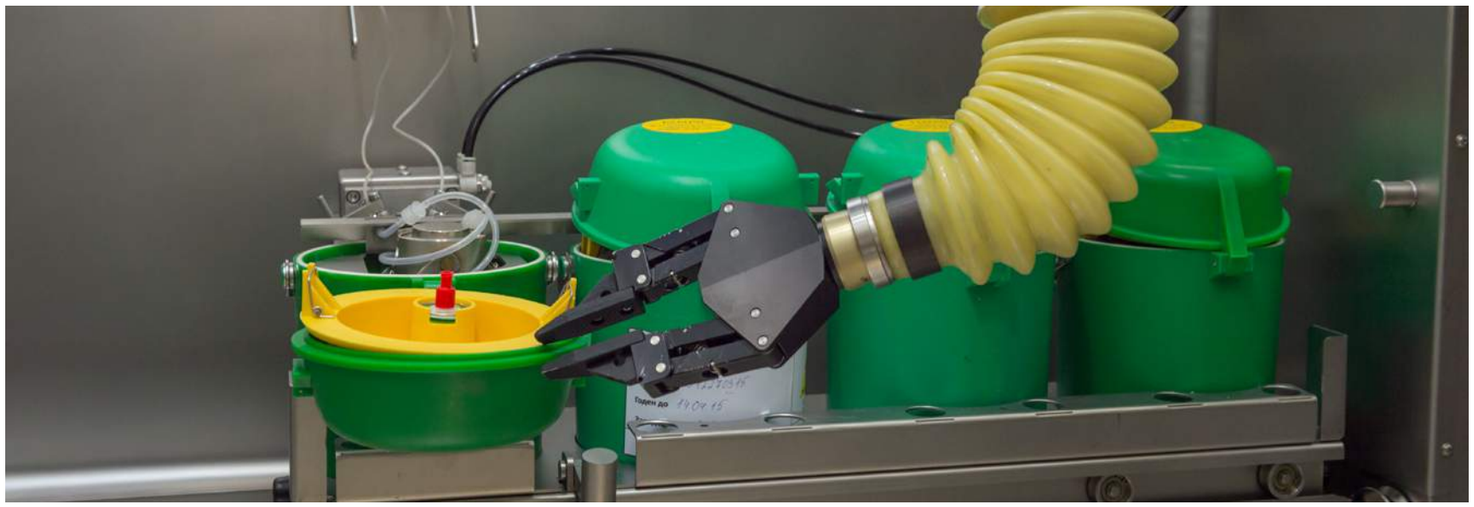
Rosatom: The Knowledge Corporation

Rosatom State Nuclear Energy Corporation (Rosatom) is the largest atomic power generating company in Russia and one of the leaders in the global market for nuclear power equipment and technology. It is the only corporation in the world offering the entire scope of nuclear power generation services: from production of natural uranium to decommissioning of nuclear power stations. As a state-owned corporation, Rosatom operations involve management of Russia nuclear assets, both civil and military, including building and maintaining power generation stations, research institutes, and the country's nuclear fleet.



Since its inception in 1942, the Soviet nuclear industry has accomplished many breakthrough scientific feats forming the foundation of Russian nuclear technology. In 2007 the Rosatom Corporation was formed to consolidate the nuclear assets of the country. Today it still remains the country's leading force in nuclear scientific research. Rosatom is also the world leader in the construction of nuclear power reactors. It has 29 projects at different stages of development in more than 12 countries. Furthermore, Rosatom's technology is applied globally in a variety of areas with overseas projects in 40 countries. Its order portfolio exceeds USD 100 billion for the next 10 years.

Rosatom in brief

15 BILLION USD
revenues in 2014

262,000
employees

17% of electricity
in Russian market

Global presence

International projects
in **40 COUNTRIES**

17% of the world
nuclear fuel market

13% of the world
natural uranium
market

36% of the world
uranium enrichment
services market

SKOLKOVO: Moscow School of Management

Established in 2006 as an initiative by the Russian business community, SKOLKOVO Moscow School of Management is one of the leading business schools in Russia and the CIS. SKOLKOVO offers a wide range of executive education programs for businesses at all stages of development, from start-ups to large corporations. Customized corporate programs based on internally developed methodology provide high quality educational solutions, effectively combining research insights with practice-based learning.

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The intrapreneurial challenge, faced by Rosatom, was of an unprecedented scale. A state corporation of strategic priority, Rosatom structure comprised more than 360 business units, including 29 research institutes and science centers. In order to bring innovation to the core of Rosatom's business culture, the leadership team had to transform both the structure of the innovation process and people. That is, brilliant scientists and engineers who also needed to become entrepreneurs and managers.

