ITMO University

First Vice Rector

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L.S.

Proposal for ITMO University's Development Strategy

for 2021-2030

St. Petersburg, 2021

The proposal for ITMO University's Development Strategy is presented as part of its application for the selection of higher education institutions as recipients of support for their development strategies as part of the implementation of the Priority 2030 strategic academic leadership program (hereafter – selection).

The Development Strategy aims to increase ITMO University's contribution to the attainment of the Russian Federation's national development goals for 2030, the balanced and widespread development of the country, and the provision of accessible, high-quality higher education in all of the Russian Federation's federal constituent entities within the framework of the Priority 2030 strategic academic leadership program.

The proposal for the Development Strategy may be subject to modification according to recommendations by the selection committee of the Ministry of Science and Higher Education of the Russian Federation and the Council for State Support of Development Programs of Educational Institutions of Higher Education Within the Framework of the Priority 2030 Strategic Academic Leadership Program.

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1.1. Key results of the previous development period and existing groundwork

ITMO University in 2021 is:

- one of the leaders of Project 5-100 according to the final review of results;
- one of 29 Russian universities to receive the title of National Research University;
- a top-100 university in the fields of Computer Science and Automation & Control according to ranking agencies such as QS, THE and ShanghaiRanking;
- the highest-ranked university in St. Petersburg and fifth in Russia in terms of the average Unified State Exam score (93.1 in 2020) among students enrolled in tuition-free positions;
- one of 27 Russian institutions of higher education that hold the right to award their own academic degrees: in 2020, 94 out of 127 PhD and DSc thesis defenses were presented before ITMO’s own academic degree councils.

The main performance indicators and qualities of ITMO's development over the past ten years demonstrate a strong growth dynamic and a collaborative approach to development.

International and double-degree educational programs taught entirely in English and participation in Erasmus programs (50 in 2020) and Horizon 2020 (6 projects) have proven to be excellent tools for ITMO’s internationalization.

The establishment of international research centers through open calls and under the joint leadership of local and international experts has proven to be another successful instrument for furthering ITMO's global scientific agenda. Currently, there are 9 international research centers.

In 2016, Nature named ITMO University a "rising star"; four journals established at ITMO are included in international citation databases. Researchers from ITMO are actively involved in several projects carried out at megascience research facilities, including the European XFEL project.

Amongst the universities participating in Project 5-100, ITMO has the highest percentage of publications indexed by Scopus and written with non-Russian co-authors (an average of 43.6% over 2010-2020)

An increase in the percentage of international faculty members at the university from 1.41% in 2010 to 15.24% in 2020 was achieved thanks to several key initiatives: the ITMO Fellowship & Professorship program for attracting specialists with experience in top universities and research centers of the world, participation in projects to attract leading scientists within the decree of the Government of the Russian Federation No. 220 of April 9, 2010 (since 2010, 11 ITMO projects were approved), and the inclusion of ITMO research groups in the global agenda.

The growth of ITMO's academic reputation and global recognition is reflected in international rankings: based on 2020's results, ITMO University is included in 24 international subject, institutional, and industry rankings (by QS, THE and ShanghaiRanking), including places in the top 100 in two rankings (Computer Science in QS and Automation and Control in ARWU), in the top 200 in 3 rankings and in the top 300 in 10 rankings. In national rankings, ITMO is placed first in computer science, chemistry, engineering, and materials science; the university is also a leader in artificial intelligence (as a branch of computer science).

Three researchers from ITMO University have received the President of Russia Award for Young Scientists in the Field of Science and Innovation.

By the end of 2020, according to Nature Index and based on publications in leading international journals on the topics of physics, chemistry and life sciences, the university was a leader in Russia in terms of ITMO staff's contributions to ITMO-affiliated articles.

ITMO's focus on tackling national challenges has been demonstrated through its participation in such projects as the National Center for Cognitive Research (launched in 2018) of the National Technology Initiative and the National Center for Quantum Internet, implemented in partnership with Russian Railways since 2019, Digital University (since 2019), as well as in 15 projects for the development of cooperation with industrial partners as part of the decree of the Government of the Russian Federation No. 218 of April 9, 2010.

The university's partner network consists of Russian and international companies (see Section 4). A number of national security and defense projects are also carried out by the university.

Another result of the previous stage of development is the arrival of new research teams to the university, which laid the foundation for the advancement of two new fields: life sciences and Art & Science, which today have led to the creation of two M-platforms (see Section 1.4).

As a result of its participation in Project 5-100, in 2013-2020 ITMO went through a significant educational transformation focused on enhancing the quality of education and providing fundamental training relevant for the 21st century. In 2018, ITMO's own educational standards for broader subject areas of Bachelor's and Master's programs were introduced based on the ITMO Code of V+F+PS+SS (Values, Fundamentals, Professional Skills, and Soft Skills); MOOCs have been developed and are currently used in the educational process, particularly on the topics of programming, Internet of Things, and digital culture. By the end of 2020, a total of over 1 million people have participated in ITMO's MOOCs; a unique system for talent search, training, and retention has been built, thanks to which ITMO University is the only seven-time ICPC world champion. Students and staff at ITMO University are three-time champions of the World Robotics Olympiad (WRO) and winners and runners-up of international and national robotics competitions such as Robocup, Robotex, Robofest, and more.

A proactive youth policy and opportunities for student self-governance, based on the student club system, contribute to the development of well-rounded individuals. As of 2020, there were a total of 132 clubs.

The university management system has gone through a major overhaul: educational programs are now regarded as structural units of their own. Educational and research work is organized within four major schools. To relieve research and teaching staff of their administrative burdens, two university-wide service departments have been created: the Student Services Office and the Faculty Support Office. The involvement of students (25% of membership) and staff in the work of the Academic Council has increased.

The university's information management system has become the core of its corporate information ecosystem and a platform for the digital transformation of the university: it includes more than 150 systems and services, and the number of its users exceeds 15 thousand people. To improve decision-making efficiency, new data-driven models of interaction with users have been introduced, as well as digital tools.

In 2017, development began on a strategic infrastructure project – ITMO Highpark, the university's second campus that is designed as a platform for interdisciplinary dialogue, technology transfer, and scientific and technological breakthroughs. Set to complete in 2027, ITMO Highpark will be home to 3,600 Master's and PhD students involved in applied research, and create 6,000 high tech jobs and 6,000 jobs for teaching, administrative, and technical staff.

The resources and expertise accumulated by the university in 2010-2020 have formed a substantial groundwork for the implementation of the ITMO University 2030 Development Strategy through contribution to the national development goals of the Russian Federation in accordance with the Decree of the President of the Russian Federation No. 474 of July 21, 2020.

Table 1.1.: Select indicators of ITMO University's development in 2010-2020

Performance indicator	**2010**	**2020**
Volume of income derived from R&D projects, per one researcher, in thousands of rubles	690	4,153
Number of Scopus-indexed publications per researcher (over a five-year period)	0.99	13.40
Number of Scopus-indexed publications per year	201	2,602
Percentage of ITMO-affiliated publications in Scopus Q1 journals	12.9	39.6
Percentage of ITMO-affiliated publications in the top 1% of the world's journals as per SJR	0.6	2.6
Number of students enrolled in Master's programs annually	673	3,014
Percentage of Master's and PhD students with previous degrees from other educational institutions	30	72
Percentage of international students	1.57	21.90

Percentage of international faculty members, including Russian specialists with PhDs from foreign universities	1.41	15.24
Number of international educational programs taught exclusively in English	0	75

1.2. Mission and strategic goal

Our values:

Academic freedom, respect for the individual, openness, integrity, and love.

Our mission:

To provide opportunities for the holistic development of individuals and to inspire them to tackle global challenges.

Strategic goal: to generate new knowledge, technologies, markets and individual self-fulfillment in a VUCA (volatile, uncertain, complex, ambiguous) world.

Strategic development goal for 2030: to train world-class specialists for the R&D sector and address the country's scientific, social, and economic challenges, taking into account national goals and priorities, strategic objectives of the current stage of the country and the university's development, and dynamics of market and regional progress in order to achieve strong industry and society collaboration and involvement in all phases of the life cycle of knowledge, technologies, and markets.

1.3. Key qualities of the university's target development model

The university is, first and foremost, people. Training graduates who are **capable and eager** to work on the scientific frontier and are eager to innovate and create products with tangible individual impact – that is the top priority of the ITMO 2030 Development Strategy.

At the heart of **ITMO University's target model for 2030** are its **ambitions** and **key qualities**, which define its image for the next ten years.

The development strategy is focused on fulfilling three ambitions in order to ensure ITMO's **global status** and **leading position in research** in the long term and its contribution to the national development goals for 2030:

Ambition 1. Top-level research beneficial for society:

our aim is to shape the scientific agenda in rapidly-growing fields and on the scientific frontier (emerging, high-risk, trending fields of research), reach Nobel Prize levels of discovery by 2030, ensure the safety of technologies and the public's trust towards them, and prioritize the humanization of technology; ITMO is to become a hub for citizen science.

Ambition 2. Top-level education:

to us, that means the best students, the best lecturers, and the best graduates; it means research-based education, an international environment, learning paths built using both external and internal content and ITMO's educational products, and the university's own Bachelor's and Master's degrees.

Ambition 3. Inspiring environment:

ITMO is a university that creates open-source products, services, and technologies; it is a place for impact entrepreneurship and the validation of breakthrough technologies; ITMO is a university that has the people's trust.

These ambitions, which focus on complex institutional changes and milestones as well as external tasks, ensure the university's alignment with national goals and priorities.

The qualities of ITMO's target model that were formed during the previous stage of development and became part of the university's DNA are that it's a research, entrepreneurial, global, and socially responsible university. At this new stage of development in the conditions of rapid digitization, information overload, increased energy usage, data security risks, and the pervasion of AI into all aspects of life, **we expand our list of key qualities by adding SPEED** (of decision-making, transformation, reaction), **OPENNESS** as a tool for cultivating public trust, and **RESULTS for PEOPLE** – meaning that our focus is on meeting people's needs at a given moment in time and changing their lives for the better (on global, community, city, and family levels) using ITMO's technologies.

In 2021-2030, ITMO University eschews competition in favor of collaboration with universities, schools, companies, foundations, corporations, and other institutions. We share our findings and solutions with the public to the fullest extent: working with the academic,

business, and corporate communities, building partnerships, and benefitting from the synergetic effects of cooperation.

The goals of ITMO's 2030 Development Strategy are:

- Increasing the university's output and value to the nation, society, and individuals (through the technologies of strong AI, communications, robotics, information security, personalized health, and digital humanities).
- Forming new markets for products and services in top-priority industries: digital technologies, advanced healthcare, cyberattack prevention, and intelligent logistics and telecommunications systems; providing effective solutions to major challenges using humanities methods.
- Providing staff for scientific organizations, technological development centers, and companies in the real sector of the economy.
- Strengthening ITMO University as a trusted center of expertise through the development of an open environment for science, learning, and the development, verification, and transfer of technologies.

The qualitative and quantitative properties of the 2030 target model in correlation with the university's ambitions and the image of ITMO in 2030 can be seen in table 1.2.

Table 1.2. Qualitative and quantitative parameters of the target model as set by ITMO University's ambitions and qualities included in the 2030 Development Strategy

Qualities of the ITMO 2030 target model	**ITMO 2030 ambitions: qualitative and quantitative results of the target model**		
	Top-level research beneficial for society	**Top-level education**	**Inspiring environment**
Research	• Share of highly-cited publications (in top-1% journals) – no less than 3% of ITMO's total • ITMO researchers are recipients of Nobel Prize-level awards	• ITMO graduates require zero adaptation time when placed in new working conditions • 100% of students have an individual learning track	• Young and ambitious PIs, no less than 20 frontier-focused research labs • Successful defenses by PhD students at ITMO in natural and exact sciences amount to at least 5% of the overall national count;
Entrepreneurship	• 150% increase in revenue from contract-based R&D • Unique TRL 7-8 R&D&I are integrated into the Russian digital economy	• 4% of graduates have their own startup or business • 80% of graduation theses are based on M-platform projects	• ITMO Accelerator receives at least 30 international teams every year • Works by Art & Science graduates are exhibited at the Venice Biennale
Global	• ITMO in Nature Index's top 3 for Russia • ITMO's Science- and Nature-level publications make up at least 5% of the Russian total based on ITMO staff members' share index.	• 50% of graduates begin employment in tech above entry-level positions • 25% share of international students	• ITMO Highpark is a world-class campus • ITMO organizes regular international high-profile events

Social responsibility	• 5 frontier research projects in key digital fields • 90% of CPD program graduates find employment in tech	• An open platform for the promotion of expert opinions on the ethics of technology, human identity in the digital world, technological safety, etc. • Investing in future generations: ITMO as an aspiration for school students (reach: 1 million)	• ITMO as a center for ethical hacking (a community for mutual testing of cybersecurity vulnerabilities) • Open-model mental recuperation services
Openness	• Digital avatars for researchers and PIs • The ITMO Digital Science platform	• Minor programs and micro-degrees (3 million students) • Peer review: an open system for educational quality assessment	• Hub for open data and services • ITMO as a point of attraction for tourists and citizens
Speed	• 2 scientists reach highly-cited researcher status • ITMO is a university with a reputation in life sciences	• Blockchain technologies for a dynamic class schedule system • Edu.Lab: a testing ground for new educational technologies	• 6,000 new high tech jobs at ITMO Highpark • Speed of attaining results in a partnership = speed of ITMO
Results for people	• 100 million users of ITMO's products and inventions • ITMO.Approved: a tech validation system	• Individual learning tracks and pace • ITMO.Media: customizable content and presentation format	• ITMO's digital services included in the St. Petersburg Plan for Social Infrastructure Development by 2030 • ITMO.Family: an environment that fosters family values

1.4. Unique qualities of ITMO's strategy and development

ITMO University's strategy draws on its **unique competitive advantages** rooted in the experience and achievements the university has acquired over the years, particularly in its 10-15 years as a National Research University and a leader of Project 5-100. For more information on these accomplishments and resources, see Section 1.1

1.4.1. ITMO's advantages and strengths

- **Top students:** ITMO is the top university in St. Petersburg and fifth in Russia in terms of the average Unified State Exam score (93.1) among students enrolled in tuition-free positions; in 2020, the university enrolled 468 winners and runners-up of academic competitions and boasts **strong and motivated students** (students enrolled in Master's programs in 2020 come from 391 universities in Russia and abroad) and **strong teaching staff** (lecturers create online content that is popular among students in Russia and beyond, and freely use modern educational approaches and technology – YouTube channels, live streams, and virtual labs). These complementary groups define the quality and pace of research projects (see Section 3.2) as well as the educational quality at ITMO (see Section 3.3), and create an environment in which new ideas, technology, products, and markets can be generated.
- **Global research and education:** research teams at ITMO are aligned with the global scientific agenda and have experience in conducting successful breakthrough research the results of which are included in the top 1% of the most highly cited publications in the world. These research efforts were carried out either entirely at ITMO (>80% of co-authors are affiliated exclusively with ITMO) or in joint cooperation (25% of co-authors are from ITMO) with leading research teams, including as part of special projects like Horizon and megascience projects. Young scientists and students at ITMO have their research results published regularly in leading scientific journals such as Science, Nature Photonics, Nature Communications, Advanced Materials, etc. and are also awarded presidential prizes and medals of the Russian Academy of Sciences and international scientific communities such as SPIE, IEEE, and ISMRM. The globalization of education has led to the creation of a flexible educational space through academic partnerships (20

international educational programs in partnership with top-400 universities), as well as through student academic mobility (8% incoming mobility of students from leading international universities, 12% outgoing mobility). As a result of receiving a quality education at ITMO, graduates are in demand on the job market (ITMO is the top university in St. Petersburg and second in Russia in terms of graduates' salaries according to Superjob – https://students.superjob.ru/reiting-vuzov/it/).

- **Master's and PhD university development model:** the ratio of Masters and PhD students to Bachelor's students is 1:1 in 2021; 15% of students are involved in real research projects. ITMO is the top university in Russia in terms of R&D revenue per researcher.
- **Entrepreneurial environment and infrastructure** aimed at developing students' project and entrepreneurial competencies and teamwork skills (OLYMP student laboratory, ITMO Technopark, ITMO Accelerator, startup studio);
- **Unique science and education focus**, with studies and research centered on the latest digital technologies and, therefore, rapidly emerging modern markets (IT, including AI, robotics, photonics and quantum technologies, modern branches of physics, materials science, chemistry, and genetics), interdisciplinary research that brings these fields together (infochemistry, bioinformatics), as well as digital humanities research.
- **Strong horizontal relationships and communication** between students and university staff, resulting in a trusting environment that enables dynamic change and quick responses to requests from students and partners (ITMO's best extracurricular practices are used by 350 Russian universities);
- **Experience in implementing large-scale joint research projects** with partners, such as the St. Petersburg-Moscow multi-node quantum network, the national cyber-testing grounds, a heterogeneous-cloud-infrastructure-based control system for machine learning models and engines that includes supercomputer systems and Big Data clusters, precise servo drives for space surveillance systems, including those installed at the Baikonur and Vostochny cosmodromes, artificial materials for MRI, etc. (see Section 4.2).

- **Distributed campus: central St. Petersburg and ITMO Highpark.** Bachelor's students take classes in the city center, integrating themselves into the culture and spirit of St. Petersburg (73% of students at ITMO are not from St. Petersburg), and by 2024 Master's and PhD students study at the world-class campus ITMO Highpark where they're involved in applied research and interact with industry partners – an approach that is entirely novel for Russia.

One unique resource that ensures the implementation of the breakthrough ITMO 2030 Development Strategy is people – the ITMO.Family community – including students with a drive to innovate who choose the role of developer, researcher or entrepreneur when designing their individual learning track; ITMO staff (54% of faculty under 39 years old); and graduates and partners with whom we collaborate and share a vision, common goals, risks, and resources.

1.4.2. M-platforms

M-platforms in brief

As part of its implementation of the Priority-2030 Program, ITMO University introduces a dynamic system of functional partnerships – M-platforms. Its purpose is to integrate education, research, technology, and innovation at the university, as well as to develop connections with scientific organizations, real economy businesses, development institutes, professional associations, and social organizations. The need for this new approach is due to qualitative changes in the university's development strategy which prioritizes the advancement of promising high-tech markets through the implementation of high-tech R&D&I and adoption of new technologies through the establishment of new collaborative relationships. The international research centers that were created as part of Project 5-100 have a narrower focus on academia and formed their teams based on affiliation to specific sciences and industries and thus lack the capacity to effectively implement these ambitious tasks.

The initial stage of ITMO University's development strategy will include five M-platforms: Next-Gen Cyberphysical Systems; Cognitive Informatics; Human. Nature. Technology; Information and Functional Security; Arts and Sciences. Each one draws on

existing research, has a unique focus, and weaves together the university's strongest competencies in the fields of IT, photonics, engineering, and life sciences.

M-platforms are based on the paradigm of today's platform economy. They are interdisciplinary, interindustrial, and interinstitutional. In their operation, they collaborate on research and educational activities with ITMO's Schools, serving as a functional superstructure in addition to the existing organizational framework. The platform economy paradigm includes the development of models that allow us to minimize transaction (resource and time) costs associated with interactions between collaborators and improve results by:

- creating added value through deep technologies;
- presenting unique value propositions through a combination of approaches from different fields;
- working on markets where demand is formed as a result of a dialogue between the participants;
- following the principles of open competition and goodwill accumulation;
- adopting the best practices from external ecosystems.

The following principles are shared by all of ITMO's M-platforms:

- M-platforms are designed as centers of expertise and resource support in addition to existing international research departments, laboratories, and centers established during Project 5-100.
- Each M-platform focuses on dealing with a major challenge, and builds its own roadmap based on the aims, objectives, and performance indicators of the university's development strategy while also implementing initiatives that involve all of the university's strategic projects.
- M-platforms interact directly with the university's partners and members of the consortium, moving away from the customer-contractor mode towards closer integration, co-creation, and the sharing of benefits and risks.
- M-platforms' research agenda is based on the Strategy for Scientific and Technological Development of the Russian Federation and current global challenges. Priority is given to subjects that have the potential for multi-industry implementation of results and

capture of promising markets. At the same time, projects that do not address global challenges are consciously rejected.

- Together with partners, the M-platforms implement complex high-TRL interdisciplinary projects (up to TRL 6 by default, with a few up to TRL 8) with verifiable significant socio-economic effects and develop systems that serve to bridge the gaps in the chain of knowledge, solutions, technology, manpower, and innovation.
- M-platform participants gain easy access to shared infrastructure, intellectual resources, and university-wide services designed to reduce administrative burdens and participate in the coordinated distribution of finances.
- The M-platform staff policy is based on the need to balance staff stability and mobility and achieve a synergy of competencies, resulting in the following categories of staff: «nuclear» (provide a starting impulse and continuity of projects), free (participate in solving specific tasks within projects), and administrative and management staff.
- The involvement of M-platforms in the training of specialists for the Russian economy's priority areas and the development of competencies for the knowledge economy includes: expert (course and program content, foresight research) and infrastructure support in adopting a project-oriented approach to Master's and PhD education, involving students in research and innovation, developing and implementing network and corporate educational programs, continuing education programs, and proactive continuous professional development in partnership with M-platform consortia members, the launch of a PI school and customer relations courses.

1.4.3. Contribution to national goals

A key focus of ITMO University's development strategy is on achieving Russia's national development goals for 2030 through the ITMO.Impact, Scientific Breakthrough, Highly Personalized Value-Based Education, and Well-Being strategic projects, as well as the associated development projects. Besides contributing to KPIs related to educational quality, science, and R&D, the university will also focus on goals related to: improving the quality of life and safeguarding public health and well-being (Health and Sports, Research and Promotion of Top Well-Being Practices development projects, and R&D delivered by

the People. Nature. Technology M-platform); creating safe environments (implementation of student-driven environmental urban initiatives, promotion of green technologies and ecological awareness through the Positive Environment and Conscious Consumption development project); developing a talent search, support, and development system for youth (sharing of ITMO's best student club practices, the Global Talent Network development project); digital transformation of the national economy and development of IT (National Center for Cognitive Research and the National Center for Quantum Internet); development of small and medium entrepreneurial projects (Impact Entrepreneurship development project); and engaging the public in volunteering and cultural events (national volunteer training program People Need You!).

1.5. Key limitations and challenges

The challenges of 2021-2030 that shape ITMO University's Development Strategy:

- Digital and cultural transformation of businesses, sectors of the economy and social life, as well as the development of new market sectors. This challenge demands that the university not only ensure a high quality of professional training, research, and technological innovations and their efficient implementation by the industry, but also develop digital economy competencies necessary to transform all business processes. An important task within this challenge is that the university has to serve as a public source of expertise to facilitate the solution of ethical and social problems that arise in the course of technological development. This would allow ITMO to detect any such problems early and find the right solutions in close cooperation with the public.
- The competition between macroregions; their digital, technological, educational, and industrial sovereignty; nationalization of industrial standards. This challenge demands from the university to engage in defining and developing the global R&D agenda, advancing high-quality research in Russia, and interacting with industrial partners for the effective transfer of new solutions into commercial products.
- Changes in society's demographic structure and the rising global competition in tech, research, and education, including the global competition for talent. This challenge urges the university and its partners to directly engage in the development and

advancement of global quality standards and the organization of activities based on the principles of open, network-, and platform-based cooperation. Despite the rising global competition, the university has to prioritize collaboration and open communication. This is the key principle at the core of the university's management and transformation models.

- **Changes in the job market. AI- and tech-driven search for new social and professional personal identities.** The university has to not only train high-quality professionals, but also accompany them when they enter the labor market and provide them with the necessary competencies and skills both during their training and afterwards.
- **The acceleration of changes, the challenge of uncertainty, and the growing complexity of work.** This is one of the most significant challenges in terms of the demands it poses to the university's development. The proposed response is an attempt to establish new scientific frontiers and breakthrough zones.

Accompanying these general challenges are those related to **R&D and education.** Among the major **educational challenges** are the expansion of online education, the digital transformation of education (including that caused by AI), interdisciplinarity, new global collaboration in education, the foundation of new corporate universities, and the rising public and market demand for lifelong learning. **The R&D challenges** define ITMO's focus and concentration of resources on the new tools introduced in ITMO's 2030 Development Strategy – M-platforms (see Section 1.4).

These challenges and trends pose certain **external limitations** on the university's development:

- the new or rapidly changing markets ITMO targets in its R&D and educational agendas are not fully established or mature;
- the insufficient level of trust towards new technologies in society and the industry;
- the lack of trained professionals in rapidly growing or changing markets;
- international, export, and innovation policies on research, technology, education, and IP commercialization markets.

The key **internal limitations** at this stage of development:

- significant disparities between research and teaching staff's theoretical knowledge and practical skills and an unfulfilled demand for research, teaching, and administrative specialists needed for breakthroughs;
- insufficiently fast and smooth transition from fundamental research to applied solutions and later to implementation and innovation due to the lack of understanding of partners' business processes and sometimes poor collaboration between groups working at different TRLs;
- the need to introduce changes to ITMO's IP management policy, especially in the field of digital technologies, and insufficiently efficient commercialization of the university's IPs;
- the insufficient level of the university's digital transformation (the internal demand for digital maturity exceeds the speed of implementation of digital transformation projects);
- insufficiency of resources and the high risk associated with entering new interdisciplinary fields;
- insufficiently fast opening of the university's educational environment to students from outside the university;
- the rising demand for a comfortable environment for studies and work at the university accompanied by a constant increase in workload, pace of life, and extent of knowledge of staff and students.

In spite of these challenges and limitations, ITMO University sees opportunities for further development. The university is launching a set of strategic projects (see Section 3) and introducing new policies and management approaches (see Section 2).

2. University policies for achievement of the target model

2.1. Educational policy

Over the past seven years, the following has been achieved in terms of ITMO's educational policy: the design and implementation of ITMO's own educational standards for broader subject areas of Bachelor's and Master's programs; the creation of "umbrella" educational programs that combine various fields of study; the establishment of university-

wide core subjects for Bachelor's and Master's students to broaden their fundamental knowledge.

In the next stage of ITMO's development, and for an effective implementation of the strategic projects Highly Personalized Value-Based Education and ITMO.Impact, the following institutional changes and approaches will need to be implemented. While these changes are internal in character, they will also have an effect beyond the university.

- A swift integration of digital and flexible educational technologies and approaches in order to boost students' attention and comprehension. To achieve this objective, we'll need to:
  - amplify and expand evidence-based research in the field of cognitive and digital pedagogy to help students achieve the best results in their studies based on their personal learning goals;
  - assemble a reliable data set of disciplines taught at ITMO based on a shared keyword library and identify learning prerequisites and outcomes;
  - build a learning analytics model based on students' personal interests, choice of career role (researcher, entrepreneur or developer), job market demand, and scientific and educational foresight;
  - create a model for dividing disciplines into micromodules based on pedagogical design principles, taking into account UX and UI, and the ITMO.Media content management system (see ITMO.Impact strategic project);
  - develop a digital tool for certification and integration of modules, micromodules, and other educational units completed by students both at ITMO and beyond into the educational programs of the university;
  - introduce a new educational standard for ITMO University that covers all fields of study to allow for university-wide core subjects for ITMO students while also giving students and heads of educational programs complete freedom in designing the educational process.
- New tools for improving the quality of education and educational content, which entail, in addition to a proactive personnel policy (see: Section 2.4), the following institutional changes and actions:

- the introduction of an open “module competition” system to increase the relevance and quality of educational content;
- the adoption of the principle of open educational system management, the key elements of which are: the transparency of educational programs; open cooperation with the industry and the scientific community; collegiality in the making of important educational decisions; and a peer-review approach in assessing the effectiveness of education;
- the launch of an initiative focused on mutual and cross-checked evaluation of the quality of education (content, technologies, results), with the participation of external (including international) experts, to strengthen the dialogue and exchange of best practices in order to improve the overall quality of studies;
- the creation of Edu.Lab – an open testing ground for the development and validation of new educational technologies and the launch of experimental educational projects. The top projects will then be scaled up and shared with other institutions around the country. As the driving force behind the open education system, this lab will enable swift adjustments to be made to the educational process in response to society's ever-changing needs.

- Accelerated development of entrepreneurial culture and environment, resulting in:
  - a system for admitting students to the university based on entrepreneurial projects; learning tracks based on entrepreneurship principles, such as funding rounds, fundraising, break-even points, and unicorns, in which the academic supervisor serves as a mentor and the project is evaluated by an associated active expert community;
  - the opportunity for students to pitch a project for ITMO’s development at any time during their studies at the university and receive funding for its implementation;
  - spaces for the formation of inter-university student teams, including distributed teams if required.

The proposed policy will provide a one-of-a-kind environment where ITMO students and staff can unlock their full potential and become world-class researchers and developers.

2.1.1. Providing conditions for the development of digital competencies and skills in digital technology use among students, including students of IT

ITMO University sets itself the task of developing a proactive lifelong learning (LLL) system in ICT, information security, computer science, artificial intelligence, and related areas. By creating educational programs (in higher education and professional development) and implementing specific measures aimed at accelerating the development of digital competencies, the university will ensure that its and other graduates will continue to advance in their career paths.

To build this life long learning system for accelerating the development of digital competencies, the university will focus on developing the following areas: creating relevant disciplines, modules, professional retraining programs for students, implementing academic mobility programs for students, and other important activities that unlock their potential: olympiads, hackathons, datathons, competitions, and summer and winter schools.

Developing one's digital competencies is a multi-phase process. The initial phase focuses solely on developing digital culture (students sign up for mandatory subjects that take into account their initial digital culture experience), students then apply their newly-found knowledge to acquire their general professional competencies (students use digital tools and technologies during their study of general professional subjects), thereby increasing their digital culture, and then they learn to embed these digital skills into their specific professional fields (within their particular major).

A variety of subjects and approaches to studying digital culture enables students to build their own individual learning tracks for a flexible and adaptive entry into the digital environment, based on their specific needs. This personalization is provided by: studying elective and optional subjects, with the choice of studying online; choosing a minor focused on developing digital competencies while mastering a new professional field; taking part in project work focused, among other things, on the development of digital competencies (for example, writing program code, creating an IT product, etc.). Courses will need to be updated regularly to stay relevant (at least once a year for an educational program; at least once a month for a specific course).

To meet their needs for developing competencies, students can use academic mobility programs, which allow them to supplement their professional knowledge with unique skills and experiences.

It’s vitally important that the main educational programs at the university implement digital practices used by IT experts in their teaching (such as gamification, VR, AR, AI and others), as well as hold events where these specialists can provide tasks and act as independent experts (CTF Summer School, CyBRICS sports hacking competitions, Blockchain Hackathon.Hack, etc.). For students not enrolled in IT-related programs, low code/no code programs should be actively used to form skills for working with ready-made IT solutions and adjusting them to their specific uses.

To ensure the availability of digital content, ITMO University continues to develop online education: online courses, micromodules, and online Master's programs.

The formation of a digital culture takes place not only within the educational program but also through the variety of opportunities provided by ITMO and its partners.

ITMO University and its partners have all the necessary technical support and infrastructure to implement the above-described measures, including a set of licensed and freely distributed software.

ITMO has created and is constantly developing an environment for flexible work, study, and generation of ideas and projects, namely: round-the-clock coworking spaces equipped with high-end computers, gaming consoles, and augmented reality equipment; the Student Services Office; and the ITMO.Sharing system of laptop and tablet rentals.

A fully-equipped technical infrastructure with real industry equipment has been created to help students learn to solve specific and practical tasks from real-life practical tasks. Such examples are the National Cyber Testing Ground support center, created jointly with Rostelecom, as well as the National Center for Cognitive Research (See Section 4).

Plans for further development of the current technical infrastructure include the creation of new ITMO digital platforms and solutions and expanding the capabilities of existing ones.

2.2.Research policy and the policy on innovation and R&D commercialization

For the successful implementation of the Scientific Breakthrough and ITMO.Impact strategic projects in the field of scientific research, commercialisation of R&D, and training of highly competent staff, ITMO University will focus its policy on the following key areas:

ITMO Digital Science is a set of coordinated administrative and IT solutions aimed at organizing research, development and innovation based on new principles in the digital realm in order to boost research and innovation activities, accelerate the implementation of R&D, increase the number of those involved in research, conduct interdisciplinary research, involve non-academic participants in science, and establish effective systems for cooperation between science, industry, and business.

ITMO's current intranet system (known as ISU) will provide the technological foundation for ITMO Digital Science. The present system integrates a large variety of services and applications that automate many elements of the university's internal business operations, such as those connected to finance, employment, project work, and other activities in the field of research and innovation. However, under the existing design, services are not coordinated and there is no structure for dealing with business stakeholder groups (customers, funds, co-executors, etc) that are not internal to the university.

ITMO Digital Science implements a set of coordinated business processes and achieves the following objectives:

- A substantial improvement of the system for the division of labour and a dramatic reduction in the administrative load on PIs and research project managers as a result of the digital transformation of all science- and innovation-related business processes.
- A new format for interaction with external participants in the research process that implements the following business processes in the digital space: placing orders, signing contracts, submitting reports, forming requests and proposals for technology transfer, and gaining access to an open database of shared IP.
- The use of digital avatars of individuals participating in R&D and innovation processes as a vital tool for digital engagement, data collection, and the building of research teams and consortia.

- Integration of ITMO’s digital research space with other digital systems and databases associated with the processes of creating knowledge and the promotion and commercialisation of research findings.

The following steps will be taken in order to implement unique R&D&I for the needs of the Russian economy:

- Establishment and development of joint corporate structures (research centers, laboratories, institutes, and testing grounds) with industry partners and market leaders. This includes adopting the principles of shared management when establishing corporate structures as well as ensuring the direct flow of external funding to departments and a reduction in internal reporting and bureaucracy.
- Conduct of complex interdisciplinary research via new structural units, M-platforms, which serve as a way of organizing interdisciplinary consortia and aim to solve global scientific, social, and economic challenges.
- Creation of courses for building customer relations for managerial staff in companies and partners of the consortium.
- Development of a funding system for short-term staff-driven research projects that will be expanded into a larger project if successful, carried out on behalf of major industry partners in order to test ideas and share potential risks.
- Humanization of technology, integration of human digital research, building of confidence in technology, and ethical validation of R&D in terms of its impact on individuals and the job market. Using the university's location in St. Petersburg’s historical center as an ideal setting for the development of transdisciplinary initiatives that fuse arts and humanities with science and technology.
- Development of an infrastructure, pilot production, and testing grounds for open validation – including ethical – of in-house and external solutions with the goal of establishing this system, along with joint laboratories and startups, at ITMO Highpark beginning in 2025.
- Active involvement in the formation of a national standardization and certification system.

Shifting the focus of the innovation policy. The university's experience with innovation within the scope of the previous development strategy indicated two distinct trends: 1) commercialization of intellectual property is challenging since clients, particularly state and major industrial organizations, tend not to engage in IP licencing, preferring custom projects with a full transfer of IP rights, **restricting future development** of the generated IP; 2) IP creators (researchers, graduates) are often **successful in entrepreneurship, especially digital entrepreneurship** (see Appendix 8), thus demonstrating that the innovation environment created at the university actively generates individuals with original projects.

As a result, three new focus areas of innovation policy are proposed: 1) the transfer of **knowledge** (not R&D) for a specific result is our strong point; 2) innovation **openness** (a free database of major IPs for partners) instead of exclusivity of IP rights; 3) a focus, first and foremost, on private investments and the initiative of graduates and staff, rather than on state funding; an **emphasis on IP creators** rather than their IPs.

The following steps are intended to achieve this goal:

- Investment in IP creators, not their works. Focus on building a conducive atmosphere for innovation within the university and providing direct funding to startups exclusively through private investors. Implementation of a no-interference policy for entrepreneurial culture, as well as reduced limitations on the growth of student entrepreneurship.
- Creation of an open (free joint use) pool of major IPs for all members of the consortium under ITMO’s public license in order to facilitate development of more IPs. Development of mechanisms for commercialization of unique solutions based on major IPs. Adherence to the international patenting policy.
- Focusing the university’s innovation support mechanisms on the interests of its partners among investment funds. Special attention is devoted to digital technologies that correspond to the focus areas of M-platforms.
- Introduction of an effective remuneration policy for IP authors and structural units in which the IPs were created so as to increase the motivation for commercialization.

- Addition of a new ITMO startup studio(s) to the already proven innovation support structures – ITMO Accelerator and ITMO Technopark.
- Development of systems for the dissemination of the open IP database to the broadest possible target audience, particularly major strategic industrial partners (including state corporations).
- Acceleration of technological transfer through the deepest possible cooperation of research teams with small businesses or individual entrepreneurs willing to commercialize the research teams' ideas. Creation of an informative public website/application with a list of key completed research projects, including practical student R&D.
- Introduction of procedures for evaluating the university's successful R&D in terms of their productivity-boosting ability (entrepreneurship is not just money).
- Organization of regular conferences for graduates-entrepreneurs where they can exchange experience with the next generation of students.

Staffing research work by training and increasing the number of PIs. As per this policy, PIs – modern researchers and managers who are capable of setting and accomplishing breakthrough goals on the scientific frontier, familiar with high tech markets, and able to set up R&D&I projects – become the key drivers of research and innovation processes at ITMO. ITMO University's research policy aims to effectively train highly competent researchers based on the principles of continuity (Master's students –> young scientists and PhD students –> young researchers and postdocs) and close coordination of such training with the demands and aims of the real economy. To achieve this objective, ITMO plans to:

- Organize practical R&D involving Master's and PhD students in collaboration with industrial partners.
- Increase the number of interdisciplinary Master's and PhD theses by improving the final thesis defense procedures based on the experience of double-degree programs; expand the number of external experts, particularly international ones, involved in the preparation and evaluation of theses.

- Invite representatives of industrial partners to act as co-supervisors for PhD students, therefore strengthening the engagement of the industry in PhD education; ensure the systematic development of research, scientific, and industrial work experience and internships; develop corporate support for PhD students; introduce a mandatory project internship phase (up to 1 year) at leading research groups and international companies as part of PhD curricula; introduce intensive courses dedicated to the assessment of emerging markets and identifying technological gaps in current innovation processes.
- Develop a set of measures intended to support young scientists at all stages of their professional development (Master's students –> young scientists and PhD students –> young researchers and postdocs) and motivate them to continue research and teaching after receiving their PhD.
- Improve postdoctoral support so that young researchers receive effective and tailored guidance after completing their PhDs.

2.3. Youth policy

ITMO's youth policy is rooted in the values of collaboration, co-creation, openness, and freedom and aims to provide opportunities for personal growth and prepare young people for new challenges.

ITMO's student government has developed and implemented an automated student ranking system that takes into account students' achievements in educational, research, social, cultural, creative and sports activities and introduced a unique student club system. Students begin their careers by finding like-minded peers through clubs (132 in total). To date, 20% of students are employed at the university. The university also operates the ITMO.Future digital platform, which gives students the opportunity to be involved in the university's development, create new communication tools, develop digital services, and design new outdoor areas on the university grounds. The next stage of this project will include a platform for the development of city-wide and regional initiatives.

ITMO's youth policy contributes to the Highly Personalized Value-Based Education, Well-Being, Scientific Breakthrough and ITMO.Impact strategic projects through the following means:

- Shaping a conscious approach to one's life path and a readiness to make independent meaningful choices and take responsibility for one's own decisions:
  - the formation of a habit of making active conscious choices: first year-students adapt to new conditions and university life through interactive immersion as part of a week-long event called Introduction Days;
  - engagement of students in university-wide research, surveys and questionnaires; rapid changes are implemented by the university management based on feedback, with results communicated through student-friendly channels;
  - development of a recommendation system for extracurricular activities (Jigsaw Education development project);
  - continuous exploration of new communication channels and formats; organization of public discussions and assessment of student-driven ideas and university-wide initiatives.
- Integration of extracurricular activities into the educational process. Student clubs provide opportunities to develop not only soft, but professional skills as well:
  - creation of student clubs together with university alumni (Alumni.Impact development project); formation of mixed teams, including with university partners, and addition of entrepreneurial tracks to club activities as part of the Impact Entrepreneurship development project;
  - development of a system for tracking the results of extracurricular activities (digital dynamic knowledge verification system);
  - interpretation of science through the creative projects of student clubs.
- Creation of an environment in which students can combine their educational process with work or projects at the university:
  - students are able to channel their energy into the university’s development through a system of brief internships within the various departments;
  - entrepreneurial culture is woven into students’ scientific and engineering activities so that ideas can be developed into new products and services for consumers.
- Creation of opportunities for the formation of well-rounded and socially responsible individuals inspired by Russian values and historical and cultural traditions:

- students and staff align themselves with ITMO University; the achievements and victories of ITMO.Family members and the university are demonstrated as an integral part of the country's development;
- development of academic and extracurricular mobility within Russia as a way to help students learn more about the diversity of the country's cultures, ethnicities, and faiths;
- support of the students' cultural identity as St. Petersburg residents, their involvement in the development project The Home of ITMO University, and the development of services for those in St. Petersburg;
- projects aimed at introducing international students to Russian culture and developing cross-cultural communication with the goal of creating a positive image of Russia abroad.

2.4. Human capital management policy

ITMO University adheres to a human capital management policy based on the following principles: ITMO University values (respect for the individual, integrity, academic freedom, openness, and love), initiative, a sense of belonging to a common cause, the balance between freedom and responsibility, conditions for maintaining and improving health, as well as care for the city and the country.

As a result of the university's efforts to attract and support qualified young staff during its previous stage of development (2013-2020), the university has succeeded in: improving the managerial decision-making process; automating the non-primary functions of educational and research departments and transferring them to administrative departments; doubling the number of students employed by the university; enhancing staff's skills as a result of new and diverse qualification requirements; and introducing a system for the professional development and well-being of staff.

Its commitment to solving scientific, technical, and educational challenges on a global scale motivates ITMO to pursue a variety of objectives, one of which is the development, retention, multiplication, and attraction of new team members. Therefore, it is critical for the university to offer appealing working conditions comparable to those of the world's best

universities and companies. For the most effective implementation of all four strategic projects, ITMO will focus its efforts and resources until 2030 on the following:

Creating conditions for attracting new ITMO. Family members through:

- continued development of the university's HR brand as a draw for young, dynamic, and progressive individuals. An important element is the Well-Being strategic project, which focuses on designing effective ways to care for students and staff and finding one's mental and life balance. The project has already been successful in drawing new talent to ITMO;
- modification of the open call for academic positions to include individual development tracks and relocation support for new faculty from other regions and countries (ITMO.Relocation program);
- launch of the ITMO.Talents program, which seeks to attract new and support existing postdocs, produce academic supervisors through the PI school, academic career planning for all ITMO.Family members, and a peer-guide scheme for staff;
- upscaling of the ITMO.Mentors project: engaging students in teaching work (already implemented) and launching a new program track for students to explore short-term administrative roles within the university;
- creation of a national platform and organizing events that bring together current and potential lecturers, allowing them to share experiences, find new jobs, and create a support system for teaching staff;
- launch of the ITMO.Crowdsourcing initiative, allowing all interested parties to collaborate on the university's projects;
- development of the ITMO.Megapolis program: the initiative will use data analysis algorithms created at ITMO to assist St. Petersburg residents in finding jobs with commercial companies and the university itself.

Creating favorable work conditions with a focus on:

- providing the option of working remotely from anywhere, including ITMO offices across Russia and the world; the opportunity to choose one's work format (a coworking area, a shared office, a remote workspace, a personal office);

- involving product management experts who will support research staff at every stage: from market research to commercialization of projects (See Section 2.2);
- establishing the ITMO.Community initiative to facilitate collaboration between university staff at any level, exchange of experience, and the implementation of joint initiatives between departments; simplifying organisational procedures by collaborating with the HR teams of ITMO University's consortium partners;
- launching the hr.itmo.ru portal, set to include a digital employment system, the ITMO.Adaptation program (digital and human assistants tasked with helping integrate new staff), an online orientation, a course on life at ITMO and the university's values, staff members' success stories, and a feedback system;
- supporting and facilitating initiatives aimed at promoting consistent, clear, and transparent behavioral standards among staff members;
- implementing the ITMO.Care program to provide a children's room for children of staff and students; includes counseling, sports training and equipment rentals, and health-related courses;
- creating conditions for work/life balance with ITMO.Reboot – an infrastructure project that includes quiet noise-insulated rooms for relaxation and outdoor leisure areas (see Section 2.5);
- introducing a culture of sabbaticals at the world's leading universities and tech companies for ITMO teaching staff.

Creating conditions for professional and personal development of staff:

- creation of a unified social network-esque platform that provides communication tools, the ability to create clubs, and easy access to information about staff members. Furthermore, the platform will include professional development programs, smart personalized newsletters, chatbots, and human capital management based on predictive analysis;
- development of the ITMO.Internship program, which allows teaching staff to join internships at Russian and international companies – and specialists from third-party companies to become involved in the work of ITMO's research labs and educational projects.

2.5. Campus and infrastructure policy

Today's top universities compete for the brightest minds worldwide. Comfortable work and study conditions and a stimulating atmosphere are critically important to succeed in that endeavor. ITMO University's campus and infrastructure policy aims to create a next-gen phygital campus where all residents simultaneously live in the virtual and physical worlds or shift between them. ITMO Highpark will be the driver of this phygital campus; there, the synergy of education, science and business in a smart self-regulating environment adapted for different generations – and equipped with its own or partner-made digital services, as well as advanced infrastructure – will contribute to the unlocking of human potential and the implementation of breakthrough research in the city-turned-lab of St. Petersburg.

Development principles of the campus and infrastructure policy:

- Multidimensionality of spaces: a balance between physical and virtual reality; new approaches to spaces for research and learning; the ability to study and work everywhere and always – in 24/7 coworking spaces, in green areas, outdoors or in virtual reality, in another city or at a partner university.
- An AI/ML-based campus management model: artificial intelligence, machine learning, and digital avatars make it possible to collect and process big data from campus residents in order to quickly make decisions, respond to situations, provide comfortable conditions, and create a welcoming and productive environment.
- A smart campus defined by seamless integration, development, and security. ITMO’s campus serves as a smart testing ground for all things new, as well as a site for testing new technology and as a secure space where all of the residents’ data is safely stored. On campus, residents have access to internal services and can seamlessly, with no restrictions, access external services (such as car and scooter sharing, etc.).

Objectives of the new campus and infrastructure policy:

- to create a fluid environment that allows areas to be used for a range of purposes: collaborative learning spaces and coworking areas, VR classrooms for mixed-reality learning, podcast and webinar studios, startup garages (sandboxes for projects where teams can gather at night and between classes to create the next HP or Yandex), and

public places for horizontal communication, continuous and diverse networking possibilities (such as open spaces, quiet zones, and rest areas), and the promotion of a healthy lifestyle.

- to value the cultural code of the city and country: make the campus increasingly accessible to non-residents (tourists and locals of St. Petersburg) through the creation of a science museum at ITMO Highpark, hold public sports and popular science events, and involve residents' families in city-wide events at the university and at other venues, such as in public urban spaces and creative clusters.
- to harmonize the development of two campuses – a distributed urban campus (a point of attraction for prospective Bachelor's students) and the greenfield project ITMO Highpark (a hub for Master's and PhD students involved in joint high-tech research projects with the industry) – through the establishment of common information and logistics systems, business processes, and other joint events.
- to develop the university's material and equipment pool, regularly upgrade its hardware and software components, service and certify equipment in a timely manner, ensure ease of access to the university's resource centers and their convergence and cross-platform availability, through the development of a unified information system and the approval of clear and transparent regulations on obtaining access to the university's material and equipment pool.
- to follow the green campus philosophy and comply with environmental standards, adhere to international Green Zoom standards, encourage sensible and conscious consumption and a sustainable approach to the environment and natural resources, and reduce the university's carbon footprint.
- to develop customized campus services: respond swiftly to residents' needs, maintain a welcoming, comfortable, clean, and modern environment, build up the campus ecosystem with the help of partners and new add-ons and services (electric vehicles, food delivery, unmanned vehicles, systems for feedback collection and monitoring of issues related to campus maintenance and residents' well-being – partly through the use of AI and digital avatars.

- to foster an atmosphere in which new residents from other cities or countries can seamlessly integrate into a tolerant and multilingual community and individuals with various interests, cultures, and languages can freely network and mingle, as well as provide an active relocation and immersion program, all through a world-class social infrastructure.
- to ensure the safety of campus residents and the rising amounts of their data (entails the creation of a campus data center capable of assuring the high degree of cybersecurity of residents' and partners' projects, as well as assist the residents in matters of IP protection) and implement a facial recognition and biometric data analysis system for proctoring and ease of authentication.
- to develop the smart-campus-in-a-smart-city concept and synchronize the electronic services of the campus, region, country, and partners (internal digital assistants: campus navigation, event updates, schedule change and emergency notifications, as well as extensive online monitoring of spaces for improvement-focused decision-making, foot traffic management, and an on-campus super app.).

The implementation of this policy will enable us to create a phygital campus ecosystem: a distributed office for a St. Petersburg-based research and education corporation of the future that will stand alongside companies such as Yandex, Sberbank, and Alibaba Group – companies our students and graduates aspire to and work at. This is a completely novel space, never before seen at other universities in terms of its philosophy and design, that meets the highest international standards.

2.6. University management system

One of ITMO's qualities for 2021-2030 is **speed** – and it is a defining characteristic of the development strategy and university management system.

At the previous stage of the university's development, ITMO formed a management model characterized by high decentralization, and also delegated certain administrative tasks of research and teaching staff to university-wide offices to streamline this work, such as the Faculty Support Office and the Student Services Office.

The 2021 university management system is clear to students and staff, transparent and distributed, with a data-driven decision support system. It employs project-based implementation of the development strategy and ITMO.Family members are ready to take on responsibility for specific results and decisions. This way, working groups, communities, and partnerships become key elements which, based on the principles of a matrix model, initiate, generate, and implement new projects, change business processes, and suggest new paths for development.

The university's digital transformation implies that all processes and interactions are happening simultaneously in two realities (physical and virtual), and each actor has their own digital avatar. This transformation is meant to accelerate and change business processes.

ITMO University works at the frontiers of science, which underlines the importance of research and technological foresight as a prediction tool, readiness to take risks, critical thinking, and the speed of generation and implementation of management solutions. **The key qualities of the new 2030 management model** are flexibility, openness, strong horizontal communication, result-oriented, generation of all things new, high efficiency, support of intensive growth and continuous development thinking, and the creation of an environment for collective assessment of results and an open attitude towards failure.

The Development Strategy management system is based on the following principles: each participating department, including M-platforms and consortia is responsible for producing results; a seamless and dynamic role-based management model; matrix organization of strategic projects implementation; amalgamation of the resources and competencies of the university and its partners; wide engagement of students into the implementation of strategic projects.

The Development Strategy's management structure consists of:

- **Supervisory Council**: external expertise and setting of strategic development tasks taking into account Russian national objectives and priorities, control of the Strategy's implementation, suggestions on the strengthening of the university's key development fields, and approval of changes in the Development Strategy;

- **Academic Council**: strategic development tasks based on the opinion of the university's expert community, control of the Strategy's implementation, a platform for collaborative development of solutions and suggestions on the strengthening of or adjustments to the Strategy;
- **International Council**: strategic development tasks based on the global context and international expertise, international discussion, and the search for new solutions, approaches, or tools for the university's development (or improvements to the existing ones) in the course of the implementation of the Strategy;
- **Development Strategy Coordination Council**: key consultative body in the Development Strategy management structure; an expert platform for strategic sessions and discussions on the development and monitoring of, and adjustments to the Development Strategy. The Council includes representatives of ITMO's senior management, including the rector and Vice Rector responsible for the Development Strategy, strategic project coordinators – young managers in research, education, commercialization, and the university's social mission, as well as young PIs and heads of educational programs;
- **M-platforms and consortia managing councils**: strategic development tasks for the M-platform fields focused on solving the big challenges of the Scientific and Technological Development Strategy of the Russian Federation and achieving Russia's national objectives, proposal and approval of transformation and development projects implemented in the consortia, division of risks and responsibility for results, exchange of resources;
- **Rector**: scientific consultant of the Development Strategy, handling of the university's strategic development tasks in implementing the Development Strategy;
- **Vice Rector responsible for the Development Strategy (First Vice Rector)**: general management of the Development Strategy and the university's public image, monitoring and control of the Development Strategy's implementation, particularly as part of the Priority 2030 program;

- **Strategic Project coordinators**: strategic and operational management of the launch and implementation of strategic and development projects, monitoring and control of activities within strategic projects;
- **Development Strategy Management Board**: strategic forecasting and R&D foresight during implementation of the Strategy; Strategy management based on predictive management principles, including predictive analytics, monitoring, reports based on internal and external information systems, communication within ITMO and with external structures, including the Ministry of Science and Higher Education of the Russian Federation and the coordinating team of the Priority 2030 program, on issues concerning the implementation of the Strategy.

The M-platforms' management system consists of the following management bodies:

- **Managing Council:** the highest management body of an M-platform, which is a board consisting mainly of representatives of the M-platform's consortium, as well as of ITMO University staff. The Council is responsible for developing and timely updating the platform's development program, shaping its research and educational agenda, developing its investment strategy, providing expert support for the implemented projects, building and developing relationships within the consortium, as well as approving and controlling the M-platform's KPIs. The Council's solutions are approved by the Development Strategy Coordination Council, the Research and Development Council, and ITMO University's Academic Council.
- **Executive Council:** its members and structure are chosen taking into account a specific M-platform. The Council might consist of academic and industrial co-supervisors; executive, technical, and operational directors; or heads of the research, educational, and innovation fields. The Council is responsible for operational management, including implementation of plans, compliance with deadlines and budgets, organization of the work of heads of projects, ensuring unfailingly functioning infrastructure, resolution of HR issues, as well as development and control of internal regulations.

- **Heads of projects:** they are appointed independently of the management hierarchy. Heads of projects are responsible for managing the allotted resources, as well as the research and teaching staff of their projects, using the principle of division of administrative and functional subordination. Heads of projects report their achieved results of specific projects to the Executive Council.

Administrative staff: they are responsible for the correct functioning of services accompanying the implementation of M-platform projects and the coordination of interaction with the university's management and service departments. Managers report to the Executive Council of the M-platform.