Science has been at the core of Rosatom since the moment of its inception. A series of breakthrough discoveries built up the knowledge and technology base, which allowed the corporation to develop a wide range of commercial applications in its core areas and even beyond. Historically the strategic focus of Rosatom was large scale research projects with time horizons of 20 to 30 years. A notable example of such is the closed fuel cycle nuclear power technology, which would minimize the waste generated by power plants and nuclear engines for spacecraft. The successful implementation of such breakthrough projects would result in disruptive innovation, redefining existing markets and business models. This long-term orientation allowed the company to build its technological excellence. However, in order to maintain its leadership in the context of the increasing pace of global competition and rapidly evolving energy sector technologies, Rosatom needed to strengthen its position in new emerging segments.

At SKOLKOVO Marina Karban, Head of Executive Education Dept., SKOLKOVO, summarized the challenge as

> "increasing Rosatom's global competitiveness, via innovation by changing the employees perspective."

To do so a method of corporate entrepreneurship would have to be implemented; one that

> "was new in the Russian market for business education."

At Rosatom, the strategy was to achieve organic growth through strengthening its position within the core sector, while simultaneously extending the applications of its technologies to non-energy markets, including medical equipment, supercomputers and grid technologies. By capitalizing on its internal intellectual capital through corporate intrapreneurship, Rosatom would increase its strategic flexibility, timely adapting to the changes in its competitive environment.

For Nikolay Verhovsky, Project work Director, SKOLKOVO, it was all about

> "team thinking and a new direction in the company's development, that is disruptive innovation. How to make the first step, which was not an evolutionary one, was the essence of the challenge."

Hard Challenges

The hardest barrier for Rosatom in its innovation-oriented strategy was the complexity of its structure. Rosatom's 262,000 employees, mainly engineers and scientists spread across more than 360 autonomous strategic business units, had been focusing on fundamental long-term research projects. This autonomous structure did not provide sufficient support to smaller scale, entrepreneurial projects. In order to consolidate intellectual capital and provide opportunities to commercialize existing technologies and know-how, an effective system of innovation management at the corporate level became of paramount importance.

To create a structure that could support innovation within Rosatom, the Department for Innovation Management (DIM) was established in 2011. A team of DIM executives led by Vyacheslav Pershukov, Deputy Director General – Chief Innovation Officer, Rosatom, played the central role in building innovation support system at Rosatom.

The key objectives of DIM, aimed at establishing a hard structure to support innovation, included:

> Creating internal processes to facilitate innovation

> Creating an internal system of intellectual property and knowledge management

> Creating a network of external actors providing a foundation of open innovation system at Rosatom

This structure was to enable innovation across multiple divisions and levels of organization, connecting researchers and executives to effectively implement high-potential innovative projects.

Soft Challenges

The key soft challenge addressed by DIM was to build an intrapreneurial culture at Rosatom. This challenge meant enabling leaders who could facilitate innovation across its multiple levels and divisions. The legacy of the Soviet system had left a profound research competence within the corporation; however the lack of professional executives who could successfully commercialize inventions was apparent. Due to its focus on large scale projects, Rosatom mainly relied on a top-down leadership approach to R&D. Yet in order to capitalize on innovation via smaller scale, high market potential projects, a new approach was needed.

The central goal of DIM was to transform the internal culture, creating awareness and incentives for the development of entrepreneurially driven innovative projects, making the personal contribution to innovation of each of its employees more transparent. This was to be accomplished through an internal environment that fostered collaboration, entrepreneurial thinking, effective management and innovation.

Sergei KIRIYENKO
CEO of Rosatom

> "Technological supremacy is the only thing that works in the nuclear industry: if you do not have any innovative potential, you immediately lose whatever leadership you might have. That is why it is very important for the State Corporation to have highly-skilled professional innovators."

Rosatom's own innovation strategy was initiated to build internal capabilities that would enable the transformation across multiple divisions and levels of the organization. In order to attain this goal, a critical mass of change agents that would drive the transformation had to be developed. The change agents, a group of Rosatom high-potential engineers and scientists would acquire a profound understanding of the market and possess a new set of managerial skills to initiate and implement intrapreneurial projects.

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The Champions of the Initiative

Vyacheslav Pershukov
Deputy Director General – Chief Innovation Officer, Rosatom

Natalia Ilyina
Deputy Chief Innovation Officer, Rosatom

Marina Karban
Head of Executive Education Dept., SKOLKOVO

Nikolay Verhovsky
Project work Director, SKOLKOVO

SKOLKOVO Moscow School of Management was selected by Rosatom as a long-term partner for creating an innovative executive development program. This choice was motivated by SKOLKOVO's experience in building customized corporate educational products.