2.7. The university's financial model

Characteristics of the current financial model (detailing the structure of the major income and spending sources)

The sustainability and efficiency of the economic aspect of ITMO University's 2020 target model was ensured by reimbursing the total financial costs of existing activities while simultaneously investing in material, technical, humanitarian, and intelligent infrastructure at a pace adequate to maintain the future production potential, as well as meet the needs of students and other consumers.

ITMO University's income and expense structure is presented in the table 2.1 (in thousand rubles):

Table 2.1

Description	2020		2019	
	Income	Expenses	Income	Expenses
CFS2 (non-state)	3,338,001	3,147,565	3,381,668	2,958,323
CFS4 (state)	3,598,701	3,163,432	3,315,877	3,062,168
CFS5 (earmarked subsidies)	1,672,432	1,856,240	1,272,272	1,337,724
Total state CFS4+CFS5	5,271,133	5,019,672	4,588,149	4,399,892
Total	8,609,133	8,167,237	7,969,817	7,358,215
% non-state financing	38.77	38.54	42.43	40.20
Income - expenses		441,896		611,602

The income structure for earmarked subsidies for 2020 is presented in the table 2.2:

Table 2.2

Item description	Unit	Amount
Student stipends from the federal budget	thousand rubles	423,310
Subsidies from Project 5-100	thousand rubles	875,784
IT-related infrastructure	thousand rubles	279,996
Anti-terror	thousand rubles	59,223
State support for measures against COVID-19	thousand rubles	33,997
Other	thousand rubles	122
Total	thousand rubles	1,672,432

The income structure for state contracts for 2020 is presented in the table 2.3:

Table 2.3

Item description	Unit	Amount
Educational programs	thousand rubles	3,302,831
Youth policy events	thousand rubles	89,426
Fundamental research	thousand rubles	186,438
Applied research	thousand rubles	20,006
Total	thousand rubles	3,598,700

The main principles of the planned changes in the financial model and its strategic/prospective parameters

Based on the current financial model, which relied on optimizing key global science and education areas of ITMO's development, ITMO's new financial model for 2021-2030 takes into account the goals, priorities, and tasks of the ITMO 2030 Development Strategy.

The development strategy is focused on training a new type of graduates, the highest standard of educational quality, breakthrough scientific research and technology transfer, as well as generation and implementation of all things new (see Section 1.3).

To implement the above-mentioned priorities, ITMO University is making changes to its financial model which aim to increase commercialization and attract private funding (non-state sources) to finance the university's research efforts.

The main idea of the new financial development model is to move away from extensive income growth as a result of the provision of services, the expectation of donations from benefactors, or an increase of state-funding, but rather focus on proactive growth through investments from legal entities (companies, associations) and individuals as a result of collaboration with the university's business partners. Due to the organizational and legal features inherent in a public institution, ITMO University cannot attract (at least at present) investments from private individuals as an independent economic entity. Therefore, investment support will be carried out in partnership with legal entities that are part of the university's ecosystem through the consortium model.

The consortium model of the university's development will lead to significant effects for Russia’s business and economy as presented in Table 2.4:

Table 2.4

Financial results and effects	Unit	Amount
Investment volume in 2021-2030		
Investments from the federal budget	mln rubles	9,900
Investments from the regional budget	mln rubles	-
Investments by non-government sources	mln rubles	9,805
Total	mln rubles	19,705
State and regional tax revenue stemming from the implementation of the initiative in 2021-2030		
Regional budget	mln rubles	3,928
Federal budget	mln rubles	12,879
Total	mln rubles	16,806
IRR of the federal budget	%	28.5%
Payback period for federal budget	years	7
The ratio of state financing to private financing by the end of 2030	years	0.65

The implementation of the 2030 Strategy will create about 1,200 high-paying jobs. Proceeds from the sales of IP and other outcomes related to the implementation of the program will reach 16 billion rubles by 2030. Net income from the development strategy will be 2.1 billion rubles.

As the development strategy kicks off in 2021, 80 Master's and PhD students will find new jobs, and by 2030 this figure will grow to 1,000 Master's and PhD students and 200 people in PI positions.

In terms of its financial model, the ITMO 2030 Development Strategy aims to increase investments in ITMO's main development areas (M-platforms). The university's role is to create transparent and clear conditions for attracting investments in order to achieve the financial results and effects outlined above.

Economic model of the ITMO 2030 Development Strategy is presented in the table 2.5.

Table 2.5 Economic model of the ITMO 2030 Development Strategy

List: Budget effects												
Year	Units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
B.o.p			1Q 2021	1Q 2022	1Q 2023	1Q 2024	1Q 2025	1Q 2026	1Q 2027	1Q 2028	1Q 2029	1Q 2030
E.o.p			4Q 2021	4Q 2022	4Q 2023	4Q 2024	4Q 2025	4Q 2026	4Q 2027	4Q 2028	4Q 2029	4Q 2030
Duration			1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
Period number			1	2	3	4	5	6	7	8	9	10
CPI (Russia)	%		4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%	4,0%
Budget income calc												
Direct Effects												
Pi employees												
Pi number	man		16	90	100	120	140	160	180	200	200	200
Other	man		80	450	500	600	700	800	900	1 000	1 000	1 000
Salary with deductions												
Pi salary	rub`000		2 800,0	2 912,0	3 028,5	3 149,6	3 275,6	3 406,6	3 542,9	3 684,6	3 832,0	3 985,3
Other emp. Salary	rub`000		940,0	974,0	1 000,0	1 020,0	1 080,0	1 110,0	1 200,0	1 240,0	1 250,0	1 280,0
Salary w/o deductions												
Pi salary	rub`000		2 372,9	2 467,8	2 566,5	2 669,2	2 775,9	2 887,0	3 002,5	3 122,5	3 247,5	3 377,4
Other emp. Salary	rub`000		723,1	749,2	769,2	784,6	830,8	853,8	923,1	953,8	961,5	984,6
Total salaries w/o deductions	mln rub	10 423	95,8	559,3	641,3	791,1	970,2	1 145,0	1 371,2	1 578,4	1 611,0	1 660,1
Amount of deductions	mln rub	2 626	24,2	141,1	161,6	198,9	244,4	288,1	346,5	398,6	405,4	417,0
Project management salary												
Total PM expenses	mln rub		20,0	100,0	100,0	130,0	140,0	160,0	190,0	220,0	250,0	260,0
Salary ratio	%	70%	14,0	70,0	70,0	91,0	98,0	112,0	133,0	154,0	175,0	182,0
Project management salary	mln rub		10,8	53,8	53,8	70,0	75,4	86,2	102,3	118,5	134,6	140,0
Amount of deductions	mln rub	254	3,2	16,2	16,2	21,0	22,6	25,8	30,7	35,5	40,4	42,0
Расчет Personal income tax calc												
Total salaries w/o deductions	mln rub	11 269	106,6	613,1	695,1	861,1	1 045,6	1 231,1	1 473,5	1 696,8	1 745,6	1 800,1
PTI rate	%	13%										

Personal income tax	mln rub	1 465	13,9	79,7	90,4	111,9	135,9	160,0	191,6	220,6	226,9	234,0
Indirect effect calculation												
Amount of employees												
Amount of employees	man		96	540	600	720	840	960	1 080	1 200	1 200	1 200
Total	man		96	540	600	720	840	960	1 080	1 200	1 200	1 200
Profit tax base determination												
Labor productivity growth in real terms	%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%	3%
Average return of corporate sector	%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%	16%
Average productivity of labor (innovations)	rub`000	7 002	7 002	7 520	8 076	8 674	9 316	10 005	10 746	11 541	12 395	13 312
Productivity increase	rub`000		7 002	7 520	8 076	8 674	9 316	10 005	10 746	11 541	12 395	13 312
Average ratio of value added to revenue	%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Amount of employees	man		96	540	600	720	840	960	1 080	1 200	1 200	1 200
Revenue	mln rub	89 557	672	4 061	4 846	6 245	7 825	9 605	11 605	13 849	14 874	15 974
Profit tax base	mln rub	14 598	110	662	790	1 018	1 276	1 566	1 892	2 257	2 424	2 604
Profit tax calc												
Profit tax base	mln rub	14 488		662	790	1 018	1 276	1 566	1 892	2 257	2 424	2 604
Profit tax rate	%	20%		0%	0%	0%	0%	0%	0%	0%	0%	0%
Profit tax	mln rub	2 898		132	158	204	255	313	378	451	485	521
Profit tax to regional budget	mln rub	17%		113	134	173	217	266	322	384	412	443
Profit tax to Federal budget	mln rub	3%		20	24	31	38	47	57	68	73	78
VAT calc												
Revenue	mln rub	88 885		4 061	4 846	6 245	7 825	9 605	11 605	13 849	14 874	15 974
VAT taxable part of revenue	%	70%										
VAT rate	%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
VAT	mln rub	12 444		569	678	874	1 096	1 345	1 625	1 939	2 082	2 236
Budget income (total)												
Regional budget												
Profit tax	mln rub	2 463	-	113	134	173	217	266	322	384	412	443

Personal income tax	mln rub	1 465	14	80	90	112	136	160	192	221	227	234
Total (regional)	mln rub	3 928	14	192	225	285	353	426	513	604	639	677
Federal budget												
Profit tax	mln rub	435	-	20	24	31	38	47	57	68	73	78
VAT	mln rub	12 444	-	569	678	874	1 096	1 345	1 625	1 939	2 082	2 236
Total (federal budget)	mln rub	12 879	-	588	702	905	1 134	1 392	1 681	2 007	2 155	2 315
Budget expense												
Federal&Regional budget expenses												
Federal budget												
Base part of a grant	mln rub	1 000	100	100	100	100	100	100	100	100	100	100
Special part of grant	mln rub	8 900	-	900	900	900	900	1 000	1 000	1 100	1 100	1 100
Other	mln rub	-	-	-	-	-	-	-	-	-	-	-
Total, federal budget	mln rub	9 900	100,0	1 000,0	1 000,0	1 000,0	1 000,0	1 100,0	1 100,0	1 200,0	1 200,0	1 200,0
Regional funds												
Regional government funds	mln rub	-	-	-	-	-	-	-	-	-	-	-
Local government funds	mln rub	-	-	-	-	-	-	-	-	-	-	-
Total, regional budget	mln rub	-	-	-	-	-	-	-	-	-	-	-
Extra budget funds												
Extra-budgetary sources												
Funds from the commercial R & D	mln rub	6 188	75	100	200	450	585	669	822	1 053	1 095	1 139
Incomes from paid educational activities	mln rub	3 617	25	25	50	112	292	426	633	658	684	712
Total, extra-budget funds	mln rub	9 805,1	100,0	125,0	250,0	562,4	877,4	1 095,0	1 455,1	1 710,7	1 779,1	1 850,3
Summary												
Investments summary												
Federal budget	mln rub	9 900,0	100	1 000	1 000	1 000	1 000	1 100	1 100	1 200	1 200	1 200
Regional budget	mln rub	-	-	-	-	-	-	-	-	-	-	-
Extra budget	mln rub	9 805,1	100	125	250	562	877	1 095	1 455	1 711	1 779	1 850
Total	mln rub	19 705,1	200,0	1 125,0	1 250,0	1 562,4	1 877,4	2 195,0	2 555,1	2 910,7	2 979,1	3 050,3
Budget effects												

Incomes to Regional budget (due taxation)												
Total	mln rub	3 928	14	192	225	285	353	426	513	604	639	677
Incomes to Federal budget (due taxation)												
Total	mln rub	12 879	-	588	702	905	1 134	1 392	1 681	2 007	2 155	2 315
Budget expenses												
Federal budget	mln rub	(9 900)	(100)	(1 000)	(1 000)	(1 000)	(1 000)	(1 100)	(1 100)	(1 200)	(1 200)	(1 200)
Regional budget	mln rub	-	-	-	-	-	-	-	-	-	-	-
Total	mln rub	(9 900)	(100)	(1 000)	(1 000)	(1 000)	(1 000)	(1 100)	(1 100)	(1 200)	(1 200)	(1 200)
Budget effect (overall)												
Budget effect	mln rub	6 906	(86)	(219)	(73)	190	487	718	1 095	1 411	1 594	1 791
IRR	%	73,6%	(86)	(306)	(379)	(189)	298	1 016	2 110	3 521	5 115	6 906
Payback period	years	5										
Budget effect (Federal budget)												
Budget effect (Federal budget)	mln rub	2 979	(100)	(412)	(298)	(95)	134	292	581	807	955	1 115
IRR	%	28,5%	(100)	(512)	(810)	(905)	(771)	(479)	102	909	1 864	2 979
Payback period	years	7										
Budget/Extra-budget funds ratio												
Budget funds	mln rub	9 900	100	1 000	1 000	1 000	1 000	1 100	1 100	1 200	1 200	1 200
Extra budget	mln rub	9 805	100	125	250	562	877	1 095	1 455	1 711	1 779	1 850
Total	mln rub	19 705	200	1 125	1 250	1 562	1 877	2 195	2 555	2 911	2 979	3 050
Ratio	%		100%	800%	400%	178%	114%	100%	76%	70%	67%	65%
Total, accumulated	%		100%	489%	442%	299%	214%	173%	141%	121%	109%	101%

2.8. Digital transformation policy

The main aim of ITMO University's digital transformation is designing business processes based on new principles. This will mean optimizing business processes, as well as generating and announcing value propositions, particularly beyond the university. This kind of transformation has to take into account the rising demand for personalization, as well as the increase in the speed and awareness of the decision-making process, the automatization of routine processes, and information security. The transformation will have to be based on a new technological foundation and will actively apply big data analysis tools, predictive analytics and recommendation algorithms, as well as distributed ledger technologies and smart contract communication protocols.

In order to support this digital transformation, the university will continue developing its corporate digital environment that brings together all members of ITMO.Family and aggregates services of various work and educational platforms. Importantly, this task does not solely imply the automatization of the main fields of activity of the university. Rather, it is more about the creation of brand new exclusively digital services (e.g. interaction with the Student Services Office, participation in various contests, or thesis-related work), as well as successful implementation of a predictive analytics system for studies, research, and administration that will speed up all of the associated business processes.

Data aggregation, collection, cleansing, and validation, as well as the credibility of data provided by the institution and beyond, are all critical factors for digital transformation.

The digital transformation of ITMO University aims to implement all four strategic projects of the strategy. It implies changing the university's management structure and system, creating a digital university filled with avatars (digital versions of prospective and current students, graduates, staff, and partners), as well as developing services and scenarios of their interaction to allot human resources to new tasks as a result of the automatization of routine processes.

Key principles of digital transformation:

- personalization, acceleration, and digitization of educational, research, and administrative processes based on IT services, data analysis, and machine learning;

- development of a strategic decision-support system based on advanced analytics of ITMO's ecosystem and external sources (partners, state services, and popular super apps). Crucially, this data should be clean and verified;
- creation and development of a unified IT infrastructure that would make it possible to develop and implement new services based on the data and interfaces of the already available ones. Integration of various IT systems on all levels.

Fields of digital transformation development:

- Digital culture, meaning the development of digital competencies of staff and students, which will result in a new thinking pattern and decision-making system, as well as the adoption of new rapid, open, and transparent business processes necessary for digital transformation in place of the classic ones.
- The digital ITMO.Family community, which is a collaborative platform for the interaction of avatars that aggregates each participant's services and resources based on their comprehensive dynamic representation. This platform will become the next stage of development for the university's corporate environment by creating a digital portrait of each member of ITMO.Family and track their progress.
- Personalized tracks, which is an approach that allows to build and quickly adjust an avatar's path (educational or professional), track their progress, and recommend relevant development tools, collaborations, and data within the university and beyond.
- Data-driven management – a decision-making strategy that employs big data, predictive analytics, and AI. This field also includes the development of a decision support system based on an existing monitoring system and employing validated data, quick feedback, and a targeted approach.
- Hybrid infrastructure – a seamless integration of physical and digital realities within the phygital campus concept, which would make it possible to organize a new academic process and research interactions. This field is to be implemented by a deep integration of the university's digital platform with external services.
- Information and cyber security – aggregation, processing, and application of validated and structured data; internal and external systems for cyber defense.

Methods:

- Assembling a team of digital reformers: business analysts, developers, as well as experts in big data, machine learning, and AI to implement the digital transformation system – primarily students, as active users of the created systems;
- Implementation and integration of external platforms for classic routine tasks (accounting, paperflow, LMS), with an emphasis on supporting unique educational and research tasks;
- Diversification of IT solutions (cloud technologies and low-code, active student engagement: internships, ITMO.Future, ITMO.Developer);
- Multimedia systems and platforms that make it possible to transition from online and remote learning to a hybrid format and ensure VR presence in class and meetings. This method also means the application of computer vision and biometric data technologies for identification and control of access to data and services;
- Implementation of distributed ledger technologies and smart contracts when designing individual learning tracks, allocating infrastructural, financial, and intellectual resources, as well as when approving legal documents.

In summary, digital transformation aims to create an ecosystem and culture that stimulates organizational and personal growth and raises the quality of education and research both within the university and beyond.

2.9. Open data policy

Openness is one of ITMO's key qualities. It enables the university's activities to be more transparent and accessible, thereby increasing public trust in the university and its research findings. Being research- and education-oriented, ITMO University generates a lot of data that fulfills a public demand. This includes staff and students' IP (from published articles and lectures to popular science talks and expert reviews), as well as data based on the digital footprint of various parties as they interact in and outside of the university. At the same time, the rate of data generation has skyrocketed, often leading to its rapid loss, obsoletion, and lack of internal structure, as well as issues with how it's understood or interpreted and a lack of accessibility, reliability, and credibility.

ITMO's open data policy ensures the openness, reliability, and availability of various data for the public through the university's digital platform.

This policy will enable ITMO to:

- **draw** new members into its ecosystem, thus effectively getting over the scalability problem and creating a community of like-minded people who use the university's services;
- **share** the data with the public for free in the form of data sets that can be processed automatically, which will help solve the issues of data reliability, integrity, and credibility;
- **assess** the current public demand for data and IP, making it possible to focus future initiatives on specific demands;
- **provide** public access to the university's experience and expertise;
- **increase** the speed of access to data and its credibility.

The aim of this policy is to turn the university into a world-class hub for open data relevant to ITMO's competencies. This hub would be based on the foundations of trust built by the professional community.

Key events within the policy:

- design of an open data publication standard and algorithms that take into account specific types of data (i.e., sensitive or personal data) and adhere to recognized international practices and standards (International Open Data Charter, Frictionless Data, Project Open Data, The ODI, the Johns Hopkins University standards);
- analysis of licensing and legal issues linked to applying the policy in the current legal environment, as well as the development of proposed legal changes;
- establishment of clear and understandable rules and mechanisms for operating with open data that are agreed upon with partners and participants of the data generation process;
- creation of services and infrastructure (a gateway for the general public) that provide access to data stored on ITMO's digital platform;
- development of systems for regular data renewal;

- promotion of the open code principle and creation of sought-after repositories of raw data and algorithms;
- integration with existing data sharing and repository platforms (i.e., GitHub, IPChain, etc.);
- involvement of the public in the university's open projects;
- popularization of ITMO's research results and the practice of public data access, including through social media.

The policy's priority is to ensure the openness of all of the university's research findings, excluding a limited range of non-publishable data.

3. Strategic projects

3.1. Strategic project 1. ITMO.Impact

During the implementation of the previous Development Strategy, the university's priorities were research, education, and innovation, while its main motivation was the boosting of its reputation. By now, ITMO has accumulated a significant pool of scientific and technical knowledge. At the present moment, the need has become clear to adopt a **new strategic focus – an increase in output**, i.e. the university's impact on the national economy, the society, and on individuals. This, along with the active digital transformation of the global economy, calls for a rapid acceleration of the rate at which products enter the market; at the same time, the products are becoming more interdisciplinary and advanced. It is necessary to **develop high-TRL technologies** wherein **products are released directly onto the market** for quick access by customers. At the same time, it is vital that these **technologies are trusted and well-received by the public**. Commercial companies cannot act as trusted tech vendors as their main focus isn't public good, but profit. The most trusted experts are university-initiated open industrial-research collaborative consortia. In this case, a university serves as the "launch pad" for future technologies and those who will implement them.

Aim of the ITMO.Impact strategic project:

To train, in collaboration with ITMO's partners, specialists, as individuals and in teams, capable of quickly advancing from research to engineering to entrepreneurship and

to ensuring their products' impact on the society and economy. At the base of all training is the students' participation in research. The key qualities of work are the **speed** of development and adoption of innovations, as well as the **openness** of all processes so as to gain the trust of individuals, the public, and the industry.

Objectives of the ITMO.Impact strategic project:

- To establish joint labs with the top names on the market in well-honed formats: open shared-use sites (TRL 3-8) and applied corporate labs (TRL 5-8).
- To establish customer relations courses for administrative staff at partner companies, dispatch scientific ambassadors to partners, and form developer advocate teams within the university.
- To launch deep-tech startups of two types: ones focused on the further development of ITMO's system of practice-oriented student R&D as well as ones led by key professors of high prominence.
- To establish an IP pool under the ITMO PL open license available free of charge to partners, including all design documentation for hardware solutions. To create commercialization models for the university and inventors.
- To develop an ecosystem of urban services in collaboration with the Committee on Informatization and Communication (citizen loyalty assessment, recommendation services for sights, restaurants, etc.).
- To create attraction points for citizens and introduce ITMO-affiliated venues at key leisure and cultural spaces of the city (Sevkabel Port, Tuchkov Buyan, etc.). To establish the AIR Gallery as a top spot for events in the field of science art (St. Petersburg International Cultural Forum, Ars Electronica Festival, etc.).
- To implement citizen science projects, particularly those dealing with environmental and ecosystem monitoring.
- To develop and promote open-source software and digital services such as libraries and automated ML frameworks.
- To launch projects that provide open access to results of intellectual activity, including the hardware aspects.

- To foster a shared digital space for open science with partners: open-access databases, particularly in the fields of autonomous vehicles, sensor data processing, and inorganic materials design.
- To establish testing sites and conduct tech validation (including ethical validation) projects with community involvement as well as stress tests of new technologies designed by the university or by third parties.
- To actively participate in the formation of a national system of standardization (technical committees 164, 194) and certification in the fields of cyberphysical systems, AI, and information security.
- To provide infrastructure and testing sites for systematic development and propagation of services and solutions via placement of joint labs and startups at ITMO Highpark starting in 2025.
- To give students of other universities the opportunity to join ITMO University's minor programs.
- To organize competitions for school and university students as well as public-oriented educational events. To further develop existing (CodeForces) and new (RoboForces) open platforms for online competitions and hackathons.
- To develop the ITMO.Media program for the production of high-quality content for external target audiences.
- To replicate ITMO's programs for support and development of academic staff (ITMO.Edu.Leaders, ITMO.Edu.Stars, ITMO.Expert) at other Russian universities.
- To develop and manage an ethical hacking community and conduct the international competition CyBRICS.
- To introduce a system of continuous professional development via the ITMO Avatar system.
- To involve graduates in teaching professional training courses, mentorship (alumni as potential employers for current students), and startup development consulting.

Affiliated development projects

The university and its partners intend to focus on five development projects:

1. **Technology transfer** – the acceleration of engagement with partners, mutual understanding of business logic, and the development of digital technologies up to TRL 8 and their introduction onto the market. This will be done using two basic approaches: 1) the creation of joint labs with key market players in tried-and-tested formats (for the development of a wide range of new digital technologies and solutions; example – National Center for Cognitive Research. For applied research in chosen fields; example – National Center for Quantum Internet) and 2) the creation of deep tech startups. When launching startups, the key indicator of success is not quantity, but survival rate. Key aspect: open IP and free access to all basic IP for partners (commercialization by way of customized solutions and industrial tech demos following the example of the AI IP commercialization operator ITMO.AI.
2. **Home of ITMO University** – active participation in the development of St. Petersburg, including as part of the research center for AI in industry (in collaboration with the Government of St. Petersburg and Gazprom Neft). Includes the digitalization of various aspects of city management, the development of services for the city and its citizens, the adoption of convenient methods for interaction with citizens, and the implementation of citizen science projects. Key aspect: St. Petersburg provides a perfect environment for the development of the Arts and Sciences M-platform.
3. **Open science. ITMO.Validation** – the communication of ITMO's findings to other Russian universities and organizations. Quick adoption of digital services using the ITMO model: open software, open research tools, shared digital space with partners, and open validation. Key aspect: contribution to the national system for standardization and certification (technical committees 164, 194).
4. **Open education** – the university's educational system is made available to a wide spectrum of students from other universities; the number of students in CPD programs is increased, including by providing them with career-long professional development opportunities. Additional opportunities for establishing contacts and choosing educational paths. Organization of competitions for school students (current reach: approx. 8,000) and university students (such as ICPC Northern Eurasia Finals, the semi-final stage of the global ICPC contest – held since 1996, it counts the likes of

Sberbank and JetBrains among its partners, includes 15 qualification events in Russia and abroad, and involves over 3,000 students each year), educational events (cultivation of a value-oriented approach among school students, promotion of modern technologies, and the debunking of myths in fields such as healthcare). Key aspect: ITMO.Media, a unique mechanism for the production of high-quality content.

5. **Alumni.Impact** – the positioning of ITMO as not a place to get a diploma, but a long-term partner. Key tool: the introduction of a free (with a paid "subscription" upon the graduates' reaching of a threshold value in annual revenue) multi-tiered program of continuous professional development for graduates. Key aspect: constant monitoring of the successes of graduates' companies (an important impact indicator), which are especially numerous in the digital entrepreneurship sector (the Kotlin programming language; the companies Quantum Communications LLC, MemSQL, VisualSVN, Serokell Labs, AI Factory, Grow Food, Lace, Everynet, Ciliz, Biarum, Devexperts, etc.) and the use of their pioneering experience in teaching professional development courses.

Results of the ITMO.Impact strategic project:

- An increase in the number of projects and volume of external R&D revenue with a simultaneous increase in the volume of revenue from non-government sources. A significant increase in revenue from IP rights with a simultaneous increase in research expenses from the university's budget.
- Active adoption of AI by various municipal services. Strengthening partnership with the city's cultural institutions.
- Communication of the university's products and practices to other Russian universities and organizations. Quick adoption of digital services based on the ITMO model by partners; participation in the development of open-source software and data sets; an increase in the number of software instances, services, and users. Emergence of joint databases with partners. Sharing of expertise with the investment and industrial communities. Monitoring of the arrival rate and sentiment of feedback received on all technologies produced by the consortia.

- Increased openness of the university's educational system to students from other higher education institutions and a growth in the number of CPD program graduates (including online programs). An increase in the number of subjects taught in the open-access format. Expansion of existing academic contest models with brand-new features.
- Increased involvement of graduates and their competencies and skills in ITMO's ecosystem. Development of an alumni community as one of the university's key development drivers.

Quick wins (by 2024):

- A 30% increase in revenue from contract-based R&D;
- Development and approval (by the Government of St. Petersburg) of a plan for the development of urban digital social services by 2030;
- Adoption of at least 30 digital services based on the ITMO model by partners;
- Launch of three new certification laboratories;
- Introduction of the RoboForces platform and organization of the international ethical hacking competition CyBRICS;
- Annual addition of two to three projects with a long-term support policy on GitHub;
- Threefold increase in the number of CPD program graduates;
- Start of the second stage of construction of ITMO Highpark, encompassing new academic (for 3,600 students) and research buildings.

Mid-term effects (by 2027):

- The ITMO Highpark Techno-Valley and Business Park begin operation, providing 12,000 new jobs and housing 40 new laboratories, including joint ones;
- Every year, 100% of the university's market-ready products and at least 10 third-party products are checked for compliance with standards of data and functional safety (ITMO.Approved);
- An IP pool, openly accessible by ITMO partners, has been formed and is updated once every 6 months.

Long-term effects (by 2030):

- A 150% increase in revenue from contract-based R&D;
- A 60-time increase in IP usage revenue;

- No less than 10 analytical industry studies every year;
- A five-fold increase in the number of graduates from CPD programs, including online programs; programs are updated every calendar quarter; 90% of CPD program graduates find employment in the most dynamic (technologically advanced) market sectors;
- 300,000 new active members of the alumni community; graduates actively participating in the CPD program make up 25% of all graduates of full-time educational programs; ITMO graduates make up 70% of all teaching staff of IT-focused professional training courses and 40% of teaching staff on courses dealing with natural and exact sciences.

3.2. Strategic Project 2. Scientific Breakthrough

Drawing from its experience as a participant of Project 5-100, its human capital, and the best current practices, ITMO University is launching the Scientific Breakthrough strategic project. This SP's top-priority goal is not only to generate new knowledge, but also to convert IP into specific products for high tech markets. SP-2 currently includes three development projects: Breakthrough Science, Unique R&D&I, and PI Training.

The Breakthrough Science project aims to: generate knowledge on the global scientific frontier and publish results of ITMO's research in journals at the level of Science/Nature; establish a pool of unique equipment at ITMO and ensure ease of access; organize the participation of ITMO staff in megascience projects (European XFEL, NICA, 11.7-T MRI) to boost international cooperation; launch and develop ITMO partner labs at other Russian universities to expand collaboration and promote best practices.

The goal of the Unique R&D&I project is to produce tailor-made high-tech solutions which fulfill customers' needs that cannot be met by their own in-house research departments for reasons such as: 1) lack of ability to quickly form interdisciplinary teams to produce results in short amounts of time; 2) lack of in-depth fundamental knowledge crucial to research and development at low TRL; 3) limitations caused by needing to establish new infrastructure to produce prototypes.

ITMO has already proven itself successful in completing unique full-cycle projects. Among previous projects are: the June 2021 launch of the pilot stretch of the St. Petersburg-

Moscow quantum communications network (700 kilometers) with the Russian Railways; the development of unique guidance systems, including those used at the Baikonur and Vostochny cosmodromes, the tracking ship Marshal Krylov, and astrophysical laboratories in the Northern Caucasus and Brazil (Itajubá); and a heterogeneous-cloud-infrastructure-based control system for machine learning models and engines which includes supercomputer systems and Big Data clusters (for Gazprom Neft).

The aim of the PI Training development project is to provide effective training for highly qualified research staff who are capable of setting and achieving breakthrough goals on the scientific frontier or can understand and communicate the needs of high tech markets, as well as oversee full-cycle innovation development.

The key results of SP 2 will be: the increase of ITMO's contribution to the economy and the social sector; an effective system for technology transfer and the commercialization of intellectual property; world-class research findings; and the growth of the R&D specialist pool.

The aim of the Scientific Breakthrough strategic project

The main aim of this project is to produce breakthrough results at the Nobel Prize level and to implement full-cycle innovative projects with a focus on direct integration of IP, resulting in a direct, measurable impact of the university's performance on Russia's social and economic development. ITMO's top-priority R&D fields up to 2030 will include existing fields of high scientific and technological prominence (relevant on the global scale and meeting demands of the growing market) as well as new high-potential fields, including transdisciplinary ones, that are designed to provide unique knowledge and form new markets. Among other things, support will be given to R&D in fields in which ITMO has already gained a reputation as a leader as indicated by global rankings (computer science, materials science, photonics, automation, nanotechnologies) and in new breakthrough fields (strong AI, green energy, bioinformatics, biomedical technologies, art & science, ecology).

Objectives of the Scientific Breakthrough strategic project:

- Technological excellence in the sensorics, telecommunications, robotics, and energy-saving technologies markets.

- Systemic integration of strong-AI technologies with the goal of transforming key processes in research, production, business, and the social sector.
- Integration of digital and high-precision technologies for the development of methods for personalized health monitoring and control.
- Formation of fact-based trust in technologies among members of the wider public.

Affiliated development projects

Three development projects have been launched with the goal of fulfilling the aforementioned objectives.

1. The **Breakthrough Science** development project consists of the following initiatives:

- The launch of frontier-focused labs aimed at producing breakthrough results for publication in the top 1% of journals by citation rate and presentation at A* level IT conferences. A key feature of the laboratories will be their focus on employing young and ambitious PIs (aged under 39) with experience in working on the scientific frontier and working in collaboration with Nobel Prize laureates (or their proteges) or top scientists with publications in journals such as Science or Nature;
- The creation of a unique equipment pool at ITMO University. Easy access to these instruments will make it possible to produce breakthrough results quickly and help attract highly talented researchers from Russia and abroad;
- The organization of ITMO staff's involvement in the operation of megascience-class projects;
- The launch of ITMO partner labs at select Russian universities. The labs' research teams will share the university's set of values, have access to advanced equipment, and collaborate with top industrial partners. ITMO's partner labs will follow the megagrant model, with practices promoted by teams comprising of staff of international research departments formed as part of Project 5-100.

2. The **Unique R&D&I** development project includes the following initiatives, carried out jointly with partners:

- The creation of a quantum «highway» network spanning the entire territory of Russia;

- The adoption by partners (Gazprom Neft, Sberbank, others) of strong-AI-based digital platforms: Digital Avatar (an environment for the design and development of an ecosystem of digital entities with social reflection and community adaptation), Foresight Configurator (an environment for generative modeling and design of digital objects in real world-systems through reproduction of the creative functions of constructors and design software), and Digital Verifier (an environment for the creation and investigation of proofs using the data of public cyberspace);
- Silk Road: an autonomous railway monitoring system that utilizes drones, smart sensors, and predictive analytics.
- KST-3: a solar coronagraph telescope 3 meters in diameter, developed as part of a project supervised by the Institute of Solar-Terrestrial Physics.

3. The **PI Training** development project, which closely ties into SP 3 (Highly Personalized Value-Based Education) and aims to produce exceptionally-trained specialists, is implemented through the following actions:

- The launch of a PI school and mentorship program (the school had its pilot launch at ITMO in June 2021 as part of a collaboration with the North-West Center for Strategic Research);
- The implementation of the personalized intensive program «Student to Professor». Starting at an early age, its participants take direct part in R&D projects at every stage of their studies. Upon receiving their Master's or PhD, they already possess skills and an IP portfolio comparable to those of a top-tier PhD or assistant professor, respectively;
- The introduction of an industrial PhD program.

Results of the Scientific Breakthrough strategic project:

Quick wins (by 2024):

- Reputation: ITMO is no longer just about IT – it's biotechnologies, chemistry, robotics, physics, bioinformatics, art & science.
- Over 50% of ITMO's PhD graduates have publications in Q1 journals.
- ITMO-affiliated publications in journals at the level of Science and Nature make up no less than 5% of Russia's total number of such papers based on ITMO staff members' share index.

- The launch of 3 tech test sites with TRL of 1-7 in collaboration with top global companies in top-priority fields of the Scientific and Technological Development Strategy of the Russian Federation.
- 10 commercialized IPs by ITMO scientists each year.
- The launch of at least 5 ITMO partner labs and 10 frontier labs.
- ITMO scientists as «millionaires» – ensuring the commercialization of IPs and technology transfer to the revenue of 1 million rubles to 1 million USD.
- The digital platforms Digital Avatar, Foresight Configurator, and Digital Verifier are completed and employed by the university's partners; a national quantum network has been established in collaboration with Russian Railways.

Mid-term effects (by 2027):

- ITMO researchers' papers on the covers of Science and Nature;
- A 100% increase in revenue from contract-based R&D&I;
- Two researchers from ITMO.FAMILY are included on the Highly Cited Researchers list;
- An ITMO scientist has been named a recipient of a prestigious scientific award: Wolf Prize, Dirac Medal, Breakthrough Prize, etc;
- A paper by ITMO researchers accrues over 1,000 citations within 5 years;
- 60% graduation rate among PhD students;
- ITMO is in the top-three of the Russian Nature Index;
- The autonomous railway monitoring system Silk Road has been launched.

Long-term effects (by 2030):

- The number of successful defenses by PhD students at ITMO in natural and exact sciences amounts to at least 5% of the overall national number;
- Nobel Prize-level achievements, an actual Nobel Prize, or another scientific honor of the highest level;
- A 150% increase in revenue from contract-based R&D&I;
- Over 80% of scientists are under the age of 39;
- At least 3% of ITMO-affiliated publications are in top-1% journals;
- ITMO is the top Russian university on the Nature Index;

- The KST-3 solar coronagraph telescope has successfully begun operation.

3.3. Strategic Project 3. Highly Personalized Value-Based Education

In the past decade, the university has significantly changed its approach to education following the adoption of the ITMO Code (V+F+PS+SS). Raising the bar for enrollment, introducing and developing individual learning tracks, fostering digital and entrepreneurial culture, as well as systems, critical, and design thinking, and supporting international academic mobility for students and staff. All these initiatives have resulted in propitious **conditions and environment** for the holistic development of individuals.

At the moment, the university is ready to take on a new challenge: **helping individuals to develop through highly personalized value-based education**. Personalization entails both the cognitive aspects (thinking, understanding, reasoning, perception) of learning, as well as other important aspects (social and emotional matters, life experience). At the same time, the global digitization of society, the automation of production, and uncertainty of career prospects result in increased mobility on the job market and require us to be ready for changes and quick decisions. In a VUCA world, there is no guarantee of stability, which is precisely why education must provide fundamental knowledge and freedom of personal choice that define one's unique path.

Personalization of content and technologies (production, delivery, consumption, and perception of content) allows students to choose the **optimal (in speed and in benefit) path towards their life goals**. ITMO students are those enrolled in Bachelor's, Master's, and PhD programs, as well as students from all over the world who have joined ITMO's courses, programs, and minors. Shifting the emphasis from individualization (shared goals for everyone) to personalization (everyone has their own goals) allows us to take the educational process to a whole new level and promote this learning model at other universities in Russia and abroad.

Aim of the Highly Personalized Value-Based Education strategic project

The aim of this project is to attain a **new quality of education at ITMO University** – one that results in **a new generation of specialists**. This is manifested in the fulfillment of students' individual potential, the formation of their unique competency profile, and a

high level of personal achievements within the context of a rapidly-changing world. Such quality of training is owed to a combination of fundamental approaches, transparency, accessibility, and continuous renewal of education ("6G education") – as well as targeted support by employers and attention to the demands and needs of individuals, the public, and the state.

An ITMO graduate is a socially responsible, highly qualified specialist prepared to tackle global challenges, work on breakthrough projects, and adopt and develop new technologies. They are capable of career growth and professional mobility in the context of digital transformation; in other words, they're ready to support the functioning and development of the national economy.

Objectives of the Highly Personalized Value-Based Education strategic project:

- To carry out **research in the field of digital transformation of education** and promote the best practices of digital teaching;
- **To follow the proactive lifelong learning (LLL) model** all the way from entrants to graduates and on to specialists at each level (HE, SE, CPD) with the use of all formats (offline, online, and blended learning);
- To develop ITMO University and its partners' **digital education ecosystem** and provide students with the ability to build their optimal LLL scenarios; to ensure connectivity between educational and career paths through adaptive LXP, Big Data analytics, and AI;
- To form a **system of educational export** – including through virtual academic mobility;
- To foster a **distributed system of university entrepreneurship** for different groups within the ITMO.Family community (students, faculty, PIs, project teams, etc.).

Affiliated development projects

In order to accomplish the aforementioned goals, ITMO University has outlined four development projects. These projects are supported by the work of M-platforms, which form consortia with ITMO's partners.

1. **Jigsaw Education**

A multi-level (HE, SE, CPD) educational program "assembled" from the educational products of ITMO, its partners, and other universities for a target audience diverse in age and experience. Individual learning paths, which tie together disciplines, modules, and activities, and the tools used to efficiently build and support them – such as learning analytics – are all designed to improve students' motivation, increase their desire to achieve their best, and make them more conscious of and responsible for their decisions.

Key events:

- formation of a consortium-based open bank of disciplines, modules, and minors;
- implementation of asynchronous education (allowing students to choose the format and pace of learning) via, among others, seamless incorporation and recognition of educational activities, project work, minor programs, CPD, and extracurricular activities – the sum of all experience acquired at ITMO and beyond it;
- development of a system of research and education test sites as an environment for learning based on unique R&D&I.
- diversification of non-conventional thesis formats: startups, art projects, articles in scientific journals, software code, and more;
- development of proactive lifelong learning in AI and adjacent fields based on digital technology forecasts.

2. **ITMO Educational Quality Standard**

ITMO University's educational quality standard is defined by **talented** and motivated applicants; **top-tier** lecturers and heads of educational programs (*attraction and development mechanisms are outlined in Section 2.4*); program goals that are aligned with key areas of scientific and technological development and future markets; **technologically advanced educational infrastructure**; **open management** of the educational process with participation of all interested parties. Quality assessment of the educational programs is based on the **peer review approach** with the involvement of independent experts and serves as an **alternative form of state accreditation** of educational activity.

ITMO's educational quality standard is validated through the recognition of the "ITMO Graduate" brand by domestic and international employers as a guarantee of a specialist's quality of training and adaptability.

Key events:

- The creation of a complementary system of Bachelor's and Master's programs in AI and adjacent fields that focuses on covering the full life cycle of the development and operation of digital intelligence technologies;
- The development of update protocols for all of ITMO's educational products – from full-time educational programs to CPD and individual disciplines – with update periods ranging in length from one month to one year;
- The development of a digital system for educational quality assessment with accelerated consumer feedback.

3. **Global Talent Network**

Talents draw talents, which is why ITMO puts emphasis not only on attracting the global leaders in tech innovations, but also on the raising of new talents through existing ones – namely, students and staff. Thus, a branched referral-based system for finding and supporting talented youth is formed. The system is based on the principles of openness and equal starting opportunities and guarantees the growth of the participants' inner potential.

Key events:

- The development of platform solutions for the conduct and organization of contests (ex: Olymp, CodeForces), hackathons, and other events for audiences ranging from high school students to graduates, with an increase in the use of proctoring and gamification services;
- The organization of an interdisciplinary ITMO entrance competition and a national inter-university entrance competition;
- The training of coaches for entrance competitions and hackathons in the fields of mathematics, computer science, programming, machine learning, information security, and physics;
- The expansion of the international mirror program/institute model (as showcased by HDU-ITMO Institute).

4. **Impact Entrepreneurship**

The university environment should be conducive to a new type of thinking – **entrepreneurial thinking** – that manifests itself in initiative, adaptability, a readiness to learn and take risks, and an orientation towards results.

Key events:

- Development of the ITMO.KIDS technopark to allow parents to invest in their children's development through early immersion in the entrepreneurial environment;
- All-encompassing adoption of entrepreneurial development paths for ITMO students and staff via the School of Technology Brokership, practical research, events involving successful graduates, and support from startup studios;
- Development of a short-term entrepreneurial academic mobility program that allows students and staff to showcase their projects and business ideas in a short time.
- Development of deep-tech projects and startups with a high level of expertise in ITMO's top-priority fields (photonics, biotech, quantum computing, AR/VR) in response to the needs and demands of corporate partners and development institutions.

Results of the Highly Personalized Value-Based Education strategic project:

Quick wins (by 2024):

- The creation of a digital teaching lab featuring a free-for-all experimental testing site (ITMO.Edu.Lab);
- 100% of Bachelor's and Master's students possess an individual learning track;
- At least 30% of students are employed at ITMO University concurrent to their studies;
- ITMO Accelerator receives at least 30 international teams every year.

Mid-term effects (by 2027):

- 20% of Bachelor's students enroll at ITMO based on their achievements in project work, entrepreneurship, sports, or creative trades (ITMO.STARS);
- No less than 60% of all graduation theses are prepared within the framework of M-platform projects;
- No less than 25% of all graduates find employment in new and rapidly-changing markets;
- ITMO University awards its own Bachelor's and Master's diplomas.

Long-term effects (by 2030):

- More than 3 million people have completed an ITMO minor or received a micro-degree;
- At least 15% of all graduation theses are done in non-conventional formats;
- At least 50% of all graduates begin employment above entry-level positions thanks to work and project experience they received as students;
- At least 50% of all graduates require zero adaptation time in new positions;
- At least 4% of all graduates have experience with entrepreneurial activity, startups, or their own businesses that was acquired during or after their studies at ITMO.

3.4. Strategic Project 4. Well-Being

Today, ITMO University operates within rapidly-changing circumstances, using a blended approach in academic, research and administrative affairs. An ever-growing information overload results in a massive competition for attention, particularly evident when working with Generation Z. In these conditions, the question arises of how to balance the virtual and physical worlds and the university becomes responsible for its students' health. During their time at university, students strive to acquire as much knowledge, competencies, and practical skills as possible while also building up their portfolio as they combine studies and work.

ITMO University brings together students from all around Russia and the world (70% of students come from outside St. Petersburg), so one of ITMO's priorities is to help students to quickly adapt and develop a strong connection with the culture and spirit of St. Petersburg.

ITMO University's key areas of expertise are, by their nature, in constant flux, with knowledge quickly becoming obsolete and new markets and challenges emerging. The university swiftly adapts to this demand, creating an environment for students and staff in which to build their identity, fulfill their potential, and find harmony. This is achieved through the Well-Being strategic project.

The aim of the Well-Being strategic project is to create a positive environment that promotes the all-round development of the members of ITMO.Family and provides an optimal balance of emotional, intellectual, physical and creative well-being through programs that support and promote sports and a healthy lifestyle, maintain a comfortable environment, promote a culture of conscious consumption, and strengthen social

connections and future careers. These programs are also to be shared with the higher education community and the public.

By using a personalized approach, the university helps students and staff to personalize not only their career path, but also their mental, physical, and social development.

ITMO University seeks to improve the quality of life of citizens of St. Petersburg and Russia as a whole and uses its knowledge and technologies to this end. ITMO's Center for Cognitive Research has developed an algorithm that reduces the risk of complications in cardiovascular diseases, while ITMO's Institute of Design and Urban Studies is implementing ways to solve environmental problems in the cityscape that affect people's health, among other things.

The University is also:

- developing healthy foods;
- conducting research into the effects of local soundscapes on climate change and urbanization;
- organizing popular science events and workshops centered on mental health;
- assessing visual, cognitive, and emotional perception in humans;
- and exploring the role of architecture and lighting for the elderly in a post-pandemic society.

Creative research groups participate in these R&D projects, fulfilling their own social responsibilities and developing the university's image of corporate social responsibility.

The promotion of a healthy lifestyle, sports, eco-consciousness, and volunteer projects is carried out in the context of ITMO University's student club system. ITMO University leads the way in Russia in terms of student sports and volunteering (ITMO's KronBars club was named the best student sports club in Russia (2016, 2017, 2018, 2020), and ITMO's Volunteer Center was the best among its Russian counterparts in 2020).

Objectives of the Well-Being strategic project:

- To promote healthy living through, among other things, the development of the KronBars student sports club as a sports club open to the wider St. Petersburg community.

- To implement a comprehensive program for social and psychological support and mental health improvement in a fast-paced work and study environment.
- To create a positive and comfortable environment for research, learning, leisure, and creative activities that uses round-the-clock ergonomic spaces to stimulate discussion and team work and increase overall productivity and effectiveness of work and studies.
- To raise awareness of environmental issues amongst ITMO.Family members and society as a whole through the creation of a series of collective spaces based on "green campus" principles, the support of students' green initiatives, the organization of popular science events on conscious consumption, and the implementation of city-wide environmental initiatives.
- To develop scientific research in the field of well-being and quality of life and use such research findings to achieve the United Nations Sustainable Development Goals in St. Petersburg and Russia.

Affiliated development projects

1. **Health and Sports**:

- Development of a health and well-being management system (digital happiness profile) – an online platform for daily biological screening (assessment of health, stress levels, mood, etc.) with a recommendation system based on big data and machine learning;
- Creation of a national student sports portal with a management system for student sports clubs, sports teams, competitions, and events;
- Implementation of a project aimed at attracting and supporting talented athletes as prospective students and further supporting them through the KronBars.Stars mentoring program.

2. **Professional Success and Socialization**:

- Design and creation of a comprehensive recommendation-based program for building individual tracks for the personal and professional development of staff within educational organizations (digital self-service program, soft skills for interaction with generation Z, legal and financial literacy, mindfulness practices);
- Creation of a system of communication platforms where students and staff can work with industrial and business partners to develop a shared research and learning agenda;

- Development of a system for attracting members of ITMO.Family and the St. Petersburg community to participate in citizen science projects as research subjects.

3. **Positive Environment and Conscious Consumption**:

- Implementation of the ITMO.OPEN.Campus project – sharing practices for transforming university spaces based on new educational approaches, current demands of young people, and the green campus model;
- Creation of a platform for multifunctional campus management using advanced authentication methods, artificial intelligence and other digital technologies;
- Creation of a center for certification and analysis of Russian eco-friendly organizations at ITMO University.

4. **Research and Promotion of Top Well-Being Practices**:

- Research into the therapeutic anxiety-reducing effects of virtual environments developed at ITMO;
- Development of research and educational projects on the issues of well-being, health, and quality of life.

Results of the Well-Being strategic project:

Quick wins (by 2024):

- A new system for the creation of individual lifestyle, education, and career development tracks allows students and staff to reduce emotional and professional burnout;
- ITMO Highpark is the first campus to be built based on the Green Zoom standard.

Mid-term effects (by 2027):

- Every year, 30% of St. Petersburg residents within ITMO's target audience participate in events organized as part of the Well-Being project.
- The number of students regularly engaged in physical activity and sports at Russian universities has increased by 10% due to the introduction of the KronBars student sports club model.

Long-term effects (by 2030):

- 95% of students, staff, and ITMO.Family members use the digital well-being profile to receive recommendations on improving their productivity;

- Annual rotation of 10% of university staff through involvement of young professionals and increase in the percentage of staff under 39 to 50% (ITMO University is the top employer in Russia in the field of education and science when it comes to unlocking the potential of staff);
- On the international arena, ITMO University is an ambassador of Russia as a country that uses well-being technologies in higher education and academia.

4. Key characteristics of interinstitutional network interaction and collaboration

4.1. Structure of key partnerships

ITMO University is actively expanding its collaboration with Russian and international research and educational organizations and major companies. All partnerships are built on openness and are result-oriented. The main types of university partnerships are:

1) oriented towards communications and society (supporting creative young people, interacting with professional communities);

2) education-oriented (corporate Master's, PhD, and CPD programs, which engage the partner's resources into the academic process and create individual learning tracks for students under the supervision of representatives of business or a research organization);

3) science- and innovation-oriented (R&D&I projects, creating joint competence centers and testing grounds, technology transfer, creation of knowledge-intensive companies, including those that attract venture capital);

4) technology-oriented (developing collaborative networks to create products with high added value and give rise to new markets).

The existing collaboration models vary based on the type of partnerships and the level of integration: with a strategic partner, with the dynamic engagement of many partners, as part of regional and interregional collaboration, with cultural institutions, and professional or creative communities.

One of the outstanding examples of implementation of a major interdisciplinary project within the **diversified industrial partnership** model with a multitude of partners is the National Technology Initiative's National Center for Cognitive Research. The Center was created in 2018 to develop the NTI Machine Learning and Cognitive Technologies. The

Center's technologies make it possible to develop self-learning systems that can assist decision-making and ensure the development of human cognitive abilities when working with analytic and creative tasks in conditions of uncertainty and incomplete information. The Center's consortium includes over 20 permanent members – major companies and research centers, such as Sberbank, MTS, STC, Gazpromneft Science and Technology Center, Mail.ru, ER-Telecom, Almazov National Medical Research Centre, and Siemens. In partnership with the members of the consortium, the Center implemented over 60 R&D projects, developed and launched 5 digital platforms (for creating IPs based on big data; for intellectualizing human-machine interaction; for managing computer models; for intelligent AR technologies; for smart cities development) together with 20 supporting services, as well as created 25 Master's and CPD programs in other regions of Russia.

An example of quick wins in a breakthrough field and in close partnership with a **major strategic partner** (Russian Railways) is the National Center for Quantum Internet. The Center has been functioning at ITMO since 2019 aiming to provide comprehensive development in the high-tech field of quantum communications. The Center is implementing a project on the development and launch of the pilot section of the quantum "highway" between St. Petersburg and Moscow. In spring 2021, the quantum-encrypted communication line was launched and the first phone call made between the Governor of St. Petersburg and the CEO of Russian Railways.

In 2019 ITMO University entered the consortium of a world-class science center Artificial Intelligence in Industry that was initiated by St. Petersburg and Gazprom Neft. In order to solve the technological challenges of the oil and gas industry, at the core of the center is collaboration of higher education institutions and research organizations in St. Petersburg. The Artificial Intelligence in Industry center is an example **of local partnership**. The center is currently launching five complex innovation programs.

The NTI Photonics Center is implementing R&D&I projects within an **interregional collaboration network**. In 2021, ITMO University entered the Center's consortium as one of three key universities together with Perm State University and Skoltech. The Center is developing integrated end-to-end photonics solutions. The associated consortium brings

together industrial organizations in various regions of Russia. ITMO's main contribution to the consortium is experience and technology transfer to regions of the country.

Deep engagement of partners in the universities educational, innovation, and research activities is implemented through corporate laboratories and centers. ITMO University is currently home to over ten such structures, including those run in collaboration with Rostelecom, CSRI Elektropribor, STC, and MTS. A unique example of such collaboration is the training center of Rostelecom's National Cyber Testing Ground based at ITMO. This center makes it possible to organize large-scale cyber training, software and hardware testing, and information security contests, which provides a unique environment and training system for students and professionals from various fields.

ITMO University is actively engaging partner companies into the academic process through **corporate Master's programs**, which minimize the gap between a graduate's competencies and business demands. Some of the most illustrative examples are the educational programs run in collaboration with Sberbank: Information Security, Robotics and AI, Digital Technologies for Smart Cities, and Big Data Financial Technologies. Corporate Master's programs make it possible to implement the consortium model in education, which means that several corporate majors are available within one educational program. For instance, the Systems and Technologies of Digital Manufacturing Master's program is implemented in partnership with Diakont, Techpribor, Technology Transfer Center Kulon, and the Etalon Science and Technology center.

An example of **cooperation** between educational organizations in the field of **digital transformation** of the university management structure is the launch of the Digital University project in 2020 in collaboration with the Higher School of Economics, Ural Federal University, Tomsk State University, and First Moscow State Medical University. The project aims to develop and implement models for digital transformation of universities, as well as create the conditions to train high-profile specialists for the digital economy. The Digital University project is meant to ensure students' continuous personal development by tracking their digital profiles, identifying sought-after competencies, and creating individual learning tracks.

The university's partnerships allow it to venture into **new fields**. In 2018, ITMO launched the international chemistry and biology laboratory SCAMT, which is based on using robotics and digital solutions to solve current challenges of life sciences. One of SCAMT's successes is the implementation of an interdisciplinary project, ordered by the Strategic Planning Center of the Federal Medical-Biological Agency, on developing a miniature robotics platform that performs all the necessary lab work to detect pathogens of any kind. In 2021, SCAMT launched a **startup studio** oriented towards the research tasks of the Invitro company, as well as the development of digital services in bioinformatics with seed investments from Tehno.