> "I believe SKOLKOVO is unique in the market of executive education because of its tailor-made approach."
>
> **Sergei KIRIYENKO**
> CEO of Rosatom

The cooperation between Rosatom and SKOLKOVO started in 2012 and resulted in the successful implementation of the integrative program "Management of Technological Innovations" which ran in three cohorts of approximately 50 participants each throughout 2013, 2014 and 2015.

In order to adjust to the changing environment and Rosatom's strategic objectives, a specific education program was developed for each cohort. The success of each program depended on (1) the quality and the relevance of the program, and (2) whether the changes facilitated during the program would later find support within the organization. The SKOLKOVO project team included 7 representatives from the corporation and 13 from the business school, who went on to jointly design the program. Rosatom's top executives, Deputy Director General – Chief Innovation Officer, Rosatom, Vyacheslav Pershukov and his deputy Natalia Illyna not only gave their personal commitment to the program, they contributed to its development, participating in the program sessions. Most importantly, they followed up working on the facilitation of internal change at Rosatom, to assure that the projects developed through the program would eventually realize their full potential within the corporation.

To gain an in-depth understanding of the challenges Rosatom was facing, a total of 16 interviews with the key stakeholders, including representatives of DIM, the management board and leadership teams of key divisions, were conducted. This team of interviewees further contributed to the creation of environment within Rosatom that would embrace changes initiated by the program through assuming the role of internal curators, providing participants with advice and counsel as well as the administrative support in the implementation of their team projects.

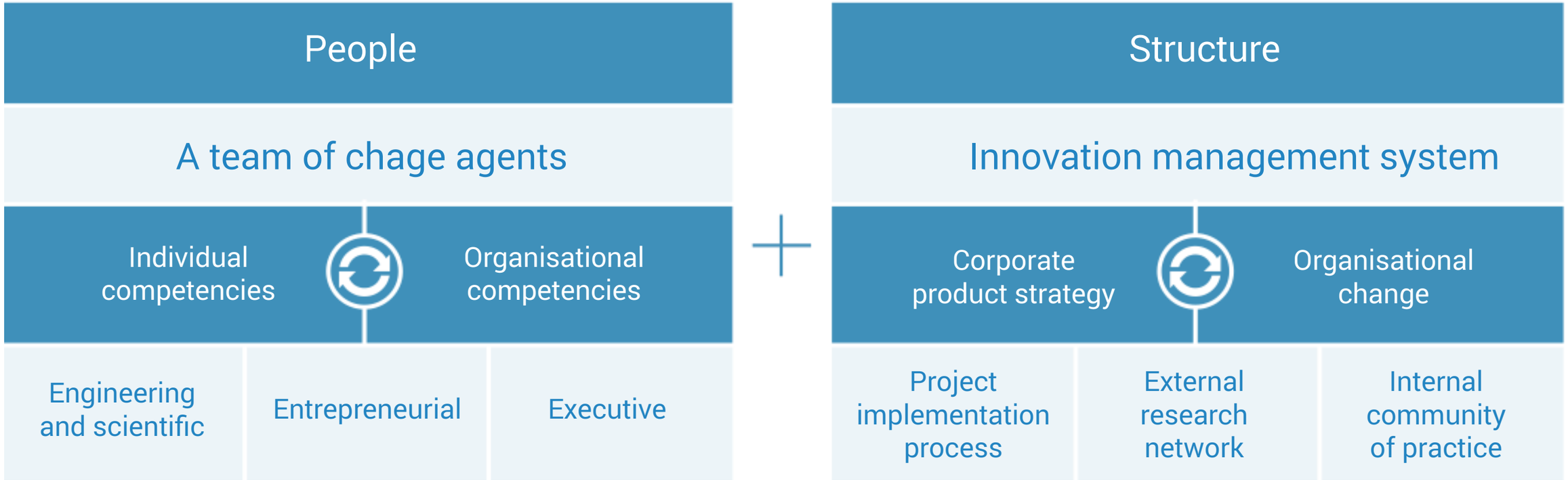
The educational program objectives were (i) the development of people and (ii) the development of an internal system of innovation management. The employee development task focused on

three key competences: engineering/scientific, entrepreneurial and executive. The main challenge was to create Rosatom strategy for implementation of smaller scale market-driven innovative projects. Another key objective was to build an internal support system that could facilitate bottom-up innovation through (a) project-based management systems, (b) a newly developed external research network, and (c) the creation of an internal community of practice within the corporation.