ITMO University is one of the pioneering higher education institutions in Russia in the field of **volunteer and citizen science**. One of the current challenges facing researchers is to learn to effectively interact with those who are not trained scientists. ITMO University launched the Internet of Bacteria project to attract volunteers to the identification of organisms with advanced electrogenic abilities.

ITMO University is also developing projects that bring together humanities and computer sciences through a digital platform for integration and interaction with the museum and library communities of St. Petersburg. One of the examples here is the St. Retrospect project that presents the city's historically important sites and preserves their cultural heritage. This platform is developed and supplied with local ethnographic data **in collaboration with the city's cultural institutions** that act as an expert community.

The world-class research, education, and innovation center ITMO Highpark is a project that aims to create a next-gen **public-private partnership** to support business development in the promising segments of the market and train specialists through the completion of R&D projects. 25 organizations from the real economy have confirmed their potential participation as residents of ITMO Highpark. The center will make it possible to implement key mechanisms for technological partnerships.

In order to build partnerships, the university has to create a **unique environment for talent acquisition**, including collaboration with the top schools, employers, and **professional communities**. One such example is ITMO's Youth Robotics Lab, whose key partner is the Presidential Physics and Mathematics Lyceum No. 239. At the lab, school

students take courses in robotics and create their own projects that regularly win awards in national and international contests, such as World Robot Olympiad, RoboCup, RobotChallenge, and Russian Robot Olympiad. As for the engagement of ITMO students in various projects in this field, one of the examples here is the Energy Club created in collaboration with Gazprom Neft to identify students' innovative projects in the oil and gas industry.

Since 2018 ITMO University provides support, as well as software and hardware for CodeForces, the largest competitive programming community in the world. There are about 2 million accounts on the community's website, with about ten contests held every month. CodeForces is a competitive programming training service, as well as an open platform to hold one's own contests and organize educational activities in the fields of algorithms and data structures. Moreover, the platform is a specialized social network.

ITMO University also collaborates with **non-profit organizations**, for instance, the key partner for training specialists in information security is the Inter-regional public organization Association of Chief Information Security Officers. The Association brings together chief security officers and information security specialists that work in various industries. The aim of this collaboration is to develop ethical hacking in Russia.

To sum up, ITMO University employs various models of consortium partnership which have resulted in a multitude of breakthrough solutions. It was only thanks to such deep collaborations with our partners that we were able to produce the results described above by complementing each other's resources and competencies and sharing risks and responsibility. Such extensive and successful experience of collaborating with our strategic partners has led us to the decision to create consortia for the Priority 2030 program.

4.2. Description of the consortium/consortia established/planned as part of the implementation of ITMO's 2030 Development Strategy

The initial stage of ITMO University's 2030 Development Strategy involves the creation of five M-platforms: Next-Gen Cyberphysical Systems; Cognitive Informatics; Human. Nature. Technology; Information and Functional Security; and Arts and Sciences. Each relies on an existing framework, has a unique focus, and is based on the fusion of the

university's strongest competencies in the fields of IT, photonics, engineering, and life sciences. A fundamental element of all these initiatives is their focus on humanity. When establishing M-platforms, it's important to diversify them not only by their scientific areas and markets, but also by their development models and commercialization and cooperation strategies. The systems themselves are dynamic, with connections between groups within the university and its partners changing to adapt to current conditions.

The M-platform Next-Gen Cyberphysical Systems (CPS 2.0) focuses on the development and integration of autonomous systems for the monitoring and control of remote objects and distributed infrastructure using a new mathematical (AI) and physical (photonics and new materials) basis. The development of this field makes it possible for us to automate a wide variety of routine, unsavory, and dangerous activities as well as processes that call for significant amounts of physical movement – which is especially significant in light of Russia's geographic expanse and its intention to develop remote areas with difficult working conditions: the Arctic, Siberia, the Far East, and the global ocean.

The top-priority research areas are:

- data-driven models, methods, algorithms, decision-making and control systems for high-assurance, computationally complex, and efficient cyberphysical systems;
- intelligent computing environments and software-configurable infrastructure for large-scale information connectivity of distributed CPS;
- photonics- and optoelectronics-based smart sensors;
- data transfer technologies and systems for optical communication networks that employ conventional and quantum encryption methods.

The choice of these areas is based on the university team's unique combination of expertise in the fields of robotics, control systems, software engineering, computing, photonics, and quantum communications – as well as their academic achievements (such as ITMO's constant presence in the top 100 of the ARWU subject ranking in Automation & Control) and experience with the implementation of complex R&D projects (such as the project for the development of quantum data transmission technologies at ITMO's National Center for Quantum Internet). In addition, several key areas of high-TRL R&D can be outlined:

- smart sensor-equipped autonomous robotic systems for use in logistics, inspection, and maintenance of structures and long-range networks;
- distributed intelligent secure sensor communications systems for continuous monitoring, predictive analytics, and decision-making at critical infrastructure subjects – including railway, ground-based, and marine pipeline and automotive networks and above-ground wireless and wired communications infrastructure.

Considering the strategically important branches of the Russian economy and the integration of ITMO's output into global cooperation chains, the top priority when integrating technologies is given to the qualitative change in the nature and environmental safety of collecting, processing, storing, and transporting energy; as well as the development of territorial connections through intelligent logistics and telecommunications systems. ITMO collaborates on these endeavors with top Russian companies such as Gazprom Neft, Russian Railways, and Sberbank.

The M-platform plans to take active part in the development of a national system for standardization and certification of CPS technologies and the assessment of their interoperability, scalability, verifiability, and safety. The M-platform's efforts will also focus on developing Russian-made software and hardware for use in top-priority branches of the economy.

The M-platform Cognitive Informatics (CI) focuses on transforming key processes in science, industry, business, and the social sector through the systematic adoption of strong AI technologies. The development of this field will make it possible to create systems capable of learning independently, adapting to changes in the environment, as well as demonstrate human creativity when approaching practical tasks (identification of key qualities, automation of design, proof analysis and identification, etc.).

The top-priority research areas are:

- composite AI based on the hybridization of machine learning, knowledge engineering, and computer modeling;
- automated machine learning for the development of composite objects of AI;
- use of AI in generative design and synthesis of physical and digital objects;

- trusted AI based on self-explaining models for use in the analysis and production of scientific proof.

The projects are diversified based on target industries and aim to produce multi-purpose tools such as: a digital platform for the generative design and synthesis of physical and digital objects; a digital environment for the support of distributed interdisciplinary research; a technology for the creation of intelligent digital objects based on multimodal data for use in non-destructive testing, validation, and quality assessment of AI-based solutions.

Among the M-platform's partners are companies working on their own digital transformation programs or other initiatives that require the use of intelligent technologies to ensure their strategic and competitive viability, as well as professional communities in the fields of AI and data analysis.

The core of the team is made up of experts in IT and programming, many of them with experience in working on projects of ITMO University's National Center for Cognitive Research, established within the framework of the National Technology Initiative.

Plans include the creation and development of an ecosystem for the commercialization of projects in AI and adjacent fields. This includes the establishment of the small innovative enterprise ITMO.AI to serve as a commercialization agent.

One of the M-platform's key tasks is to create and promote open software and digital services and libraries related to AI and adjacent fields, as well as to participate in the development of the corresponding legal framework, including corporate and national standards and regulations.

The M-platform Human. Nature. Technology focuses on the integration of convergent technologies, applied genomics, and digital and targeted technologies that deal with personalized health monitoring and control. This focus area concerns the economically and socially vital matters of longevity, health, quality of life, environment, and sustainability.

The top-priority research areas are:

- global biotransformation: the improvement of the use of recombinant DNA in biotechnologies and cell engineering;

- applied genomics: the development and integration of new bioengineering methods that utilize bioinformatics analysis and genome editing for efficient prevention, diagnosis, and treatment of illnesses and disorders;
- intelligent healthcare: the integration of new personalized approaches to monitoring, disease prevention, and lifestyle and health regulation;
- rational use of natural resources: the provision of conditions and solution of a number of interdisciplinary challenges related to the creation of new materials and technologies intended to reduce the consumption of natural resources;
- targeted technologies: the development of methods of targeted additive manufacturing with the goal of achieving targeted material functionalization, as well as the production of metamaterials and new products based on metamaterials.

The M-platform's activities focus on breakthrough development of Russian and international markets in the following fields: genetic technologies and cell therapy; high-throughput screening and biosensing; targeted, including transdermal, drug delivery; functional nutrition and alternative foods; new prosthetic materials and electronic implants; and environmental monitoring and soil analysis.

The M-platform Information and Functional Security (IFS) focuses on ensuring fact-driven trust towards complex intelligent systems that function via remote control or a certain level of autonomy. The platform is devised as a center of excellence specializing in the information and functional security of innovative products and in support of market integration of high-TRL technologies, products, and services.

The platform will work in close collaboration with other M-platforms in order to identify the means to ensure the ISF of developed solutions, starting from the early stages of their life cycle. It will then analyze and solve challenges related to striking the balance between the functionality and safety of products and technologies.

The top-priority research areas are:

- mathematical methods of support for next-gen communication networks, including quantum networks;
- functional security of unmanned transport vehicles;
- mathematical methods of conversion, processing, and protection of data;

- automated validation of software and machine learning datasets.

The M-platform’s partnership strategy includes close collaboration with key state monopolies and state companies in transportation and energy (Gazprom Neft, Russian Railways), major banks (Sberbank), telecommunications providers (Rostelecom), state security agencies, and government bodies.

One of the M-platform’s key contributions is the development and management of an ethical hacking community – both within the context of international and national CTF competitions and as part of cyber-training events at the International Research Center for Safety and Security of Critical Information Technologies.

The Arts and Sciences M-platform focuses on forming a positive image of the future and fostering individual and public trust towards technologies, the humanization of technologies, and the implementation of the Human Digital concept. The platform’s development will enable the emergence of new research in the fields of digital music, digital literature, narrative design, and so on.

The top-priority research areas are:

- development of transdisciplinary research;
- creation of digital services for the urban ecosystem;
- development of and production support for digital products, including those based on VR/AR/MR, for cultural institutions and creative industries;
- development of mechanisms for interaction and networking between experts from the scientific and creative communities;
- establishment of infrastructure for the search for and implementation of new ways of promoting scientific achievements through artistic interpretation with the consequent exhibition of works at international exhibitions and festivals;
- development of open-source software with a low entry threshold (low-code/no-code) to increase accessibility to cultural data analysis.

The platform's products will satisfy a demand in the fields of digital deep native advertising and marketing (AdTech/MarTech) and art and cultural events (CulTech).

The M-platform’s other key tasks include: the establishment of an interdisciplinary relationship with St. Petersburg as part of the development of a system of digital urban

services; the development of projects that showcase St. Petersburg's cultural memory in digital and interactive formats; and the organization of open lectures, seminars, workshops, roundtable discussions, and conferences at ITMO University's AIR Gallery with the goal of public validation of technologies.

Consortia established as part of the Development Strategy

A successful fulfillment of the three ambitions outlined in Section 1.3 requires **openness** and adherence to a cooperation strategy. One of the instruments of the latter are the five consortia formed by ITMO in five strategic fields:

- Next-Gen Cyberphysical Systems
- Cognitive Informatics
- Human. Nature. Technology
- Information and Functional Security
- Arts and Sciences

This approach is prompted by a desire to set very **specific goals and tasks for each of the consortia**. The consortia are each associated with a specific M-platform in accordance with the university's main scientific and technological focus areas. In their interaction with consortia members, each M-platform aims to overcome technological hurdles that prevent the development of solutions to major challenges. All participants of the process channel their efforts into setting and accomplishing goals associated with that challenge. Following the principle that lies at the foundation of M-platforms – that each of them contribute to all four strategic projects of ITMO's 2030 Development Strategy – the consortia also consolidate their abilities and resources to accomplish strategic goals, thus ensuring the strategic unity of the Development Strategy.

The aim of the establishment of M-platform consortia is to create strategic initiatives and projects in order to tap into new high tech markets and design and develop advanced products, technologies, and services that account for changes in the global economy – including through the honing of new collaboration mechanisms – in order to respond to worldwide challenges.

For industrial partners, joining a consortium is an opportunity to ensure their technological supremacy on the national market and competitive viability on global markets through the integration of advanced technologies and products into their activities.

For the university, this is a chance to achieve a technology readiness level (TRL) of up to 8 when developing and validating new technologies.

Focus areas of M-platform consortia:

The Next-Gen Cyberphysical Systems consortium focuses on overcoming technological hurdles related to the development and adoption of the methods and technologies of artificial intelligence (new mathematical basis) and photonics and new materials (new physical basis) in the implementation of monitoring and control systems for remote objects and distributed infrastructure.

The Cognitive Informatics consortium is focused on overcoming technological hurdles related to the transformation of key processes in science, industry, business, and society through the systematic adoption of strong-AI technologies.

The Information and Functional Security consortium focuses on building public trust towards complex intelligent systems that operate via remote control or at a certain degree of autonomy.

The Human. Nature. Technology consortium focuses on the integration of digital and targeted technologies that aim to improve the methods of personalized health monitoring and control while also contributing to the overall quality of life and the state of the environment.

The Arts and Sciences consortium is focused on shaping an image of the future and fostering trust towards technologies while overcoming challenges related to the implementation of the Human Digital concept.

Objectives with which the M-platform consortia are tasked:

1) to ensure the cohesiveness and unity of the scientific and technological development of the economy and society by implementing complex R&D&I in alignment with the current scientific agenda as defined by the priority fields of the Scientific and Technological Development Strategy of the Russian Federation;

2) to eliminate gaps in university-level innovative production cycles, ensure that the developed products cause a multiplier effect, and to increase the rate of production of technologies, products, and services;

3) to validate technologies that are of critical importance to human activities, such as general-purpose digital technologies;

4) to develop a strategy for the transformation of science-to-real economy processes and design and introduce new tools to facilitate cooperation between research and educational institutions and businesses of the real economy;

5) to ensure the sustainable development of individuals and the public by integrating advanced technological solutions;

6) to create new high-paying jobs in high tech branches of the Russian economy;

7) to strengthen the public's trust towards technologies, drawing on the fact that extensive open collaborations between industry and science, conducted by a leading university, are the most capable of being well-received by the public.

Key principles of the formation of M-platform consortia:

M-platform consortia are open, dynamic, flexible, and founded on the idea of mutual trust and shared interests and risks between the primary and associate members. Partnerships formed by the consortia aim to fill in the gaps that exist in current R&D&I processes, build up students' individual learning tracks, transfer technologies, and carry out a social mission.

Each M-platform's consortium consists of **seven to ten primary (founding) and an unspecified number of associate members** (see Appendix 6). Each M-platform also forms a pool of external partners that contribute to project teams – in other words, become associate members for the duration of joint projects.

A key activity of the consortia is collaboration with educational (talent scouting and development) and innovative partners that assist them through contribution of staff and ideas.

Member roles are defined by the following categories of primary and associated consortium members: tasksetters (initiators, end customers); developers; investment funds; talent scouting organizations; professional communities; regulators; disseminators (integrate and replicate technologies); and validators (opinion leaders and experts). The

members' individual roles, their contribution to the university's strategic activities, consortia activities, and strategic projects are outlined in detail in Appendix 6.

Each consortium's **management system** is integrated into the management system of the corresponding M-platform (see Section 2.6): representatives of the founding members and the public are elected into each M-platform's managing council. Associate members and external partners provide expertise. Decisions on changes to the list of a consortium's members are made by its managing council.

Risk management. Among the consortia's key risks are possible conflicts between members and differing levels of engagement and interest due to a large number of members and crossover connections between various M-platforms' projects. In order to maintain a balance of interest and negate risks, the following principles are to be adopted:

1) focus – the consortia are "thematic," ensuring each member's awareness of their involvement and interest in the topic;

2) diversification – between consortia in terms of subjects and challenges; within consortia in terms of roles, approaches, and industries, all in order to avoid direct conflicts of interest or monopolization of activities by major partners;

3) openness – in decision-making, risk-sharing, responsibility, communications, procedures, and business processes as reflected in the Development Strategy's policies;

4) collegiality – the agenda and resource distribution are decided on by collegial managing bodies (councils) and the M-platforms's expert communities;

5) adaptivity – projects and partnerships are dynamic in structure and possess a matrix management system (projects don't prompt the establishment of "set in stone" administrative units unless required).

New mechanisms for collaboration between members of the consortia include 1) open platforms for shared use of resources through the formation of **project teams** that use a variety of internal procedure models, as well as through the development of **distributed**, dynamic, and innovative **contract labs** that consolidate the necessary research capacities in order to complete projects; 2) recruiting and training of experienced managerial staff for research projects (PIs); 3) transformative nature of technological development; 4) new principles of IP use and extensive opportunities for collaboration stemming from the

members' ability to freely use the provided IP; 5) establishment of joint enterprises by consortia members and partners for specific purposes and commercialization of R&D; 6) conscious application of the outstaffing model for joint activities and comprehensive projects; 7) development of partnerships within the context of activities implemented at megascience-class facilities; 8) creation of the ITMO Digital Science platform as a universal digital tool for networking between members and partners.

The plans for the development of partnerships are based on the consortia's open structure, which is conducive to the introduction of new members on the condition of the relevance and fitness of their key capacities to the goals and tasks of the strategic projects. A prominent role will be given to socially responsible businesses, cultural and artistic establishments, and development of unique environments for interaction between humans, technologies, and the environment.

Appendix №1. Strategic projects' coverage of the university's policies in the main domains of activity

The university's policy in the main domains of activity	3.1. Strategic Project 1. ITMO.Impact	3.2. Strategic Project 2. Scientific Breakthrough	3.3. Strategic Project 3. Highly Personalized Value-Based Education	3.4. Strategic Project 4. Well-Being
Educational policy	+	+	+	+
Research policy and the policy on innovation and R&D commercialization	+	+	+	+
Youth policy	+	+	+	+
Human capital management policy	+	+	+	+
Campus and infrastructure policy	+	+	+	+
University management system	+	+	+	+
University's financial model	+	+	+	+
Digital transformation policy	+	+	+	+
Open data policy	+	+	+	+
Additional routes of development				

Appendix №2. Indicators necessary for achievement of the grant allocation results

Indicator	unit of measurement		2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1. Number of persons trained in additional professional programs in the university including online courses	person	Base part of the grant	X	X	4,300	4,500	4,700	5,100	5,600	6,500	7,100	7,800	8,200	8,600
		Special part of the grant	X	X		1,600	3,200	4,600	5,900	6,800	8,000	9,100	10,500	11,900
2. The total number of implemented projects, including projects with the participation of members of the consortium (consortiums), for each of the activities of the development programs specified in paragraph 5 of the Selection Rules	Unit	Base part of the grant	X	X	8	8	8	8	8	8	8	8	8	8
		Special part of the grant				37	42	52	62	72	82	92	92	92
2.1 among them, in activity «a», including:	Unit	Base part of the grant	X	X	4	3	3	3	3	3	3	3	3	3
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.1.1 ITMO.Impact	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.1.2 Scientific Breakthrough	Unit	Base part of the grant	X	X	1									
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.1.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	2	2	2	2	2	2	2	2	2	2
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.2. among them, in activity «б», including:	Unit	Base part of the grant	X	X										

		Special part of the grant				4	4	4	4	4	4	4	4	4
2.2.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.2.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.3. among them, in activity «в», including:	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.3.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.3.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.3.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.4. among them, in activity «г», including:	Unit	Base part of the grant	X	X	6	6	6	6	6	6	6	6	6	6
		Special part of the grant												
2.4.1 ITMO.Impact	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.4.2 Scientific Breakthrough	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1

		Special part of the grant												
2.4.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	2	2	2	2	2	2	2	2	2	2
		Special part of the grant												
2.4.4 Well-Being	Unit	Base part of the grant	X	X	2	2	2	2	2	2	2	2	2	2
		Special part of the grant												
2.5 among them, in activity «д», including:	Unit	Base part of the grant	X	X	4	4	4	4	4	4	4	4	4	4
		Special part of the grant												
2.5.1 ITMO.Impact	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.5.2 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	2	2	2	2	2	2	2	2	2	2
		Special part of the grant												
2.5.3 Well-Being	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.6. among them, in activity «е», including:	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.6.1 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.6.2 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										

		Special part of the grant				1	1	1	1	1	1	1	1	1
2.6.3 Well-Being	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.7. among them, in activity «ж», including:	Unit	Base part of the grant	X	X										
		Special part of the grant				7	7	7	7	7	7	7	7	7
2.7.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.7.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.7.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.7.4 Well-Being	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.8. among them, in activity «з», including:	Unit	Base part of the grant	X	X										
		Special part of the grant				8	8	8	8	8	8	8	8	8
2.8.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.8.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										

		Special part of the grant				1	1	1	1	1	1	1	1	1
2.8.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.8.4 Well-Being	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.9. among them, in activity «и», including:	Unit	Base part of the grant	X	X										
		Special part of the grant				6	6	6	6	6	6	6	6	6
2.9.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.9.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.9.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.10. among them, in activity «к», including:	Unit	Base part of the grant	X	X	2	4	4	4	4	4	4	4	4	4
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.10.1 ITMO.Impact	Unit	Base part of the grant	X	X	1	3	3	3	3	3	3	3	3	3
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.10.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										

		Special part of the grant				2	2	2	2	2	2	2	2	2
2.10.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.11. among them, in activity «л», including:	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				6	6	6	6	6	6	6	6	6
2.11.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.11.2 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.11.3 Well-Being	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.12. among them, in activity «м», including:	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.12.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.12.2 Scientific Breakthrough	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.12.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										

		Special part of the grant				1	1	1	1	1	1	1	1	1
2.13. among them, in activity «o», including:	Unit	Base part of the grant	X	X	3	4	4	4	4	4	4	4	4	4
		Special part of the grant				5	5	5	5	5	5	5	5	5
2.13.1 ITMO.Impact	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.13.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.13.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	2	2	2	2	2	2	2	2	2	2
		Special part of the grant												
2.13.4 Well-Being	Unit	Base part of the grant	X	X		1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.14. among them, in activity «п», including:	Unit	Base part of the grant	X	X	3	2	2	2	2	2	2	2	2	2
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.14.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.14.2 Scientific Breakthrough	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.14.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X	1									

		Special part of the grant												
2.14.4 Well-Being	Unit	Base part of the grant	X	X	1	1	1	1	1	1	1	1	1	1
		Special part of the grant												
2.15. among them, in activity «p», including:	Unit	Base part of the grant	X	X										
		Special part of the grant				5	5	5	5	5	5	5	5	5
2.15.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				3	3	3	3	3	3	3	3	3
2.15.2 Well-Being	Unit	Base part of the grant	X	X										
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.16. among them, in activity «c», including:	Unit	Base part of the grant	X	X	1									
		Special part of the grant				5	5	5	5	5	5	5	5	5
2.16.1 ITMO.Impact	Unit	Base part of the grant	X	X	1									
		Special part of the grant				2	2	2	2	2	2	2	2	2
2.16.2 Scientific Breakthrough	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.16.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.16.4 Well-Being	Unit	Base part of the grant	X	X										

		Special part of the grant				1	1	1	1	1	1	1	1	1
2.17. among them, in activity «т», including:	Unit	Base part of the grant	X	X	1									
		Special part of the grant				6	6	6	6	6	6	6	6	6
2.17.1 ITMO.Impact	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.17.2 Scientific Breakthrough	Unit	Base part of the grant	X	X	1									
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.17.3 Highly Personalized Value-Based Education	Unit	Base part of the grant	X	X										
		Special part of the grant				1	1	1	1	1	1	1	1	1
2.17.4 Well-Being	Unit	Base part of the grant	X	X										
		Special part of the grant				3	3	3	3	3	3	3	3	3

Appendix №3. Target indicators of effectiveness of the development strategy's (the draft strategy's) implementation

№	Indicator	unit of measurement	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Target indicators of the efficiency of implementation of the university development program for the basic part of the grant													
P1(b)	Scope of scientific work and R&D activity, per one person of academic staff	thousand rubles	4,894	5,031	5,094	5,781	5,919	6,056	6,192	6,481	6,923	7,669	8,563
P2(b)	Share of employees aged under 39 in the overall number of academic staff	%	43.34	43.67	43.88	44.08	44.29	44.69	45.10	45.51	45.92	46.33	46.73
P3(b)	Share of students in bachelor's, specialist's, and master's full-time programs, who have acquired an additional qualification free of charge, in the overall number of students in bachelor's, specialist's, and master's fulltime programs	%	26.60	30.00	32.50	35.00	37.50	40.00	42.50	45.00	47.50	50.00	52.50
P4(b)	University's income from financially profitable activities, per one person of academic staff	thousand rubles	5,263	5,353	5,497	5,644	5,880	6,154	6,473	6,840	7,296	7,783	8,302
P5(b)	Number of students in programs of secondary professional education and/or higher education, where obtaining professional competencies is related to formation of digital skills of using and	person	12,588	13,200	13,275	13,280	13,410	13,555	13,850	14,150	14,250	14,250	14,250

	mastering new digital technologies, including educational programs developed with consideration of updated basic full-time educational programs with digital component, recommended by central educational center for replication												
P6(b)	Expenses for scientific research and developments from university's own finance, per one person of academic staff	thousand rubles	73.067	102.201	109.718	117.188	124.611	139.752	154.799	169.753	184.615	199.387	229.358
Target indicators of the efficiency of implementation of the university development program for the special part of the grant													
P1(sp1)	Number of publications in scientific journals of quartiles I and II, and scientific journals included in Arts and Humanities Citation Index (A&HCI) and Book Citation Index – Social Sciences & Humanities (BKCI-SSH) presented in Web of Science Core Collection, per one person of academic staff	unit	1.128	1.164	1.215	1.281	1.347	1.413	1.478	1.543	1.623	1.702	1.781
P2(sp1)	Number of publications in Scopus and quartiles I and II of SNIP, per one person of academic staff	unit	1.437	1.478	1.536	1.609	1.682	1.755	1.827	1.898	1.985	2.071	2.156

P3(sp1)	Number of highly quoted “article”- and “review”-type publications in Web of Science Core Collection over the last full five years, per one person of academic staff	unit	0.084	0.086	0.094	0.106	0.121	0.140	0.155	0.193	0.215	0.242	0.268
P4(sp1)	Share of researchers aged under 39 in overall number of researchers	%	79.18	80.63	80.79	80.95	81.11	81.27	81.42	81.58	81.75	81.91	82.07
P5(sp1)	Amount of finance for performed scientific and R&D work (excluding finance allocated for state assignment), per one person of academic staff	thousand rubles	4,568	4,709	4,774	5,462	5,592	5,730	5,867	6,142	6,585	7,331	8,211
P6(sp1)	Amount of income from exclusive rights to intellectual activity results (from agreement of license or of alienation of exclusive rights), per one person of academic staff	thousand rubles	1.681	4.796	6.270	7.813	15.576	23.292	30.960	38.580	53.846	69.018	91.743
P7(sp1)	Share of students in master’s, post-graduate’s, medical resident’s programs or in probation assistantship in overall number of students in full-time higher education programs	%	49.35	49.37	49.40	49.43	49.65	50.23	51.30	52.30	52.66	52.71	52.77

P8(sp1)	Share of foreign citizens and stateless people in full-time master's, post-graduate's, medical resident's programs or in probation assistantship	%	19.87	21.94	22.27	22.83	23.03	23.09	23.10	23.12	23.64	24.32	25.06

Appendix №4. Impact of strategic projects on target indicators of the efficiency of the implementation of the development strategy (project)

№	Indicator	3.1. Strategic Project 1. ITMO.Impact	3.2. Strategic Project 2. Scientific Breakthrough	3.3. Strategic Project 3. Highly Personalized Value-Based Education	3.4. Strategic Project 4. Well-Being
Target indicators of the efficiency of implementation of the university development program (or draft program's) for the basic part of the grant					
P1(b)	Scope of scientific work and R&D activity, per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	defines the value
P2(b)	Share of employees aged under 39 in the overall number of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	contributes to the achievement of the value	contributes to the achievement of the value
P3(b)	Share of students in bachelor's, specialist's, and master's full-time programs, who have acquired an additional qualification free of charge, in the overall number of students in bachelor's, specialist's, and master's fulltime programs	contributes to the achievement of the value	defines the value	contributes to the achievement of the value	defines the value
P4(b)	University's income from financially profitable activities, per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	has no effect
P5(b)	Number of students in programs of secondary professional education and/or higher education, where obtaining professional competencies is related to formation of digital skills of using and mastering new digital technologies, including educational programs developed with consideration of updated basic full-time educational programs with digital component, recommended by central educational center for replication	contributes to the achievement of the value	defines the value	contributes to the achievement of the value	defines the value

P6(b)	Expenses for scientific research and developments from university's own finance, per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	defines the value
Target indicators of the efficiency of implementation of the university development program (or draft program's) for the special part of the grant					
P1(sp1)	Number of publications in scientific journals of quartiles I and II, and scientific journals included in Arts and Humanities Citation Index (A&HCI) and Book Citation Index – Social Sciences & Humanities (BKCI-SSH) presented in Web of Science Core Collection, per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	defines the value
P2(sp1)	Number of publications in Scopus and quartiles I and II of SNIP, per one person of academic staff	defines the value	contributes to the achievement of the value	defines the value	defines the value
P3(sp1)	Number of highly quoted "article"- and "review"-type publications in Web of Science Core Collection over the last full five years, per one person of academic staff	defines the value	contributes to the achievement of the value	defines the value	defines the value
P4(sp1)	Share of researchers aged under 39 in overall number of researchers	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	contributes to the achievement of the value
P5(sp1)	Amount of finance for performed scientific and R&D work (excluding finance allocated for state assignment), per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	defines the value
P6(sp1)	Amount of income from exclusive rights to intellectual activity results (from agreement of license or of alienation of exclusive rights), per one person of academic staff	contributes to the achievement of the value	contributes to the achievement of the value	defines the value	has no effect

P7(sp1)	Share of students in master's, post-graduate's, medical resident's programs or in probation assistantship in overall number of students in full-time higher education programs	defines the value	contributes to the achievement of the value	contributes to the achievement of the value	defines the value
P8(sp1)	Share of foreign citizens and stateless people in full-time master's, post-graduate's, medical resident's programs or in probation assistantship	defines the value	contributes to the achievement of the value	contributes to the achievement of the value	contributes to the achievement of the value

Appendix №5. Financial support of the development strategy (draft strategy)

Financial support for the strategy (draft strategy) from different sources

№	Source of funding	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
1.	Federal budget, base part of the grant, thousand rubles	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
2.	Federal budget, special part of the grant, thousand rubles		900,000	900,000	900,000	900,000	1,000,000	1,000,000	1,100,000	1,100,000	1,100,000
3.	Federal budget, other sources, thousand rubles										
4.	Regional budget, thousand rubles										
5.	Local budgets, thousand rubles										
6.	Foreign sources, thousand rubles										
7.	Extra budgetary resources, thousand rubles	100,000	125,000	250,000	562,400	877,400	1,095,000	1,455,100	1,710,700	1,779,100	1,850,300
Total		200,000	1,125,000	1,250,000	1,562,400	1,877,400	2,195,000	2,555,100	2,910,700	2,979,100	3,050,300

Appendix №6. Information on the consortium/consortia established/planned as part of the implementation of the strategic project(s) of the development strategy (draft strategy)

Next-Gen Cyberphysical Systems Consortium (CPS 2.0)	
Name of the strategic project implemented with the consortium's participation	The consortium's role in the strategic project's implementation
ITMO.Impact	1. Key role in establishing partnerships for launching applied scientific and tech projects with high TRL (6-8) in development and release of specialized digital platform and software/hardware solutions in robotics, sensors, intelligent and data management systems as well in navigational and secure communications systems for autonomous monitoring and management of remote objects and distributed infrastructure. Implementation of comprehensive full-cycle "smart secure city" projects, including those focusing on the development of urban infrastructure and energy. 2. Joint development of the "Expert Customer School" based on the events and information resources for the leading specialists and management of the partner companies. 3. Development of the entrepreneurial environment through the launch of a corporate track in the accelerator and ITMO University's startup studio. Participation in the selection and investment of the startups based on established groundwork, including successfully completed practice-oriented projects by ITMO students. 4. Active participation in the establishment of an open-licence intellectual property bank, a key role in the development of intellectual property for software/hardware solutions in the next-gen cyberphysical systems field. 5. Active participation in the project "Unified digital space for open science with partners," including infrastructure and administrative support for the creation of publicly accessible datasets and open source software packages in the field of control and information processing for robotic systems based on AI methods. 6. Expert, resource and administrative support for ITMO University's participation in the formation of the national system for validation, standardization and certification in the field of unmanned technologies, smart sensors, quantum communications. 7. Expert and resource support, knowledge bank contributions and organization of thematic tracks for the newly developed, open national platform for holding practice-oriented robotics competitions. 8. Active participation in exploratory research and frontier analytical studies, as well as in the creation of multi-industry test sites for comprehensive validation of the CPS 2.0 tech implementation.

Scientific Breakthrough	9. Joint development of the research agenda and the investment strategy for the M-platform CPS 2.0 through involving business representatives in the Management council. 10. Resource and infrastructure support for research based in corporate laboratories and centers, in particular, the development of the successfully working National Center for Quantum Internet (in collaboration with Russian Railways) and the international research and education center “Gazprom - ITMO”, as well as the launch of a corporate lab with Sber Group. 11. Key role in the implementation of the Unique R&D&I project, focusing on the priority areas for M-platform CPS 2.0, including the development projects for a quantum backbone network; a robotics system for intelligent monitoring of transport highways and communication lines “The Silk Road”; an integrated information and control system of autonomous underwater vehicles for servicing offshore gas pipelines and environmental monitoring at significant depths; a large solar telescope-coronagraph within the framework of the project "National Heliogeophysical Complex of the Russian Academy of Sciences". 12. Key role in the Scientific Breakthrough strategic development project in the areas of: a new mathematical and physical basis for methods, components and platforms for designing, sensing, controlling, organizing computations and communication in autonomous and distributed robotic systems. Megascience-level projects, including those in international collaborations on the European XFEL facilities. 13. Participation in PI Training through industrial PhD programs with the consortium’s partners, including expert and resource support for Master’s and PhD students in robotics and control.
Highly Personalized Value-Based Education	14. Expert and resource support for updating the content and implementation of Master's degree educational programs in the areas of robotics, sensorics, data processing and transmission systems, precision instrumentation and optical engineering. 15. Development of the digital educational ecosystem of ITMO University and partners to ensure the coherence of educational and career paths. Assistance in the implementation of the best practices for digital transformation of education in areas related to the activities of the consortium. 16. Active participation in the implementation of a lifelong learning model, particularly in the development and deployment of continuing education courses on the methodological basis of the Autodesk international education and research center, projects by the Photonics research center, and in collaboration with the universities of consortium partner companies. 17. Raising the prestige of engineering professions, creation of new high-tech jobs and career support for ITMO students in the areas of robotics, control, photonics and data processing. 18. Development and deployment of network educational programs and replication of educational modules in universities in the regions where partner companies are present.
Well-Being	19. Organization of sabbatical bilateral exchanges for the staff of all participants of the consortium. 20. Joint citizen science and intellectual crowdfunding projects, in particular, researching the impact of automation on changes in various industries and areas of human activity.

				21. Joint projects in robotics, sensors, secure communications aimed at the development of ITMO Highpark infrastructure. 22. Exchange of best practices and joint implementation and use of an infrastructure and programs for social and psychological support with the end goal of creating a comfortable environment for professional activities and leisure, increasing overall productivity and efficiency in studies and work.	
Information about the members of the consortium					
No	Full name of the member organization	Short name of the member organization	Member organization's tax ID number	Member organization's role in the consortium	Member organization's role in the strategic project's implementation
1	CSRI Elektropribor JSC	CSRI Elektropribor JSC	7813438763	Long-term partner in the field of education and science, technological partner in the development of unique fiber-optic sensors and algorithmic and programming software for navigational systems. The company has unique production and laboratory facilities and equipment. *Co-developer, technology validator, customer, and consumer of projects*	**Role in ITMO.Impact**: 1. Customer and co-developer of applied R&D projects with a focus on integrated information, management, and navigation systems for pilotless transport. 2. Expert support of standardization and certification of solutions in robotics and sensors. 3. Participation in the creation of a distributed training ground for the testing of resilience and fault tolerance of the developed soft- and hardware solutions. **Role in Scientific Breakthrough:** 1. Customer and co-developer of fundamental and applied R&D projects in navigation and sensors, including fiber-optic sensors. 2. Co-developer and infrastructural partner in the implementation of the Unique R&D&I project in the field of information and management systems for responsible applications, including those related to the creation of a large solar coronagraph telescope. 3. Expert and resource partner of industrial PhD studies, as well as of project activities of Master's and PhD students in robotics and control systems. **Role in Highly Personalized Value-Based Education:** 1.Corporate partner of Master's programs in the fields of navigation and control systems, as well as mechatronics and robotics.

					2.Creation of new high tech job positions and helping ITMO University alumni with employment at facilities of defense and dual technologies.
2	Limited Liability Company SMARTS-Quanttelecom	SMARTS-Quanttelecom LLC	7802875514	Subsidiary of ITMO University in terms of the creation of quantum communications systems and quantum distribution of the encryption key systems that has received investments of more than 100 million rubles; is engaged in the program of creating a quantum network commissioned by Russian Railways in collaboration with the National Center for Quantum Internet. *Co-developer, solution provider*	**Role in ITMO.Impact**: 1. Co-developer of quantum key distribution systems. The only provider of complete production systems on the Russian market. 2. Active participation in the standardization and certification of solutions in the field of quantum communications. 3. Active collaboration with the National Center for Quantum Internet and Russian Railways in the field of quantum communications.
3	Limited Liability Company MTS Artificial Intelligence Center	MTS Artificial Intelligence Center LLC	9725021438	Partner in the field of science and education. The company's team has expertise in the fields of AI technologies for computer vision, biometrics, and processing of multisensor information, as well as commercialization and implementation of high tech products. The center is a structure that includes an accelerator, an investment fund, and a research department. *Customer, co-developer, validator*	**Role in ITMO.Impact**: 1. Customer, co-developer, and validator of scientific projects in the fields of pilotless technologies in logistics, telecommunications, and monitoring in special environments. 2. Customer and validator of analytical research in the field of assessment of technological attainability in promising products of Deep Tech startups. 3. Active participation in the development of entrepreneurship and technology transfer as an external accelerator and investment fund. 4. Participation in the development of customer relations courses. **Role in Scientific Breakthrough:** 1. Customer, co-developer, validator, and disseminator in the Unique R&D&I project when it comes to the development of autonomous monitoring systems in communication infrastructure. 2. Customer and co-developer of applied R&D projects in pilotless robotics systems and distributed sensor networks, which employ AI methods.

					3. Participation in the organization of project activities of Master's and PhD students in the fields of AI, robotics, and human-computer interaction. 4. Expert support of PI training with a focus on entrepreneurial activities and technology transfer. **Role in Highly Personalized Value-Based Education:** 1. Corporate partner of Master's programs in Internet of Things technologies, robotics, and AI. 2. Development of entrepreneurial culture and support of technological startups created by ITMO alumni. 3. Participation in the development of ITMO University and its partners digital educational ecosystem to ensure that educational and career paths are connected. **Role in Well-Being:** 1. Participant in the sabbatical programs. 2. Participant in projects for the development of ITMO Highpark's infrastructure in terms of telecommunication, biometrics, etc. 3. Expert, technological, and infrastructural partner of projects for citizen science and intellectual crowdfunding.
4	Public Joint-Stock Company Sberbank	Sberbank PJSC	7707083893	Strategic partner in education, science, innovation, and social activities. Corporate partner of Master's program, in particular Robotics and Artificial Intelligence. Sberbank Group is a unique ecosystem of labs, business departments, subsidiaries, and a corporate university focused on the development and application of AI in various fields. The segment related to the technologies of pilotless transportation, intelligent sensors, and human-computer interfaces is one of the most prioritized and rapidly developing: SberAutoTech, SberDevices, Cognitive Pilot, VisionLabs, etc. Sberbank Group includes large internal customers in electronic commerce, delivery,	**Role in ITMO.Impact**: 1. Customer, co-developer, validator, and disseminator of projects in the implementation of AI technologies in robotics, data compilation and processing systems with distributed sensor networks, and smart devices with multimodal human-computer interfaces. 2. Partner of the corporate track in the accelerator program for technological startups of ITMO students, alumni, and employees. 3. Expert partner and active participant in customer relations courses.

				and transportation, as well as SberLogistics and SberLeasing, etc. *Customer, co-developer, technology validator, opinion leader*	4. Active participation in the creation of an IP bank under the ITMO PL open license. 5. Key technological partner of RoboForces. 6. Customer and coordinator of frontier analytical research in AI in robotics. **Role in Scientific Breakthrough:** 1. Customer, validator, propagator, and co-developer of research projects in the development of methods for AI in: modeling, management, and processing of information for intelligent service robots and multiagent systems; reality simulators with high accuracy; multimodal human-computer interfaces. 2. Active supporter of project activities of Master's and PhD students in the field of robotics and AI. 3. Customer of industrial PhD programs. **Role in Highly Personalized Value-Based Education:** 1. Corporate partner of Master's programs in the field of robotics and AI. 2. Active participant in the program for the implementation of the best practices of digital transformation in education, creation of digital platforms and services for educational activities (including the competencies of Sberbank's Corporate University and School no. 21). 3. Participant in the program for the development of network programs with other university partners. 4. Partner of international and national educational events held at ITMO (*I am a Professional* contest). 5. Customer and co-developer of continuous learning programs in the development of digital competencies, in particular in AI in robotics and computer vision. 6. Creation of new high tech job positions and helping ITMO University alumni with employment at Sberbank facilities.

					Role in Well-Being: 1. Participant in the program for sabbaticals. 2. Expert, technological, and infrastructural partner of projects for citizen science and intellectual crowdfunding. 3. Active participant in the program for the joint use of infrastructure by consortium members to create a favorable and comfortable environment for professional work and leisure, in particular on the basis of Sber's DS-hub in St. Petersburg.
5	Gazprom Neft Public Joint-Stock Company	Gazprom Neft PJSC	5504036333	Strategic partner in the fields of AI education and science, digital technologies, sensor systems, solution chemistry that has a corporate research and educational center at the university. One of St. Petersburg's key companies. Acknowledged experts in the energy market, one of the most prioritized markets of the M-platform CPS 2.0. The company has a high demand for solutions in robotization of technological processes and a high potential for their implementation as part of the strategy for digital transformation of Gazprom Neft. *Customer, co-developer, technology validator, and opinion leader*	**Role in ITMO.Impact**: 1. Customer, co-developer, validator, and propagator of scientific projects in pilotless robotics systems and intelligent sensors for robotized production and monitoring of the infrastructure. 2. Expert partner and active participant in the customer relations courses. 3. Partner of the corporate track in the accelerator program for technological startups created by students, alumni, and employees of ITMO University. 4. Technological and resource partner from the energy industry for the creation of an IP bank under the ITMO PL open license. 5. Expert and administrative support of standardization and certification of solutions in the field of robotics and sensors for the oil and gas industry. 6. Technological and resource partner of the distributed testing ground for standardization and validation of robotized technologies in production and the energy industry. 7. Industrial partner of RoboForces. 8. Customer, co-developer, and propagator of projects in the development of urban power infrastructure. **Role in Scientific Breakthrough:** 1. Key partner of the international research and educational center Gazprom Neft – ITMO.

					2. Customer, validator, propagator, and co-developer for research projects in information and robotized systems based on pinch and green technologies for robotized technologies and facilities that lead to the decrease in usage of dangerous materials and power, as well as the enhancement of production efficiency, durability, qualities, and recycling possibilities. 3. Key partner of the Unique R&D&I project in the field of creation of an information and control system for autonomous submarine equipment for sea pipelines and ecological monitoring. 4. Active participant in the organization of project activities of Master's and PhD students in the field of robotization of oil exploration, production, transportation, and processing. 5. Participant in the program for PI training with a focus on technology transfer to companies of the power industry. **Role in Highly Personalized Value-Based Education:** 1. Gazpromneft Science & Technology Centre is a corporate partner of Master's programs in the field of energy- and resource-saving processes in chemical technologies, petrochemistry, and biotechnologies using green chemistry technologies. 2. Active participant in the program for implementation of the best practices of digital transformation of education. 3. Participant in the program for the development of network programs with other university partners. 4. Partner of accelerator programs of ITMO University. 5. Customer and co-developer of continuous learning programs in the development of digital competencies for specialists in the field of oil, gas, and power industry.

					6. Creation of new high tech job positions and helping ITMO University alumni with employment at Gazprom Neft facilities. **Role in Well-Being:** 1. Participant in the program for sabbaticals. 2. Expert, technological, and infrastructural partner of projects for citizen science and intellectual crowdfunding. 3. Participant of the program for the joint use of infrastructure by consortium members to create a comfortable environment for professional work and leisure, in particular at the Tsifergauz digital transformation center in St. Petersburg.
6	Joint-Stock Company Russian Railways	Russian Railways JSC	7708503727	Strategic, industrial partner, and the main customer of projects by the National Center for Quantum Internet. Russian Railways JSC is a key expert and resource partner of ITMO University for the implementation of projects in the field of quantum communications, quantum internet, and the development of pilotless technologies on railway transport. Together with the subsidiaries NIIAS JSC and Railway Research Institute of Russian Railways JSC, ITMO University develops technological solutions to be implemented in facilities of Russian Railways. *Customer, co-developer, technology validator and propagator*	**Role in ITMO.Impact**: 1. Customer, co-developer, validator, and disseminator of projects in the fields of quantum communications, pilotless rail transport, monitoring, and maintenance of the railway infrastructure. 2. Expert partner and active participant in the customer relations courses. 3. Partner of the corporate track in the accelerator program for technological startups of ITMO students, alumni, and employees. 4. Expert and administrative support of standardization and certification of solutions in the field of quantum communications, robotics, and sensors for railway transport. 5. Technological and resource partner of the distributed polygon for standardization and validation of secure quantum communication technologies, as well as solutions in robotization of monitoring and maintenance of railways and related infrastructure. 6. Customer, co-developer, and propagator of projects in the development of the urban transport infrastructure. **Role in Scientific Breakthrough:**

					Key partner of the National Center for Quantum Internet. **Role in Highly Personalized Value-Based Education:** Creation of new high tech job positions and helping ITMO University alumni with employment at Russian Railways facilities. **Role in Well-Being:** Participant in projects for the development of ITMO Highpark's infrastructure in terms of transport and communications.
7	RUSNANO Management Company	RUSNANO Management Company	7728864753	Key institute for development in the field of solution support and nanoindustrial technologies, including bioengineering, photonics, and nanomaterials. *Tasksetter, customer, validator, system integrator*	**Role in ITMO.Impact**: 1. Expertise of projects and startups 2. Investment in Deep Tech projects 3. Creation of corporate technological laboratories in specialized fields as separate legal entities at ITMO University.
8	Fund for Infrastructure and Educational Programs	Fund for Infrastructure and Educational Programs	7728116275	Key foundation in the field of support of continuous learning programs and Master's programs in the nanoindustry.	**Role in ITMO.Impact**: Support, development, and distribution of educational programs and practices among Russian universities
9	Committee on Informatization and Communication of St. Petersburg	Committee on Informatization and Communication of St. Petersburg	7825457753	Specialized committee of the Government of St. Petersburg, interaction with which is important in order to establish the connection between the university, businesses, and the government and implement the consortium's projects in St. Petersburg's economy and environment. *Part of the executive branch of the Government of St. Petersburg, center of expertise in the implementation of IT solutions, tasksetter, disseminator and validator of technologies.*	**Role in ITMO.Impact**: 1. Customer and validator of dissemination projects in the development of urban transport and telecommunication infrastructure. 2. Infrastructural and administrative support for the creation of publicly available data in the fields related to the consortium's activities.
10	Internet Initiatives Development Fund	Internet Initiatives Development Fund	7704280879	National leader in the development of technological entrepreneurship and establishment of ecosystems for a venture market in Russia.	**Role in ITMO.Impact**: 1. Customer and validator of analytical research in the field of assessment of technological attainability in promising products of Deep Tech startups.

					2. Participation in the development of entrepreneurship at ITMO as an external accelerator and investment fund. 3. Promoting innovative products, development, and adaptation of business models. 4. Informational, methodological, and expert support of all stages of the development of competitive products (infocommunication technologies and IT services).
11	European X-ray Free-Electron Laser Facility GmbH	European XFEL	-	International operator company that helps organize research at the European XFEL project, a megascience facility in Hamburg, Germany. ITMO University specialists have won competitions for access to the device three times.	**Role in ITMO.Impact**: Support of ITMO University's participation in large-scale international research projects. **Role in Scientific Breakthrough:** 1. Provision of unique infrastructure for cutting-edge research in the fields of new materials in photonics. 2. Participation in the training of PhD students of joint programs.
12	Joint-Stock Company Research and Technological Institute of Optical Materials of All-Russia Scientific Center S.I.Vavilov State Optical Institute	Vavilov State Optical Institute	7811483834	Part of the Shvabe Holding of state-owned group Rostec, former part of the Vavilov State Optical Institute, partner of ITMO University and other members of the consortium in education and research, as well as is engaged in the implementation of technological projects in the development and production of optic fiber for special purposes. *Customer, co-developer*	**Role in ITMO.Impact**: 1. Customer and co-developer of applied research projects in new optical fiber with unique properties. 2. Participation in the creation of a distributed testing ground for the assessment of resilience and fault tolerance of soft- and hardware.
13	Federal State Budgetary Institution of Science Prokhorov General Physics Institute of the Russian Academy of Sciences	GPI RAS	7736029700	Partner in the field of research of the interaction between laser radiation and substances, as well as cutting-edge laser technologies, physics, and manufacturing. *Co-developer*	**Role in ITMO.Impact**: Co-developer of projects in the field of creation of broadband radiation receivers, lasers with ultra-high pulse frequency, hybrid laser systems, and radio-photon converters of electromagnetic impulses. **Role in Scientific Breakthrough:** 1. Participant in fundamental R&D projects in the development of new methods for quantum connection and cryptography, remote control and sounding,

					generation, reception, and transformation of radiation for systems of monitoring and control of remote objects. 2. Participant in applied R&D projects in the development of new sources, receivers, and transformers of optic, terahertz, and radio radiation for monitoring of remote objects.

Cognitive Informatics Consortium	
Name of the strategic project implemented with the consortium's participation	The consortium's role in the strategic project's implementation
ITMO.Impact	1. Key role in creating open joint-use spaces together with partners for the development of new digital technologies and full-cycle solutions (TRL 1-8) in AI. Further development of ITMO's National Center for Cognitive Research. 2. Key role in coordinating activities with leading universities and companies of St. Petersburg as part of the regional AI in Industry research and educational center. 3. Key role in developing a services ecosystem for the city and its citizens. 4. Development of an IP commercialization company for AI - ITMO.AI. Development of a commercialization infrastructure within ITMO.AI. 5. Active participation in the creation of an open-license IP bank, with key focus on AI-related IP. Key role in the Open Software project: creation and promotion of open source software and digital services in AI and related issues. 6. Participation in the formation of the national standardization system: participation in TK 164 Artificial Intelligence. 7. Active participation in the development of a lifelong learning system by providing opportunities for staff's continuous professional development during their career using ITMO Avatars. Key role in increasing the number of students at continuing professional development programs (CPD). 8. Support for school- and university-level academic competitions in math and computer science, including ICPC Northern Eurasia. Development of an open platform for professional communities for holding remote programming competitions.
Scientific Breakthrough	1. Key participation in the development of the Unique R&D&I project. Specifically, implementing digital platforms based on strong AI at partner companies (Gazprom Neft, Sber, etc.): development of a digital avatar (an environment for the development of the ecosystem of digital personas with the implementation of such functions as social reflection and learning in the community); development of a configurator of the future (an environment for generative modeling and design of digital objects in the systems of the real world with the reproduction of the creative functions of a constructor-designer), development of a digital inquisitor (an environment for the formation and research of evidence based on the data available in public cyberspace).