Natalia ILYINA
Deputy Chief Innovation Officer,
Rosatom

> "We needed a generation of skilled engineers that would be able to successfully commercialize their innovations on the market. This, was what we have directed our focus on in creation of the program."

Program objectives



Based on the program objectives, the key strategic themes of the program were formulated. The same process was applied to the development of the program for the second and third cohorts. This way each program cohort targeted the most relevant issues facing the company.

The long-term orientation of the program allowed for its continuous improvement, a customized engagement adjusted to specific strategic focus of the corporation at specific points in time. The summary of the three-year program, which hosted the total of 146 participants, is presented below:

Program overview

Rosatom-SKOLKOVO “Management of Innovation” program 2012-2015

Cohort 1: 2012-2013	Cohort 2: 2013-2014	Cohort 3: 2014-2015
Organizational transformation towards innovative development	Mastering innovation skills	Sustaining innovation
Building internal processes to facilitate development and commercialization of innovative projects	Commercialization and development of innovative products for external clients	Sustaining innovation culture within Rosatom
Processes for transforming invention to innovation – from idea conceptualization to implementation (acceleration, access to capital)	Development of innovative products for new markets (differentiation to sectors beyond energy)	Increasing business effectiveness through innovation

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Selecting program participants

In order to maximize its impact, the executive education program targeted high-potential leaders across different business divisions. Scientists and engineers under the age of 45 with previous experience of management of R&D projects were eligible to participate in this program. The objective of the selection process was to achieve maximum diversity in terms of function, business unit and regional subdivision. This would facilitate the development of innovative projects across multiple subdivisions of the corporation.

The selection process was organized in two stages. First, participants were pre-selected based on their internal application. The second step was a two day selection module where representatives of both Rosatom and SKOLKOVO program coordinators had face-to-face interviews with candidates and made observations of group activities to proceed with the final selection.

For the three years and the three cohorts of the program, over 650 employees submitted applications for participation. At the first stage of selection process 170 program candidates were pre-selected, and after the second stage the 146 embarked on the program.

The SKOLKOVO Method: Learning through Development

Yulia MOTKINA
Adviser at Department for Innovation Management, Rosatom

> “Learning from real projects is the key factor of professional training for innovators. You can spend a lifetime studying theories and reading textbooks, but all only works when people set to solve real tasks of a real project. It is then when they learn how to avoid actual pitfalls, and develop a specific approach to each project rather than a general one.”

The key cornerstone of the SKOLKOVO ‘Learning trough Development’ method is team work targeting real company projects. To maximize the practical value of the program, the employed method emphasized active learning; participants applied the newly acquired skills and knowledge to actual projects. The method combined a stimulating educational environment with a start-up accelerator infrastructure. Project teams received expertise, facilitation, mentorship, resources and, finally, the investment capital necessary for a successful launch of their high-potential innovative projects.

Each team chose a theme for their project congruent with Rosatom’s strategic objectives. To ensure effective communication and to facilitate collaboration between team members, a professional moderator was assigned to each group, providing counsel and advice throughout all stages of the project work. The efficiency of the teamwork was then further facilitated by a team of internal project curators. Their goal was to accelerate project implementation inside the organization, overcoming any administrative or communication barriers. The overarching objective was to legitimize change at the organizational level. The team of project curators was also present at the school when teams were presenting their projects. By the end of the project phase, each team had the unique opportunity to pitch their projects directly to the CEO and to the management board of Rosatom.

> An important element of the method, applied in the design of the program was the ‘role positioning communication device.’

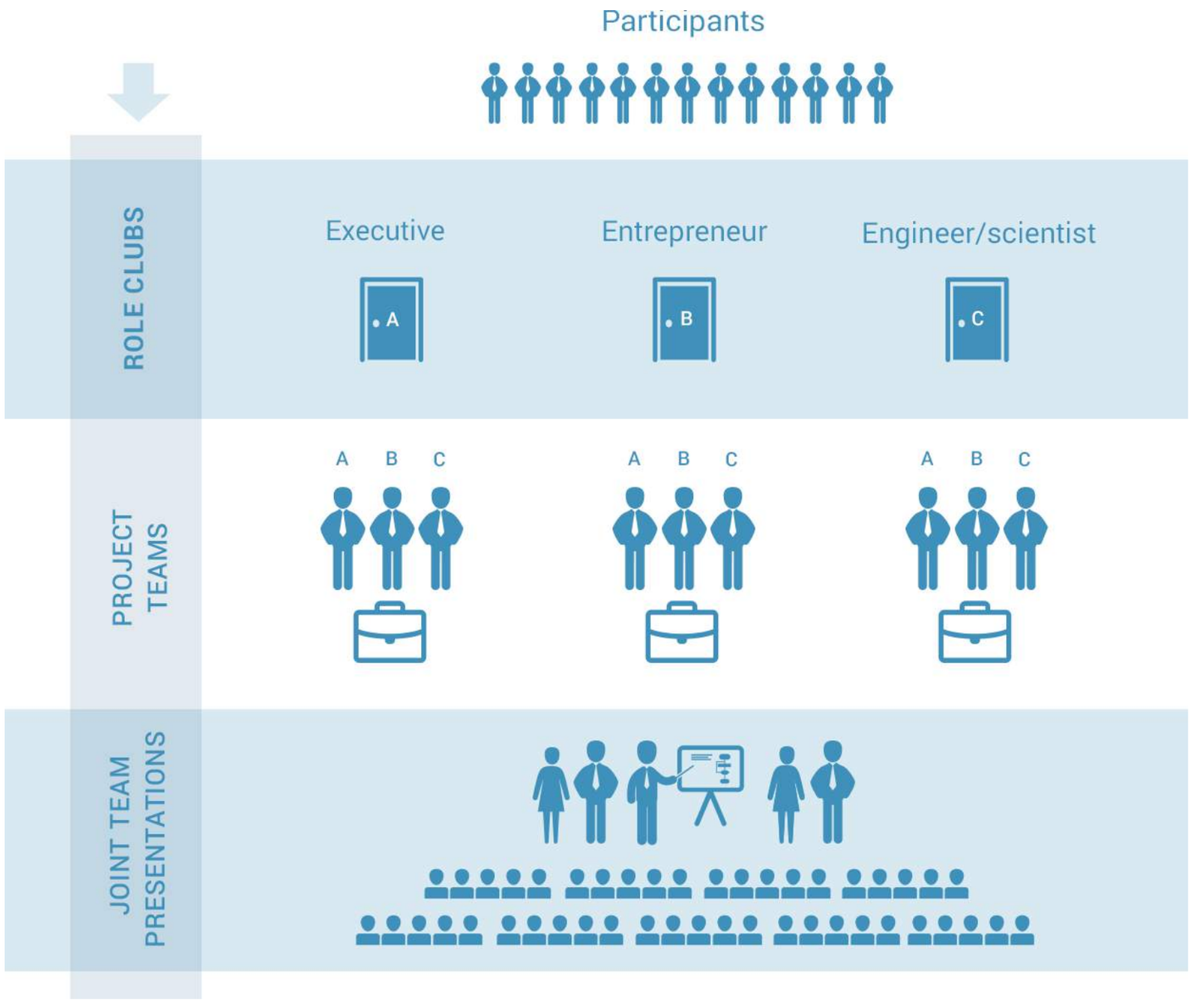
The learning process was organized around three main sets of competencies, all which were

deemed necessary for a successful project implementation. These competencies were conceptualized in terms of the three roles mentioned earlier:

1. **Executive**
   (the organization processes)
2. **Entrepreneur**
   (the business case)
3. **Engineer/scientist**
   (the engineering challenge)

Participants were introduced to their role in the team project through 'Role clubs', a space where they jointly discussed their potential contribution to the team project, and how they would communicate and collaborate with other team members whose assigned roles were different from their own. The teams included representatives of each of the three roles, and team members were encouraged to contribute to the teamwork based on their assigned role. At the joint presentations, the program participants exchanged their experience with other teams. By recognizing the change process elements, and through the prism of these three roles, participants gained an in-depth understanding of the essential drivers of innovation while creating lasting common knowledge for change.

Building teams: Role diversity



Program structure

Each program comprised a total of seven modules each lasting five full consecutive days. The main activities of the program took place at SKOLKOVO's Moscow campus with one study module abroad. The format allowed participants to depart from their daily work routine, and fully focus on their innovation projects. A significant amount of project work was carried out in-between the modules. During their off campus time, participants continued to work on their projects, capitalizing on the support from the team of curators at Rosatom.

An important part of the content development was to balance the Russian context with best global practices. To gain a profound understanding of global trends, a total of 75 SKOLKOVO and foreign professors and industry experts participated in this custom-made program. In addition there were international study trips. During the three years five countries in Asia and Europe and 12 companies were visited[1]. The international and best practice knowledge and expertise was then complemented by the workshops given by expert practitioners who had an in-depth understanding of the local market environment.