				2. Participation in the Breakthrough Science project. In particular, the development of a leading research center for strong AI (TRL 1-4), focusing on the following objectives: • research and development of cognitive algorithms and structures of strong AI that reproduce human creative activity; • obtaining new results in the fundamental foundations of computer science, ensuring transition to the technologies of strong AI. 3. Participation in PI Training through industrial Master's programs with consortium's partners, as well as expert and resource support for project activities of Master's and PhD students in the areas of AI and cognitive technologies.	
Highly Personalized Value-Based Education				1. Research in the areas of digital transformation of education, replicating best practices in digital pedagogy for AI in regional partner universities; 2. Implementation of the lifelong learning model from applicant to graduate to specialist in the labor force with the use of all levels of education (HE, SE and CPD) and formats (offline, online, blended) in the area of digital technologies; 3. Development of ITMO University and its partners' digital educational ecosystem that enables each ITMO student to build an optimal learning track as part of lifelong learning, interconnectedness of the educational and career paths based on the principles of an adaptive LXP-platform, big data analysis and AI. 4. Development and deployment of network educational programs and replication of educational modules in universities in the regions where partner companies are present.	
Well-Being				1. Research in the field of well-being and quality of life improvement and using the results to achieve the sustainable development goals in St. Petersburg and the Russian Federation. 2. Implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment. 3. Participation in the development projects Professional Success and Socialization; Positive Environment and Conscious Consumption; and Research and Promotion of Top Well-Being Practices.	
Information about the members of the consortium					
No	Full name of the member organization	Short name of the member organization	Member organization's tax ID number	Member organization's role in the consortium	Member organization's role in the strategic project's implementation
1	Consortium of the National Center for Cognitive Research	NCCR		NCCR Consortium was founded in 2018 at the National Technical Initiative Center for Competencies in machine learning and cognitive technologies. Its goal is the development of an R&D, commercialization and training ecosystem in AI and related subjects. It includes organizations that fulfill different roles and can produce solutions with a high TRL, infrastructure support, dissemination of results in the learning process, etc. As	**Role in ITMO.Impact**: 1. Key role in creating open joint-use spaces together with partners for the development of new digital technologies and full-cycle solutions (TRL 1-8) in AI. Further development of ITMO's National Center for Cognitive Research.

				it is part of the Cognitive Informatics M-Platform, it makes it possible to inherit the roles of the key participants and more in the implementation of its development program.	2. Key role in coordinating activities with leading universities and companies of St. Petersburg as part of the regional AI in Industry research and educational center. 3. Key role in developing a services ecosystem for the city and its citizens. 4. Development of an IP commercialization company for AI - ITMO.AI. Development of a commercialization infrastructure within ITMO.AI. 5. Active participation in the creation of an open-license IP bank, with a key focus on AI-related IP. Key role in the Open Software project: creation and promotion of open source software and digital services in AI and related issues. 6. Participation in the formation of the national standardization system: participation in TK 164 Artificial Intelligence. 7. Active participation in the development of a lifelong learning system by providing opportunities for staff's continuous professional development during their career using ITMO Avatars. Key role in increasing the number of students in CPD programs. 8. Support for school- and university-level academic competitions in math and computer science, including ICPC Northern Eurasia. Development of an open platform for professional communities for holding remote programming competitions. **Role in Scientific Breakthrough:** 1. Key participation in the development of the Unique R&D&I project. Specifically, implementing digital platforms based on strong AI at partner companies (Gazprom Neft, Sber, etc.): development of a digital avatar (an environment for the development of the ecosystem of digital personas with the implementation of such functions as social reflection and learning in the community); development of a configurator of the future (an environment for generative modeling and design of digital objects in the systems of the real world with the

					reproduction of the creative functions of a constructor-designer), development of a digital inquisitor (an environment for the formation and research of evidence based on the data available in public cyberspace). 2. Participation in the Breakthrough Science project. In particular, the development of a leading research center for strong AI (TRL 1-4), focusing on the following objectives: ● research and development of cognitive algorithms and structures of strong AI that reproduce human creative activity; ● obtaining new results in the fundamental foundations of computer science, ensuring transition to the technologies of strong AI. 3. Participation in PI Training through industrial Master's programs with consortium's partners, as well as expert and resource support for project activities of Master's and PhD students in the areas of AI and cognitive technologies. **Role in Highly Personalized Value-Based Education:** 1. Research in the areas of digital transformation of education, replicating best practices in digital pedagogy for AI in regional partner universities; 2. Implementation of the lifelong learning model from applicant to graduate to specialist in the labor force with the use of all levels of education (HE, SE and CPD) and formats (offline, online, blended) in the area of digital technologies; 3. Development of ITMO University and its partners' digital educational ecosystem that enables each ITMO student to build an optimal learning track as part of lifelong learning, interconnectedness of the educational and career paths based on the principles of an adaptive LXP-platform, big data analysis and AI. 4. Development and deployment of network educational programs and replication of educational

					modules in universities in the regions where partner companies are present. **Role in Well-Being:** 1. Research in the field of well-being and quality of life improvement and using the results to achieve the sustainable development goals in St. Petersburg and the Russian Federation. *2.* Implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment. 3. Participation in the Professional Success and Socialization, Positive Environment and Conscious Consumption, and Research and Promotion of Top Well-Being Practices development projects .
2	Limited Liability Company MTS Artificial Intelligence Center	MTS Artificial Intelligence Center LLC	7740000076	Leader in the design and implementation of IA systems, tasksetter, disseminator	**Role in ITMO.Impact**: Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8) **Role in Scientific Breakthrough:** Participation in testing and implementation of platform solutions based on strong AI: digital avatar
3	Limited Liability Company Center for Speech Technologies	Center for Speech Technologies LLC	7805093681	Disseminator of technologies and products in AI	**Role in ITMO.Impact:** Participation in the formation of the national standardization system: participation in TK 164 Artificial Intelligence. **Role in Scientific Breakthrough:** Organizer of PI internships for high-level specialists capable of managing projects in AI and related fields.
4	Limited Liability Company Mail.Ru	Mail.Ru LLC	7743001840	Leader in design and implementation of AI systems, tasksetter	**Role in ITMO.Impact:** Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8) **Role in Scientific Breakthrough:**

					Participation in testing and implementation of platform solutions based on strong AI: digital avatar
5	Joint-Stock Company Diakont	JSC Diakont	7819013502	Propagator of technologies and products in AI	**Role in ITMO.Impact:** Participation in the formation of the national standardization system: participation in TK 164 Artificial Intelligence. **Role in Scientific Breakthrough:** Organizer of PI internships for high-level specialists capable of managing projects in AI and related fields.
6	Limited Liability Company Gazprom Neft Research Center	Gazprom Neft Research Center LLC	7838395487	Leader in design and implementation of AI systems, tasksetter	**Role in ITMO. Impact:** Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8) **Role in Scientific Breakthrough:** Participation in testing and implementation of platform solutions based on strong AI: configurator of the future **Role in Highly Personalized Value-Based Education:** Implementation of the lifelong learning model from applicant to graduate using all levels of education.
7	Limited Liability Company Open Code	Open Code LLC	6313007301	Disseminator of technologies and products in AI	**Role in ITMO. Impact:** Key role in the Open Software project: creation and promotion of open-source software and digital services in AI and related issues. **Role in Scientific Breakthrough:** Organizer of PI internships for high-level specialists capable of managing projects in AI and related fields. **Role in Highly Personalized Value-Based Education:** Implementation of the lifelong learning model from applicant to graduate to specialist in the labor force with the use of all levels of education.
8	Joint-Stock Company Er-Telecom Holding	JSC Er-Telecom Holding	5902202276	Disseminator of technologies and products in AI	**Role in ITMO.Impact:** Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8)

					Role in Well-Being: Research in the field of well-being and quality of life improvement and using the results to achieve the sustainable development goals in St. Petersburg and the Russian Federation.
9	Federal State Budgetary Institution Almazov National Medical Research Center of the Health Ministry of the Russian Federation	Almazov National Medical Research Center	7802030429	Propagator of technologies and products in AI in healthcare	**Role in Scientific Breakthrough:** Participation in the establishment and development of a leading research center for strong AI (TRL 1-4) **Role in Highly Personalized Value-Based Education:** Implementation of the lifelong learning model from applicant to graduate to specialist in the labor force with the use of all levels of education. **Role in Well-Being:** Participation in the Health and Sports and Positive Environment and Conscious Consumption development projects
10	Public Joint-Stock Company Sberbank	PJSC Sberbank	7707083893	Strategic partner in education, science, innovations, social responsibility activities. Corporate partner of Master's programs, specifically, Smart City Digital Technologies, Big Data Financial Technologies. Sber Group is a unique ecosystem of laboratories, business units, subsidiaries and a corporate university, focusing on the development and use of AI in various areas. Sber is a recognized leader in the development and implementation of AI, ITMO University's strategic partner in research and education, and is part of the NCCR Consortium. With its participation, ITMO has carried out several R&D projects in the areas of digital avatars, social networks data enrichment, and explainable AI. Customer, co-developer, technology validator, and opinion leader	**Role in ITMO.Impact:** 1. Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8) 2. Active participation in the development of a lifelong learning system by providing opportunities for staff's continuous professional development during their career using ITMO Avatars. Key role in increasing the number of students at continuing professional development programs (CPD). 3. Support for school- and university-level academic competitions in math and computer science, including ICPC Northern Eurasia. Development of an open platform for professional communities for holding remote programming competitions. **Role in Scientific Breakthrough:** Participation in testing and implementation in platform solutions based on strong AI: digital avatar

					Role in Highly Personalized Value-Based Education: 1) Research in the areas of digital transformation of education, replicating and scaling best practices in digital pedagogy 2) Development of ITMO University and its partners' digital educational ecosystem that enables each ITMO student to build an optimal learning track as part of lifelong learning, interconnectedness of the educational and career paths based on the principles of an adaptive LXP-platform, big data analysis and AI. **Role in Well-Being:** 1. Active participants in sabbatical program with ITMO. 2. Expert, tech and infrastructure partner in citizen science and intellectual crowdfunding projects. 3.Active participant in the program for the joint use of infrastructure by consortium members to create a comfortable environment for professional work and leisure, in particular on the basis of Sber's DS-hub in St. Petersburg. 4. Implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment.
11	Limited Liability Company Siemens	Siemens LLC	7725025502	Leader in design and implementation of AI systems, tasksetter	**Role in ITMO.Impact:** Active participation in the development of a lifelong learning system by providing opportunities for staff's continuous professional development during their career using ITMO Avatars. Key role in increasing the number of students in CPD programs . **Role in Scientific Breakthrough:** 1. Participation in testing and implementation of platform solutions based on strong AI: configurator of the future
12	Gazprom Neft Public Joint-Stock Company	Gasprom Neft PJSC	5504036333	Leader in design and implementation of AI systems, tasksetter Strategic partner in education and research in AI and digital technologies. The company is one of the system-	**Role in ITMO.Impact:** Key role in coordinating activities with leading universities and companies of St. Petersburg as part of the regional AI in Industry research and educational center.

				forming companies in St. Petersburg. It is a recognized expert in the energy market, one of the top priorities for the M-platform Next-Gen Cyberphysical Systems (CPS 2.0) Together with ITMO University, it carries out R&D in digital technologies as well as CPD in digital tech. The company has a justifiably high demand for solutions in the field of AI and a high potential for their widespread implementation within the framework of the existing digital transformation strategy of Gazprom Neft PJSC.	**Role in Scientific Breakthrough:** Participation in testing and implementation of platform solutions based on strong AI: configurator of the future **Role in Well-Being:** 1. Active participant in the sabbatical program with ITMO. 2. Expert, tech and infrastructure partner with citizen science and intellectual crowdfunding projects. 3. Participant of the program for the joint use of infrastructure by consortium members to create a comfortable environment for professional work and leisure, in particular at the Tsifergauz digital transformation center in St. Petersburg. 4. Implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment.
13	RUSNANO Management Company	RUSNANO Management Company	7728864753	Tasksetter and disseminator of solutions in AI. Rosnano is ITMO's collaborator in developing digital tech for scientific devices, new materials and systems with programmable devices.	**Role in ITMO.Impact:** Participation in creating open joint-use spaces for the development of new digital technologies and solutions (TRL 1-8) **Role in Scientific Breakthrough:** Participation in testing and implementation of platform solutions based on strong AI: digital inquisitor
14	Committee on Informatization and Communication of St. Petersburg	Committee on Informatization and Communication of St. Petersburg	7825457753	A committee of the St. Petersburg government crucial in the implementation of the "university-business-government" triangle and support for integration of the consortium's products into the economy and the life of St. Petersburg. Tasksetter in digital urban studies.	**Role in ITMO.Impact:** Development of the digital services and products for the city's digital ecosystem. **Role in Well-Being:** Research in the field of well-being and quality of life improvement and using the results to achieve the sustainable development goals in St. Petersburg and the Russian Federation.
15	Internet Initiatives Development Fund	IIDF	7704280879	Russia-based leader in tech entrepreneurship and venture market ecosystems in the Russian Federation.	**Role in ITMO.Impact:** 1. Customer and validator of analytical studies to assess the technological feasibility of promising products of Deep Tech startups.

					2. Support for entrepreneurship development at ITMO as an outside accelerator and investment fund. 3. Innovative products promotion, development and adaptation of business models. 4. Information and expert support on all stages of the development of competitive products in communications tech and IT services.
16	Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences	Keldysh Institute of Applied Mathematics	7710063939	Leader in R&D in IA, co-developer	**Role in Scientific Breakthrough:** Participation in the establishment and development of a leading research center for strong AI (TRL 1-4)
17	Ivannikov Institute for System Programming of the Russian Academy of Sciences	The Ivannikov Institute for System Programming of the Russian Academy of Sciences	7709006125	Leader in R&D in IA, co-developer	**Role in Scientific Breakthrough:** Participation in the establishment and development of a leading research center for strong AI (TRL 1-4)
18	Far Eastern Federal University	Far Eastern Federal University	2536014538	Leader in R&D in AR/VR, co-developer	**Role in Scientific Breakthrough:** Participation in the establishment and development of a leading research center for strong AI (TRL 1-4) **Role in Highly Personalized Value-Based Education:** Dissemination of best practices in digital pedagogy
19	Yaroslav-the-Wise Novgorod State University	Yaroslav-the-Wise Novgorod State University	5321033744	Talent feeder	**Role in Scientific Breakthrough:** Participation in the development of PI Training **Role in Highly Personalized Value-Based Education:** Dissemination of best practices in digital pedagogy
20	Lobachevsky State University of Nizhny Novgorod	Lobachevsky State University of Nizhny Novgorod	5262004442	Leader of R&D in explainable AI, co-developer	**Role in Scientific Breakthrough:** 1. Participation in the establishment and development of a leading research center for strong AI (TRL 1-4) 2. Participation in the PI training development project **Role in Highly Personalized Value-Based Education:** Research in digital transformation of education, dissemination of best practices in digital pedagogy

21	STANKIN Moscow State University of Technology	STANKIN Moscow State University of Technology	7707003506	Talent feeder	**Role in Scientific Breakthrough:** Participation in the PI training development project **Role in Highly Personalized Value-Based Education:** Dissemination of best practices in digital pedagogy
22	Independent non-profit organization of additional professional education Research and Education Center JetBrains	INO APE Research and Education Center JetBrains	7814717551	Partner in education, leader in training highly qualified programmers. Focused on the development of applied digital solutions and dissemination of tech solutions.	**Role in Scientific Breakthrough:** Organizer of PI internships for high-level specialists capable of managing projects in AI and related fields. **Role in Highly Personalized Value-Based Education:** Implementation of the lifelong learning model from applicant to graduate to specialist in the labor force with the use of all levels of education.
23	Management Company Rocket Group	Rocket Group	4703142366	Owner of datasets on the sustainable development of St. Petersburg	**Role in Well-Being:** Research in the field of well-being and quality of life improvement and using the results to achieve the sustainable development goals in St. Petersburg and the Russian Federation.

Human. Nature. Technology Consortium	
Name of the strategic project implemented with the consortium's participation	The consortium's role in the strategic project's implementation
ITMO.Impact	1. Key role in establishing partnerships in the implementation of applied R&D projects and bringing the results to TRL 6-8 in terms of the creation and implementation of personalized diagnostic test systems, the development of new therapeutic solutions based on existing pharmacological substances, and the creation of new early diagnostic methods using the results of genomic analysis. 2. Creation of an innovative design laboratory together with the consortium participants at St. Petersburg's Technopark in the following fields: high-precision printing of personalized products, microreactor chemistry technologies, and synthetic biology technologies for solving genetic engineering problems. 3. Development of the Gazprom Neft scientific and educational center – a petrochemistry engineering laboratory for analysis and design. 4. Conducting large-scale research projects involving the public to identify aspects of our planet's biodiversity and their potential use, particularly by implementing citizen science city projects on environmental monitoring, biobanking, and personalized monitoring of living systems. 5. Active participation in the Shared Digital Space for Open Science with Partners project, which includes infrastructure and administrative support for the creation of publicly available data sets and open source software packages in the fields of inorganic materials design, microorganism and microbial community engineering, and basic gene editing and genome assembly technologies.

	6. Active involvement in exploratory and frontier analytical research, as well as the construction of multi-industry testing grounds for complex validation of the implementation of technologies that assure human health improvement. 7. Joint implementation of translational research projects in the fields of molecular engineering in life sciences, microbial consortia engineering, and early detection and diagnostics of novel infectious pathogens. 8. Joint technology transfer, including the development of deep tech entrepreneurship. Seed funding and strategic support of startup studios in a number of areas of generative design and engineering in relation to life sciences (biochemistry, biotechnology, biomedicine, bioengineering, and biomaterials), as well as the use of high-precision additive technologies and digital engineering information technologies, to enable an upgrade to TRL6-8 level projects. For example, the launch of mass production of new screening platforms and the development of new digital services for processing genomic data in collaboration with the Centre for Strategic Planning of the Federal Medical Biological Agency of Russia and Helix.
Scientific Breakthrough	9. Joint formation of a research agenda and an investment strategy for the Human. Nature. Technology M-platform through the involvement of representatives of cultural institutions and creative industries in managing councils. 10. Resource and infrastructure support for research in the fields of personalized medicine, diagnostics, digital engineering of materials, high-precision printing, and technological safety of human life, based on technologies confirmed by and implemented jointly with consortium participants. In particular, support in the field of registering and performing clinical trials of technologies that have passed preclinical research or demonstrated a high diagnostic effect. 1. Participation in the PI Training development project through industrial PhD programs with consortium partners, as well as expert and resource support for Master's and PhD students project work in chemistry and biology studies. Formation of a support and development system for PIs, particularly using the PI school format as a set of events and information resources for leading specialists and the management staff of partner companies in the field of modern molecular engineering in life sciences.
Highly Personalized Value-Based Education	12. Expert and resource support for Master's programs with a focus on chemistry and biology. 13. ITMO University and its partners are developing a digital educational environment to ensure the connection between learning and career tracks. Adoption of best practices in educational digital transformation in areas related to the consortium's activity. 14. Active participation in the implementation of the proactive lifelong learning model, in particular in CPD programs which bring together natural sciences and digital courses. 15. Promoting chemistry and biology majors, establishing new high-tech jobs, and encouraging ITMO University graduates to work in fields such as applied materials chemistry, infochemistry, biotechnology, and photonics.

	1. Development of an entrepreneurial environment through collaborative student mentoring, investment in ITMO University's startup studio, participation in the selection and investment of startups based on previous achievements, including successfully completed practice-oriented projects by ITMO students.
Well-Being	17. Industrial sabbatical (mutual employee exchange programs with corporate partners). 18. Unlocking human potential in the knowledge economy through citizen science and intellectual crowdfunding projects. 19. Exchange of best practises and implementation of projects for creating and joint use of infrastructure and social and psychological support programs by consortium members, in order to create a favorable and comfortable environment for professional work and leisure, thereby increasing overall productivity and efficiency in study and work.

Information about the members of the consortium

No	Full name of the member organization	Short name of the member organization	Member organization's tax ID number	Member organization's role in the consortium	Member organization's role in the strategic project's implementation
1	Closed Joint-Stock Company Innovation Center Biryuch	Innovation Centre Biryuch CJSC	3122508005	A strategic science and education partner in life sciences. The center is a leader in commercial research and high-tech projects in food biotechnologies, molecular biology, and genetic technologies. The center is a research division of the EFKO group of companies, which is one of the three largest agricultural companies in Russia. Biryuch is one of seven Russian companies that have access to Bayer technologies for plant breeding. The center has a broad equipment infrastructure, and has experience in practice-oriented research in biotech and foodtech. Biryuch is focused on value and impact. Technology validator, co-developer, technology propagator, provider of training for talented students	**Role in ITMO.Impact**: 1) Creation of: ● a unified AI-based algorithmic platform for engineering microorganisms and microbial communities; ● an online service for optimizing technological process in the production of fuel cells; ● experimental laboratory for testing chemical engineering structures for validators integrating basic genomic editing and genome assembly technologies in the agricultural sector; 2) Examination and validation of technological solutions and innovative projects in biotech and foodtech created at ITMO University. 3) Providing resources and a site for prototyping, scaling, and testing promising technologies and support for their subsequent implementation, as well as the validation and implementation of solid-state printing technologies at the partner's production sites; 4) Implementation and validation of technologies for rapid screening of pathogens in the central nervous system. **Role in Scientific Breakthrough:**

					1) Performing interdisciplinary research, particularly in synthetic biology and molecular engineering of materials; 2) Implementation of R&D&I projects, development of new commercial solutions, and offering the possibility to integrate the latest R&D into the industry within one year; 3) Creating project initiatives in a number of areas of generative design and engineering in relation to life sciences, namely biochemistry, biotechnology, biomedicine, bioengineering, and biomaterials, as well as the use of high-precision additive technologies and digital engineering information technologies, which together will allow us to obtain breakthrough results at TRL 6-8. 4) Participation in the PI School for young PhD holders: ● mentoring graduates of the PI School (creation of satellite laboratories of the platform, as well as involving participants in project work of the platform remotely); ● M-platform's PI School focused on developing interdisciplinary projects 5) Creation of a joint research group to conduct targeted genetic research; 6) Implementation of a project on personalized nutrition, taking into account the technologies of genetic screening and sequencing of microbiotic material to create next-gen functional products, as well as conducting research on their therapeutic properties; 7) Creation and digitization of a common database of human microbiota and microbial communities for the development of microbiota data-based smart foods. **Role in Highly Personalized Value-Based Education:** 1) Participation in events held by the M-platform in the form of open conversations in a series of lectures on the quality of life in terms of the integration of chemical, engineering, and biotechnological solutions. 2) Creation of an effective internship system for young specialists in R&D.

					3) Expert and resource support for updating the content for and implementing Master's programs in chemistry and biology. 4) Active participation in the implementation of the lifelong learning model, in particular in the development and implementation of CPD programs that combine natural sciences with digital fields. 5) Building an entrepreneurial environment through collaborative student mentoring, investments in ITMO University's startup studio, participating in the selection and investment into startups based on previous developments, in particular successfully completed practice-oriented projects by ITMO students. **Role in Well-Being:** 1) Industrial sabbatical (mutual employee exchange programs with corporate partners); 2) Creating a unified online environment for direct communication between young talented specialists and businesses for exchanging experience and developing soft skills. 3) Implementation of comprehensive social and psychological support programs and mental health improvement in a high-paced study and work environment. 4) Participation in the Health and Sports, Professional Success and Socialization, Positive Environment and Conscious Consumption, and Research and Promotion of Top Well-Being Practices development projects. 5) Acting as an expert, technical, and infrastructure partner for citizen science and intellectual crowdfunding projects.
2	Limited Liability Company Heineken United Breweries	Heineken Breweries LLC	7802118578	Heineken is one of the world's largest fermented beverage producers (beer). The St. Petersburg branch is equipped with modern physical and chemical laboratories to ensure product quality control, as well as scientific laboratories for the development of fundamentally new products using raw and other materials atypical for brewing. A long-time partner in the field of science and education in the following areas: resource saving,	**Role in ITMO.Impact**: 1) Organization of an experimental physics and chemistry laboratory focused on specific scientific fields (agrotechnology, microbiology, fermentation technology, resource-saving technologies, and recycling). **Role in Scientific Breakthrough:** 1) Implementation of interdisciplinary scientific and practical research in the fields of biotechnology; molecular biology;

				changing production technologies, processing secondary material resources. Tasksetter, disseminator and validator of technologies.	metabolic biochemistry; food production equipment and technology 2) Conduct of cross-sectional research to identify needs of the population and subsequent implementation of projects to create products with functional properties. **Role in Highly Personalized Value-Based Education:** 1) Expert and resource support for updating the content for and implementing Master's programs in chemistry and biology. 2) Active participation in the implementation of the lifelong learning model, in particular in the development and implementation of CPD programs in the fields of agrotechnology, microbiology, fermentation technology, resource-saving technologies, and recycling. **Role in Well-Being:** 1) Industrial sabbatical (mutual employee exchange programs with corporate partners).
3	Federal State Budgetary Institution Centre for Strategic Planning and Management of Biomedical Health Risks of the Federal Medical-Biological Agency	FMBA	7704084560	Main customer and validator of technologies at ITMO in medicine and biology. The largest innovative center for the integration of biomedical solutions into practice. The Center is focused on genetic research and the fight against pathogen resistance. Joint major projects are being implemented. In particular, in the field of at-home diagnostic systems (point of care). This member's participation in the consortium will make it possible to quickly integrate R&D from an idea to clinical trials, without the need to attract external funding. Technology validator, tasksetter, opinion leader, co-developer, technology propagator.	**Role in ITMO.Impact**: 1) Validation of ready-made solutions and promotion of scientific solutions to social problems in medicine and biology 2) Creation of innovative design laboratories for innovative biomedical solutions: ● synthetic biological technology for solving genetic engineering problems; ● technologies for diagnosing pathogens of any nature; ● molecular machine development 3) Expert and financial support for registering pharmaceuticals and medical devices. **Role in Scientific Breakthrough:** 1) Creating project initiatives in a number of areas of generative design and engineering in relation to life sciences, namely biochemistry, biotechnology, biomedicine, bioengineering, and biomaterials, as well as the use of high-precision additive technologies and digital engineering information technologies, which together will allow us to obtain breakthrough results at TRL 6-8.