[1] South Korea: KAIST, Renault & Samsung Motor, Jeju Smart Grid Zone, DSME
Netherlands: TU DELFT, High Tech Campus
Belgium: IMEC, SCK-CEN, Philips Healthcare, GIANT
France: CEA Leti
Germany: RWTH Aaachen University

Program overview

Selection module	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7
2 days. Selecting participants for the program.	Strategic Domain	Market Domain	R&D Domain		Resource Domain	Implementation Domain	Stakeholder Domain
Educational Focus	Innovation strategy	Entrepreneurship	Commercializa-tion models	International Study Visits	Mapping stakeholders and effective communications	Project management Project Economy	Presentation skills
Team Project Work*	Problem formulation	Analysis	Solution development		Implementation plan	Pilot studies	Project presentation

Lectures, Seminars and Workshops

Faculty from SKOLKOVO and other business schools	Industry experts from domestic and foreign corporations	Experts and leadership team of Rosatom

Applied Skills: Business simulations, Teaching cases, Team building activities

Intra-modular Off-campus Work: team meetings offline and via Skype, expert advice, negotiating with stakeholders, prototype testing

* 30% from total on-campus program activities

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For three years the Program of Innovative Development, the joint initiative between Rosatom and SKOLKOVO, served as an acceleration engine driving the implementation of Rosatom's innovation strategy.

Marina KARBAN
Head of Executive Education Dept., SKOLKOVO

> "At the beginning there was the natural fear to fail. After all this is a huge corporation, a big name, a signal to the Russian market. And yet at the end our first time experiment exceeded all expectations."

The program first established the internal structures and processes to support intrapreneurship. It subsequently nurtured the culture of intrapreneurship increasing awareness and support for bottom up innovation. The third program cohort designed an innovation hub based on collaborative projects with research centers and universities. Moreover participating executives managed to execute successful innovation projects at the firm's core activities and in adjacent non-energy markets. But most importantly, throughout the three years of the program its 146 successful graduates have assumed the role of the change agents, facilitating innovative development across Rosatom.

Turning Rosatom engineers and scientists into change agents that drive transformation

Successful implementation of the program enabled the creation of a pool of skilled leaders that today drive innovation at Rosatom.

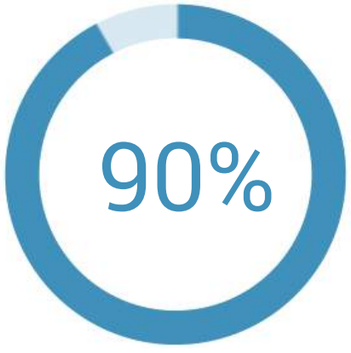
The team based approach to innovation allowed Rosatom to overcome the inertia and shortcomings of an individual-centered management approach. This was especially relevant to the Russian context as strong top-down hierarchy and high power distance often prevent organizations from achieving their full innovation potential. A shared language and a common system of ideas emerged within Rosatom, facilitating the implementation of smaller scale entrepreneurial projects that fully capitalized on the firm's intellectual potential.

Upon the completion of the program, a series of interviews with participants from each program cohort was carried out. The interviews revealed significant changes in perception and attitude after their experience in the program.

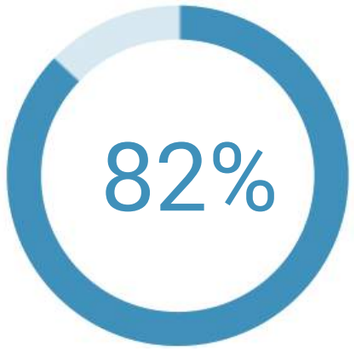
Igor TITOV
Senior Manager, participant of the third cohort of the program

> "Prior to the program I saw corporate innovation practice from my small area of operation. Here at SKOLKOVO I saw the whole picture for the first time, from the idea creation until final approval by top management. It became clear to me why I should engage in innovation - to sustain Rosatom's technological leadership. Before our corporation was a colossus standing on two legs - energy and defense. The third leg which we are developing today is technological innovation for new markets."

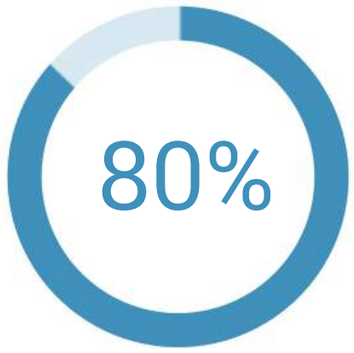
Graduates on feedback of the program



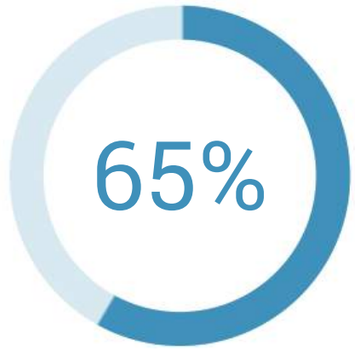
Of graduates rely on the experience they gained during the program in their work



Share the program experience with their colleagues



Claim that the project tasks of the program yield positive results



Responded that the program had a positive impact on their career

Said they would recommend this program to their colleagues/employees

Creating the internal structure to support innovation across multiple subdivisions

As a result of the program a corporate database of intellectual capital has been created, allowing employees from every subdivision to update recent developments within the corporation and to register their projects. This now allows for effective knowledge management and knowledge sharing across multiple levels and divisions of the organization.

In 2014, and as a result of an initiative of program graduates, an Innovation Hub was established at Rosatom. The Hub represents a network of “change agents” (program graduates as well as employees interested in working with innovation projects) and already includes more than 500 members. The Innovation Hub is formed to facilitate communication and development of innovations at Rosatom.

The network participants share the common vision of innovation at Rosatom and become aware of each other’s skills and capabilities to implement innovative projects. In order to facilitate further communication and collaboration within this community of practice, and with support of the DIM, a digital innovation platform named “Rosatom Innovations” was successfully launched (www.innov-rosatom.ru).

During the program an external network was also developed through active cooperation with research centers and universities across the country. As a result of this project, the Portal for Higher Education Institutions (www.innovniokr.mephi.ru) has been developed, its focus being joint projects of common research agendas between Rosatom and selected universities. The next step of this platform network development is the initiation and engagement in international joint research projects with foreign academic institutions.

Project results

In summary, a total of 23 project proposals had been presented at the completion of the program's three years (an overview of the team projects is presented in Appendix II). The first year projects focused on developing the internal system of innovation, as well as on the building of internal processes, along external networks and internal communities of practice. In year two, intrapreneurial projects were designed for the commercialization of existing know how and the launch of high-tech start-ups. Projects from the third cohort addressed the implementation of innovation at the corporation itself. Two projects from the third cohort have been funded, including the "Big Helm" flagship project (see Appendix III). The IRR of the projects was calculated in range of 78-113%. In short, the relationship between Rosatom and SKOLKOVO brought more than learning, it had an impact on the bottom line and hence the engagement is expected to continue in the future.

Global Nuclear Power Industry Outlook

Key leading countries in Global nuclear market[1]:

US: 29.34%
France: 18.91%
Russia: 7.38%

Nuclear power station construction projects around the Globe:

- Total number of nuclear reactors at various stages of construction[2]: 62 reactors
- ... of which reactors constructed by Rosatom[3]: 29 reactors (47% of total)

Nuclear Reactor Construction Market Growth Outlook[4]:

Global market:
2015: 3.71%
2019: 1.84%

BRIC countries:
2015: 12.58%
2019: 8.86%

Key facts about nuclear power industry[1]:

- Abundance of power resources (uranium)
- High cost efficiency and reliability of supply
- Difficulty in disposal of radioactive fuel waste
- High installation costs

Key Market Trends[1]:

- Increase in global energy demand
- Growing safety concerns
- Fast technology advancement

Sources:
1.Techavio Global Nuclear Reactor Construction Market report
2.World Nuclear Industry Status Report 2015
3.Information provided by Rosatom
4.Techavio Nuclear power in BRIC countries 2015-2019 report

Development phase	Organizational development projects	Innovative projects to improve internal efficiency	Technological intrapreneurial start-ups
Completed projects	Innovation Hub (community of practice) and digital platform		
	Intellectual property management system: corporate database of intellectual capital		
	Online portal for management joint research projects with universities		
Investment stage		Big Helm Project: nuclear power station construction process optimization	
		OPORa Project: Assessment of nuclear power stations equipment	
Prototype		Stable Kilowatt: remote control of Smart Grid systems	STRIX: UV-Cameras for Electrical Equipment and Power Transmission Lines
			Radiopharmaceuticals for cancer treatment
			Smart Bucket: Portable device for medical waste disposal
Pre-study	Development of a internal processes for investment analysis and risk assessment of R&D projects	Foam-based solution for decontamination of radio-actively polluted areas	Compact nuclear power stations adapted to arctic climate conditions
	Development of open-innovation platform	Automated nuclear waste processing system by the type of input	Nuclear waste management technologies: reduction of nuclear waste by incineration of minor actinides in the blanket-accelerator systems
	Development of action-plan to facilitate application of existing technologies to new markets	Modular system using carbon molecular adsorbents for purification, separation and concentration of gases	Integrated solution using a compact super computer to process large quantities of data for building complex infrastructure projects
		Creating measuring channels based heat-resistant and radiation-resistant optical fiber sensors	Reengineering of fuel-releasing assemblies for atomic reactors
			Expanding the functionality of VVER production of radioisotope products for nuclear medicine
			Development of a system of noncontact screening for the airport security

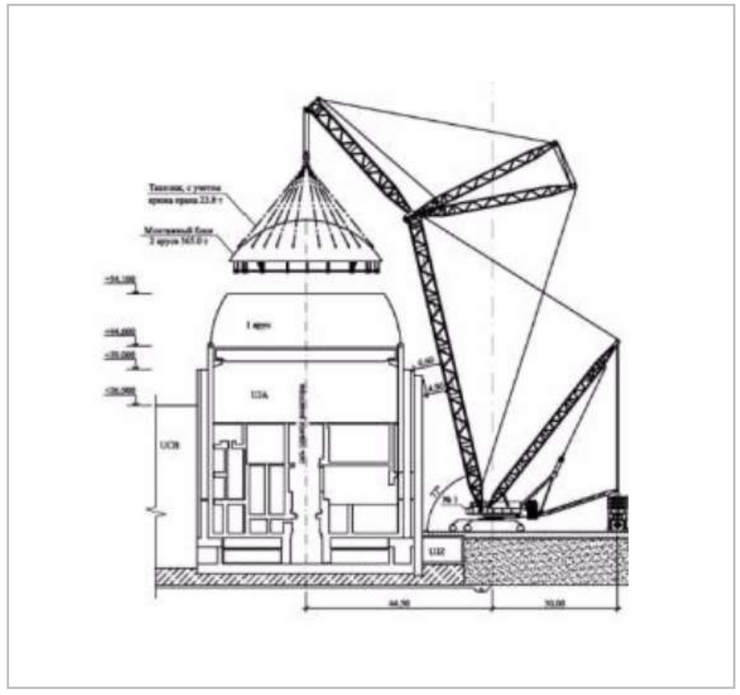
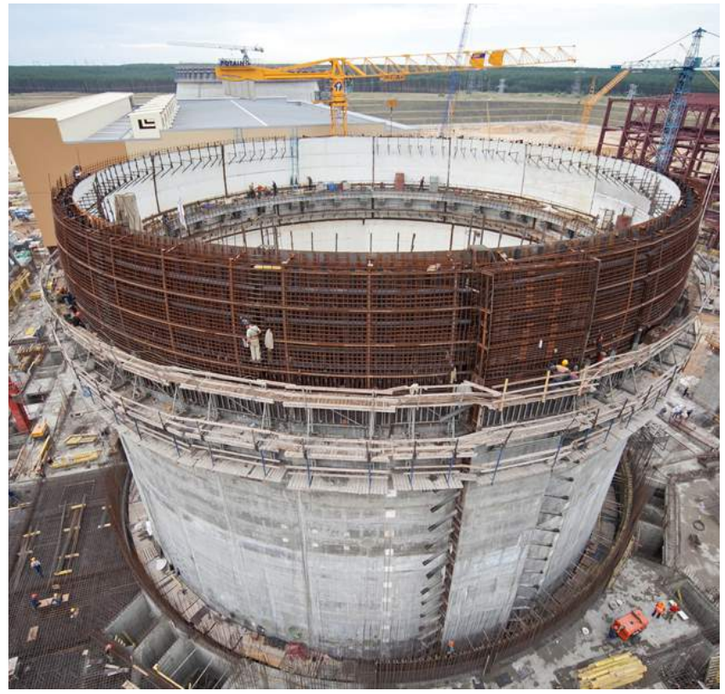
Big Helm Project

Challenge

By 2030, about 40 nuclear power plant units are scheduled for construction and commissioning, both in Russia and abroad. Time is an important resource in the construction of a nuclear power station. The average time needed for the completion of 1 power unit is 5 to 7 years. The construction of the dome constitutes one of the critical operations taking up to 60 months to construct. The decrease in the construction time for a dome allows for the saving of considerable resources.

Technology

The project provides for the replacement of the concrete enclosed containment dome with a steel dome, leaving the design of cylinder part of the dome unchanged. Thus, a reinforced concrete containment dome will be replaced with a complex structure with a steel dome and reinforced concrete cylinder part.

Operational benefit

Replacement of a reinforced concrete containment dome with a combined structure allows reducing the construction time for the containment dome of the nuclear power plant by 90 days while assuring all safety requirements.