					2) Performing interdisciplinary research, particularly in synthetic biology and molecular biological engineering, nanotoxicology, nanopharmaceuticals, applied genomics, antibiotic resistance; 3) Co-development of new solutions for prevention and diagnostics based on bioinformatic analysis to identify the stage of cardiovascular complications and oncological predispositions at an early stage.
4	Limited Liability Company Tehno	Tehno LLC	7701981450	Technological partner for the production of the latest installations for generating biosafe fast-hardening foams jointly developed with ITMO University. It is a testing ground for pilot trials of new technologies for the protection of nature and the environment. Technology testing and implementation, customer and technology propagator.	**Role in ITMO.Impact**: 1) Creation of an industrial testing ground for new biodegradable products to determine their effectiveness 2) Introduction and production of new technological solutions in the field of biodegradable materials for use in forest fire prevention, suppression of alkali and alkaline-earth metal fire, neutralization of localized liquid ammonia and alkali spills, and neutralization of acids. **Role in Scientific Breakthrough:** 1) Creating project initiatives in a number of areas of generative design of new materials, the production of which is possible in situ and in relation to the protection of natural resources. 2) Participation in the PI School for young PhD holders: ● mentoring PI School graduates (creation of satellite laboratories, and remote integration of participants in project work) ● M-platform's PI School focused on building interdisciplinary projects **Role in Highly Personalized Value-Based Education:** 1) Developing a digital educational ecosystem for ITMO University and its partners to ensure that educational and career paths are connected. Promoting best practices in digital transformation of education. 2) development and implementation of CPD programs that combine natural sciences with digital fields. 3) Building an entrepreneurial environment through collaborative student mentoring, investments in ITMO

					University's startup studio, participating in selecting and investing in startups based on the previous achievements, in particular successfully completed practice-oriented projects by ITMO students. 4) Participation in events held by the M-platform in the form of open conversations in a series of lectures on the quality of life in terms of the integration of chemical, engineering, and biotechnological solutions. **Role in Well-Being:** 1) Industrial sabbatical (mutual employee exchange programs with corporate partners);
5	Gazprom Neft Public Joint-Stock Company	Gazprom Neft PJSC	5504036333	A strategic partner in the field of education and science, specifically in AI, digital technologies, sensor systems, solution chemistry, and energy. This company has a corporate science and educational center at the university. This is one of the backbone companies in St. Petersburg. The company is a recognized expert in the energy market, which is one of the major aspects of the M-platform. The company is in great need for solutions in scientific engineering and digitization of materials for optimizing production processes. Customer, co-developer, technology validator, and opinion leader.	**Role in ITMO.Impact**: 1) Setting tasks, co-development, validation, and propagation of results of scientific projects for technologies for molecular engineering of materials, high-precision additive technologies, and intelligent technologies for molecular engineering; 2) Partnership with the Energy Club for technology startups of ITMO students, graduates, and employees in the energy sector; 3) Expert and administrative support for standardization and certification of solutions in the field of molecular robotics and sensors for the oil and gas sector; 4) Acting as a technical and resource partner of the engineering laboratory for analysis and design in the field of petrochemistry; 5) ordering, co-developing, and propagating urban citizen science projects in the field of environmental monitoring and an open database on the design of inorganic materials. **Role in Scientific Breakthrough:** 1) Setting tasks, co-development, and validation of technologies for molecular engineering of materials, high-precision additive technologies and intelligent technologies for molecular engineering, leading to a reduction in the use of hazardous materials, improving efficiency, increased tech safety of staff, reduced energy consumption and increased resource conservation, as well as the possibility of recycling and/or increasing biodegradable properties;

					2) Participation in the PI preparation program focusing on technology transfer in companies within the energy market, and also through industrial PhD programs. **Role in Highly Personalized Value-Based Education:** 1) Corporate partnerships for Master's programs in energy- and resource-saving processes in chemical technology, petrochemistry, and biotechnology using green chemistry technologies. The center's staff participate in collaborative mentoring and supervise research. 2) Active participation in the program for introducing the best practices of digital transformation of education using the experience from Gazprom Neft Corporate University. 3) Partnerships with accelerator educational programs at ITMO. 4) Ordering and co-developing CPD programs for developing digital competences of specialists in the oil and gas, and energy industries. 5) Creation of new high-tech jobs and assistance with employing ITMO University graduates at Gazprom Neft. 6) Active participation in organizing project work for Master's and PhD students in chemical engineering. **Role in Well-Being:** 1) Active participation in the industrial sabbatical program 2) Acting as an expert, technical, and infrastructure partner for citizen science and intellectual crowdfunding projects. 3) Participant of the program for the joint use of infrastructure by consortium members to create a comfortable environment for professional work and leisure, in particular at the Tsifergauz digital transformation center in St. Petersburg. 4) Implementation of comprehensive social and psychological support programs and mental health improvement in a high-paced study and work environment. 1. Participation of socially responsible business(es) from amongst the consortium members and M-platform partners in implementing the Health and Sports, Professional

					Success and Socialization, Positive Environment and Conscious Consumption, Research and Promotion of Top Well-Being Practices development projects.
6	Limited Liability Company Helix Research and Production Company	RPC Helix LLC	7802122535	Strategic partner in life sciences. In particular, in R&D of new highly specific sensors. The company is actively involved in citizen science projects, has unique databases for depersonalized bioinformatic analysis, and is an investor for a startup studio for validating new diagnostic test systems. Co-developer, technology validator, and opinion leader	**Role in ITMO.Impact**: 1) Co-creation of new solutions for highly specific sensors, validation of ready-made solutions, and involvement in conducting depersonalized bioinformatic analysis; 2) Creation of a new citizen science project for monitoring soil states and establishing dependencies in the development of pathologies in the local population; 3) Expert and advisory support of startup studios for biotech projects. **Role in Well-Being:** 1) Industrial sabbatical (mutual employee exchange programs with corporate partners); 2) Implementation of comprehensive social and psychological support programs and mental health improvement in a high-paced study and work environment.
8	RUSNANO Management Company	RUSNANO	7728864753	An important development institute in decision support and nanoindustry technologies, including bioengineering, photonics, and nanomaterials. Tasksetter, customer, validator, system integrator	**Role in ITMO.Impact**: 1) Assessment of projects and startups; 2) Investments in Deep Tech projects; 3) Creation of contract-based corporate tech labs at ITMO University in key areas as separate legal entities.
9	Fund for Infrastructure and Educational Programs	FIEP	7728116275	An important fund for supporting nanoindustry CPD and Master's programs.	**Role in Highly Personalized Value-Based Education:** 1) Support, development, and replication of educational programs and educational practices in Russian universities

Information and Functional Security (IFS) Consortium	
Name of the strategic project implemented with the consortium's participation	The consortium's role in the strategic project's implementation
ITMO.Impact	1. ITMO.Approved – introduction of a system for validation and assessment for compliance with requirements for information and functional security of innovative products. 2. Ensuring the university's leading position when it comes to extracurricular IFS specialist training. Management of an ethical hacking-based learning system. Formation of educational policy for national-scale cyber-training. Management and development of an ethical hacking community and organization of national and international CyBRICS competitions.

	3. Involvement in tackling the social, governmental, corporate, cross-cultural, technological, and other challenges related to ensuring security of the digitalization of the economy. 4. Upgrading existing and developing new special corporate and accreditation labs in the field of IFS. 5. Active involvement in the ITMO.Validation project: creation of cyber testing grounds and organization of open (for the community and involving the community) technology validation projects.
Scientific Breakthrough	6. Key role in the implementation of the Unique R&D&I strategic project. In particular: experimental high-TRL R&D in the fields of mathematical data security methods, mathematical models, AI security and validation and verification of complex technical systems. 7. Establishment of a center of excellence in the field of IFS of innovative products, including complex intelligent systems; validation and assessment of innovative solutions for compliance with IFS requirements with the goal of introducing high-TRL technologies, products, and services onto the market. 8. Participation in the PI Training development project through joint industrial PhD programs with the consortium's partners, as well as expert and resource support of Master's and PhD students' projects in the field of IFS with emphasis on development dynamics of emerging technologies. 9. Comprehensive support of other M-platforms on tasks related to the IFS of innovative products. Organization of joint research spaces and staff exchange on interdisciplinary tasks.
Highly Personalized Value-Based Education	10. Development and implementation of network-based educational programs with a focus on the promotion of understanding and familiarity with technologies for the management of risks related to the operation of critical digital technologies in key sectors of Russian national economy. Implementation of educational modules at universities in regions consortium's partner companies working with communication systems, financial transactions, functional security of CPSs, AI, computer systems, and specialized software are based. 11. Patriotic education of IFS specialists. 12. Implementation of research on the security of the digital transformation of education. 13. Implementation of the model of proactive lifelong learning from applicant to graduate to specialist at every level (HE, SE, CPD) and format (full-time, online, blended learning) in collaboration with the M-platform's members and partners. 14. Development of the digital educational ecosystem of ITMO University and partners to ensure the coherence of educational and career paths. Assistance in the implementation of the best practices for digital transformation of education in areas related to the activities of the consortium.
Well-Being	15. Development and operation of a center of excellence in IFS as a public environment based on new principles: elimination of structural barriers and openness and accessibility of projects to all consortium members and students, including those from other universities. 16. Implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment. 17. Promotion of an "achievement culture" through the organization of cyber-competitions in ethical hacking and training students for national and international contests.

				18. Participation of socially responsible businesses from among the consortium members and M-platform partners in the implementation of the development projects Health and Sports, Professional Success and Socialization, Positive Environment and Conscious Consumption, and Research and Promotion of Top Well-Being Practices.	
Information about the members of the consortium					
№	Full name of the member organization	Short name of the member organization	Member organization's tax ID number	Member organization's role in the consortium	Member organization's role in the strategic project's implementation
1	Joint Stock Company Resarch and Design Institute for Information Technology, Signaling and Telecommunications in Railway Transportation	NIIAS JSC	7709752846	NIIAS is a subsidiary of Russian Railways JSC and a developer of breakthrough research projects in railway transportation. The company is a key developer of management systems for driverless trains. ITMO and NIIAS have signed an agreement on the implementation of a network Master's program and are working on a number of research projects related to the validation of complex technical systems. *Co-developer, technology propagator at Russian Railways JSC, and technology validator*	**Role in ITMO.Impact**: 1. ITMO.Approved – development of a system for validation and assessment of complex technical systems, including unmanned vehicle systems, for compliance with IFS standards. 2. Ensuring ITMO's position as a leader in extracurricular training of specialists in the IFS of driverless trains 3. Improvement of existing and development of new special certification and contract labs in the field of IFS. **Role in Scientific Breakthrough:** 1. Key participant in the implementation of Unique R&D&I and specifically projects related to mathematical data protection methods, the security of AI systems, and the validation and verification of complex technical systems. 2. Development of a center of excellence in the field of railway IFS; validation and assessment of scientific and technical solutions for railway transport for compliance with IFS standards – with the end goal of introducing high-TRL technologies, products, and services for the benefit of Russian Railways JSC 3. Participation in the PI Training development project, namely continuous proactive training of research staff in the field of IFS for driverless train management systems **Role in Highly Personalized Value-Based Education:**

					1. Expert support and involvement in the implementation of educational programs related to the functional security of critically important systems 2. Development of ITMO University and its partners' digital educational ecosystem and the system of individual learning tracks
2	Public Joint-Stock Company Rostelecom	Rostelecom PJSC	7707049388	Nationwide provider of services and technologies for data asset protection, targeted monitoring, and information security management. *Customer, co-developer, technology validator, and opinion leader*	**Role in ITMO.Impact**: 1. Development of the National Cyber Testing Ground and the northwest region's unique ecosystem for training of students and practicing specialists of various fields. 2. Organization of large-scale "cyber drills" in information security, exercises, testing of software and hardware, and competitions in information security. **Role in Scientific Breakthrough:** Key participant in the implementation of the Unique R&D&I development project. Particular tasks include the conduct of joint R&D with a focus on synthesis and analysis of mathematical models for digital copies of industry-specific infrastructure. **Role in Highly Personalized Value-Based Education:** 1. Development and launch of CPD programs in systems for security of data transmission, processing, and storage. 2. Organization of practical classes for students and practicing specialists at the National Cyber Testing Ground. **Role in Well-Being:** 1. Promotion of a culture of excellence through organization of ethical hacking competitions and encouraging students to participate in national and international contests. 2. Creation of and support for a center of excellence in IFS as a public environment based on new principles: elimination of structural barriers and openness and

					accessibility of projects to all consortium members and students, including those from other universities
3	Gazprom Neft Public Joint-Stock Company	Gazprom Neft PJSC	5504036333	Strategic partner in education and research in the fields of AI, digital technologies, driverless vehicles, sensor systems, and solution chemistry; the company operates a corporate research and education center at ITMO University. One of the most crucial companies to St. Petersburg's economy. The company is a partner of the Master's program Functional Safety of Autonomous Transport Vehicles *Customer, co-developer, technology validator, and opinion leader*	**Role in ITMO.Impact**: 1. Customer, co-developer, and validator and disseminator of the results of R&D projects focused on driverless transport vehicles for the energy industry. 2. Expert partner and active participant in the implementation of customer relations courses. 3. Corporate partner of an acceleration program for startups by ITMO students, staff, and graduates. 4. Provision of technologies and resources as a representative of the energy industry during the development of the consortium's shared IP pool under the ITMO PL open license. **Role in Well-Being:** 1. Implementation of a comprehensive program for social and psychological support and mental health improvement in a fast-paced work and study environment. 2. Participation in the implementation of development projects Health and Sports, Professional Success and Socialization, Positive Environment and Conscious Consumption, and Research and Promotion of Top Well-Being Practices
4	Limited Liability Company Scientific-Production Association StarLine	LLC SPA StarLine	7802728654	A leading manufacturer of smart ICT-based security equipment for automobiles and a developer of driverless cars. Possesses competencies in automation, robotics, and telematics. Key focus of the company's activities is on innovative development in the field of driverless vehicles, as well as design and development of methods and techniques for testing of electronic devices. ITMO and StarLine operate joint corporate Master's programs with a focus on driverless vehicles and design of functional security technologies. *Technology validator, provides training for talented students*	**Role in ITMO.Impact**: 1. ITMO.Approved – implementation of a system for validation and assessment for compliance with IFS requirements for driverless cars. 2. Upgrading existing ones and developing new special corporate and accreditation labs in the field of IFS of driverless cars. **Role in Highly Personalized Value-Based Education:** 1. Ensuring the university's leading position in regards to extracurricular training of specialists in IFS of driverless cars. 2. Provision of expertise and participation in the implementation of educational programs focused on the

					use of driverless vehicles and design of functional security technologies. 3. Development of ITMO University and its partners' digital educational ecosystem that allows students to build individual learning tracks and ensures the coherence of their educational and career paths. **Role in Well-Being:** 1. Development of research for the improvement of public well-being and quality of life; use of research results in the fulfillment of St. Petersburg's sustainable development goals. 2. Development and operation of a center of excellence in IFS as a public environment based on new principles: elimination of structural barriers and openness and accessibility of projects to all consortium members and students, including those from other universities.
5	St. Petersburg Federal Research Center of the Russian Academy of Sciences	St. Petersburg Federal Research Center of the Russian Academy of Sciences	7801003920	St. Petersburg Federal Research Center of the Russian Academy of Sciences is ITMO University's long-time partner on fundamental and practical research in the fields of computer science, intelligent automation systems, and information technologies. Some of the center's key fields of study are the fundamentals of information security, cybersecurity of social network structures and computing and telecommunication systems, and counter-cyberterrorism. Operates the joint International Laboratory of Information Security of Cyberphysical Systems *Developer/co-developer, technology validator*	**Role in ITMO.Impact**: 1. ITMO.Approved – implementation of a system for validation and assessment for compliance with IFS requirements for intelligent automation systems and information technologies. 2. Further development of the International Laboratory of Information Security of Cyberphysical Systems. 3. Development and supervision of an information security community; organization of national and international conferences on cybersecurity. **Role in Scientific Breakthrough:** 1. Key participant in the implementation of Unique R&D&I and specifically projects related to mathematical data protection methods, mathematical models, the security of AI systems, and the validation and verification of complex technical systems. 2. Development of a center of excellence in the field of IFS of innovative products (including complex intelligent technical systems).

					3. Participation in the PI Training development project, namely the implementation of network PhD programs. 4. Organization of joint research spaces and staff exchange on interdisciplinary tasks.
6	Inter-regional public organization Association of Chief Information Security Officers	ARSIB	7723369314	ARSIB brings together heads and specialists from the information security departments of various industries, as well as representatives of professional public associations. ARSIB organizes a number of professional conferences and forums, information security competitions, and professional development courses. *Provider of training for talented students* *Работа с талантами*	**Role in ITMO.Impact**: 1. Development of an ethical hacking community and organization of national and international competitions, including CyBRICS. **Role in Highly Personalized Value-Based Education:** 1. Patriotic value-based education of IFS specialists. 2. Participation in implementation of research findings in the field of digital transformation of education; promotion of the best digital pedagogy practices through organization of ethical hacking competitions. 3. Participation in implementation of the model of proactive lifelong learning from school student to graduate to practicing specialist via organization of ethical hacking competitions. **Role in Well-Being:** Promotion of a culture of excellence through organization of ethical hacking competitions and encouraging students to participate in national and international contests.
7	Committee on Informatization and Communication of St. Petersburg	Committee on Informatization and Communication of St. Petersburg	7825457753	A committee of the Government of St. Petersburg that is crucial to the establishment of the "university-business-government" triangle and the integration of the consortium's products into the economy and life of St. Petersburg. *Executive body of the Government of St. Petersburg, source of expertise in the integration of IT solutions, tasksetter, disseminator and validator of technologies.*	**Role in ITMO.Impact**: 1. Customer and validator of full-TRL projects in the field of smart-city technologies, including those on the development of urban infrastructure and energy networks. 2. Infrastructure and administrative support for the establishment of open-access data sets on the consortium's focus fields.
8	Fund for Infrastructure and Educational Programs	FIEP	7704280879	A Russian leader in the development of tech entrepreneurship and establishment of ecosystems for the national venture market.	**Role in ITMO.Impact**: 1. Customer and validator of analytical research and assessment of the technological attainability of prospective digital and IT solutions.

					2. Assistance in the development of entrepreneurship at ITMO in the role of an external accelerator and investment fund. 3. Promotion of innovative products; development and adaptation of business models 4. Informational, methodological, and expert assistance at every stage of development of viable infocommunication and IT technologies and services.

Arts and Sciences (A&S) Consortium	
Name of the strategic project implemented with the consortium's participation	The consortium's role in the strategic project's implementation
ITMO.Impact	1. Establishing partnerships with the city's cultural institutions and creative industries in order to develop points of attraction for citizens and involve a wider audience in joint analog-digital projects. 2. Active participation in the development of an ecosystem of open-API urban services and provision of convenient digital services for citizens and tourists. 3. Expert and resource support, contribution to the knowledge pool, and implementation of joint analog-digital projects, including those aimed at: • showcasing St. Petersburg's cultural memory in digital and interactive formats, including the St. Retrospect web application and the Que.St mobile app; • developing the International Digital Humanities Center's GitHub repository with the goal of providing open access to databases, libraries, and tools; • joint development of the AIR gallery and art residency as a space for public events in the field of science art; • promoting citizen science. 4. Joint participation in the development of best practices for the communication of results of transdisciplinary research at the intersection of art, humanities, and exact sciences. The aim of this endeavor is to increase the percentage of early adopters of new technologies as well as to promote the concept of humanized technology and increase the public's trust towards new discoveries.
Scientific Breakthrough	5. Joint formation of a research agenda and an investment strategy for the A&S M-platform through the involvement of representatives of cultural institutions and creative industries in managing and expert councils. 6. Key role in the implementation of the development project Unique R&D&I with a focus on transdisciplinary research and projects at the intersection of art, humanities, and exact sciences – including digital projects on the representation of cultural heritage and memory. In particular, this involves: the creation of new forms of broadcasting scientific and technological achievements and educating the public through artistic interpretation; researching the Russian National Corpus (RNC) with the use of digital humanities approaches, including machine and deep learning methods; searching for new forms of representation of cultural heritage

	through narrative design-based digital products; as well as the creation of 3D interfaces for the representation of cultural data. 7. Participation in the PI Training development project through the launch of joint labs for specific student-initiated projects and collaborations with top research teams in the associated field, such as the Princeton Slavic Digital Humanities Working Group.
Highly Personalized Value-Based Education	8. Expert and resource support for Master's programs with a focus on intelligent systems in humanities and innovations. 9. Active participation in the implementation of the proactive lifelong learning model through the development of joint educational programs in the blended format (microdegrees, CPD) at the International Digital Humanities Center and the Art & Science Center. 10. Support in the replication and and scaling of the best practices in digital pedagogy. 11. Assistance in the development of a digital educational ecosystem for ITMO University and its partners that allows ITMO students to build their optimal learning tracks within the framework of the lifelong learning model. Harmonization of technical and humanitarian knowledge. 12. Support in the development of a tutoring system for a more efficient personalization of ITMO students' individual learning tracks.
Well-Being	13. Joint implementation of projects intended to improve public well-being and quality of life as part of the development of an urban ecosystem of digital services. 14. Participation in the development projects Professional Success and Socialization; Positive Environment and Conscious Consumption; and Research and Promotion of Top Well-Being Practices. 15. Exchange of best practices for the implementation of a comprehensive program for social and psychological support and improvement of mental health in a fast-paced work and learning environment.

Information about the members of the consortium

№	Full name of the member organization	Short name of the member organization	Member organization's tax ID number	Member organization's role in the consortium	Member organization's role in the strategic project's implementation
1	The State Russian Museum	The State Russian Museum	7830002230	The State Russian Museum is one of the largest Russian cultural institutions tasked with preservation and representation of the cultural diversity of our country. The museum's Multimedia Centre is involved in the development of multimedia projects at the intersection of humanities, arts, and computer technologies and is the communications hub for the virtual branch of the Russian Museum.	**Role in ITMO.Impact**: 1. Co-developer and disseminator of the results of high-TRL transdisciplinary projects at the intersection of humanities and computer technologies with a focus on the availability of the developed multimedia applications to a wider audience. 2. Expert support in the field of Russian art. 3. Resource support for filling the databases and the knowledge bank for implementation of joint analog-digital projects.

					4. Joint development of International Digital Humanities Center's GitHub repository with detailed description and open access to databases, libraries, and tools used in modern research. **Role in Scientific Breakthrough:** 1. Co-executor, validator, and disseminator of the results of high-TRL transdisciplinary projects at the intersection of humanities and computer technologies with a focus on the availability of the developed multimedia applications to a wider audience. 2. Expert support in the area of Russian art. 3. Resource support for filling the databases and the knowledge bank for implementation of joint analog-digital projects. **Role in Highly Personalized Value-Based Education:** 1. Co-developer and validator of CPD programs in digital humanities. 2. Expert support for the DH Project as Thesis initiative
2	The State Museum of the History of St. Petersburg	The State Museum of the History of St. Petersburg	7813080598	The State Museum of the History of St. Petersburg is one of the largest history museums in Russia that preserves cultural and artistic artifacts related to the history and founding of St. Petersburg	Role in **ITMO. Impact**: 1. Co-developer and disseminator of the results of high-TRL transdisciplinary projects at the intersection of humanities and computer technologies with a focus on the availability of the developed multimedia applications to a wider audience. 2. Expert support in the area of history of St. Petersburg. 3. Resource support for filling the databases and the knowledge bank for implementation of joint analog-digital urban projects. **Role in Scientific Breakthrough:**

					1. Co-executor, validator, and disseminator of the results of transdisciplinary projects at the intersection of humanities and computer technologies. 2. Resource support for filling databases and knowledge banks for implementation of joint research projects in the interests of the city. **Role in Highly Personalized Value-Based Education:** 1. Co-developer and validator of CPD programs in digital humanities. 2. Expert support for the DH Project as Thesis initiative
3	The Institute of Russian Literature (Pushkin House) of the Russian Academy of Sciences	The Institute of Russian Literature (Pushkin House) of the Russian Academy of Sciences	7801030401	Pushkin House is ITMO's partner in educational activities (as a student internship venue) as well as a customer and partner on several joint web and mobile development projects, including those for the Literature Museum of the Pushkin House.	**Role in ITMO.Impact**: 1. Customer and co-developer of high-TRL transdisciplinary projects at the intersection of humanities and computer technologies with a focus on the availability of the developed multimedia applications to a wider audience. 2. Expert support in the fields of linguistics, philology, and literature. 3. Resource support for filling the databases and the knowledge bank for implementation of joint analog-digital projects. 4. 4.Joint development of International Digital Humanities Center's GitHub repository with detailed description and open access to databases, libraries, and tools used in modern research. **Role in Scientific Breakthrough:** 1. Co-executor of joint research projects on Russian language and literature. 2. Expert support in the fields of linguistics, philology, and literature.
4	Cyland Foundation Inc.	Cyland Foundation Inc.		Cyland Foundation Inc. is a partner of ITMO University. It is one of the most active non-profit media art organizations in Russia. Cyland is the host of the annual Cyberfest, the largest media-art festival in Russia, which promotes new forms of interaction between art and high tech, fosters professional connections	**Role in ITMO.Impact**: 1. Validator and disseminator of the results of transdisciplinary projects in the area of technological art. 2. ITMO University's co-participant in Cyberfest, one of the largest international festivals of media art. 3. Expert support in the Art Project as Thesis initiative as well as in the implementation of student projects.

				among artists, curators, engineers, and programmers around the world, and makes robotic, video, sound and net art available to a wider audience.	**Role in Highly Personalized Value-Based Education:** 1. Expert support of the Art Project as Thesis initiative as well as in the implementation of student projects. 2. Pre-graduation training venue for ITMO University students. **Role in Well-Being:** Co-organizer of joint events aimed at the popularization of conscious consumption
5	Committee on Informatization and Communication of St. Petersburg	Committee on Informatization and Communication of St. Petersburg	7825457753	A committee of the St. Petersburg government crucial in the implementation of the "university-business-government" triangle and support for integration of the consortium's products into the economy and the life of St. Petersburg. The Committee on Informatization and Communication of St. Petersburg is the initiator of the development of an open-API city-wide digital services ecosystem. *Part of the executive branch of the Government of St. Petersburg, center of expertise in implementation of IT solutions, tasksetter, and disseminator and validator of technologies.*	**Role in ITMO.Impact**: 1. Customer, validator, and disseminator of digital services and products for the city's digital ecosystem. 2. Infrastructure and administrative support for the creation of data sets of publicly available data on the consortium's fields of activity. **Role in Well-Being:** 1. Work on joint projects for the improvement of public well-being and quality of life as part of the city's ecosystem of digital services. 2. Participation in the development projects Professional Success and Socialization; Positive Environment and Conscious Consumption; and Research and Promotion of Top Well-Being Practices. 3. Implementation of projects that are of social significance for the city.
6	State Museum of the History of Religion	State Museum of the History of Religion	7808006920	State Museum of the History of Religion is ITMO's partner in educational activities as an internship venue for ITMO University students and is also a customer and partner in the development of several web and mobile solutions, including for permanent and temporary exhibitions.	**Role in ITMO.Impact**: 1. Customer and co-executor of high-TRL transdisciplinary projects at the intersection of humanities and computer technologies with a focus on the availability of the developed multimedia applications to a wider audience. 2. Expert support in religious studies and research. 3. Resource support for filling the databases and the knowledge bank for implementation of joint analog-digital projects. 4. Joint development of International Digital Humanities Center's GitHub repository with detailed

					description and open access to databases, libraries, and tools used in modern research. **Role in Scientific Breakthrough:** 1. Co-executor in joint research projects in the area of religious studies. 2. Expert support in religious studies. **Role in Highly Personalized Value-Based Education:** 1. Co-developer and validator of CPD programs in digital humanities. 2. Expert support in the DH Project as Thesis initiative. **Role in Well-Being:** 1. Co-developer, validator, and disseminator of results as part of the project Museum – Space For Interpretation, which aims to form a culture of conscious leisure and provide visitors with the experience of close personal interaction with cultural heritage.

Appendix №7. Information on conditions to be provided for the development of digital competencies and skills among students, including students of IT

7.1. Implementation of courses and modules intended to equip students with digital competencies in the field of algorithm and software development that can be applied in practice, as well as with the skills necessary to master and apply new digital technologies (particularly educational programs developed in accordance with the recommendations of the Support Educational Center for Digital Economy) within individual learning tracks based upon educational programs in non-IT fields

ITMO University continues to develop courses and modules meant to equip all students, regardless of their educational program, with digital competencies through compulsory courses (for instance, Introduction to Digital Culture) and optional courses that vary in complexity, language of training, format (online, offline, blended learning), and focus within the subject field (such as Digital Image Processing or Digital Literature).

As a result of mastering these courses, students acquire universally applicable, general professional, and specialized professional digital competencies.

Bachelor's and Specialist's programs:

Digital competency: can apply digital technologies to analyze and solve philosophical, interpersonal, personal, and professional problems and processes that shape their activity in the digital environment.

Fields of study that the courses or modules are intended for: all Bachelor's programs offered at ITMO University as well as those within the subject area 12.05.01 Digital and Optical Digital Devices and Special Purposes Systems

Number of students: 7,175 (2021), 7,220 (2022), 7,215 (2023)

Final grading and assessment requirements: completion of online exercises included in the course, as well as a comprehensive proctored final assignment.

Digital competency: can use ICT, including special methods, software, hardware, and AI technologies in their professional activities while adhering to standards and norms for project documentation, as well as information security requirements

Fields of study that the courses or modules are intended for: 12.03.02 Optical Engineering, 12.03.03 Photonics and Optical Information, 12.03.04 Biotechnical Systems and Technologies, 18.03.02 Energy- and Resource Saving Processes in Chemical Technology, Petroleum Chemistry and Biotechnology, 12.03.05 Laser Engineering and Laser Technologies, 16.03.01 Technical Physics

Number of students: 680 (2021), 680 (2022), 680 (2023)

Final grading and assessment requirements: defense of a lab project on the design of 3D models, assembly units, component blueprints, and assembly blueprints using KOMPAS-3D CAD software.

Digital competency: can apply contemporary technological solutions and information technologies in analytics.

Fields of study that the courses or modules are intended for: 27.03.05 Innovation Science

Number of students: 222 (2021), 222 (2022), 222 (2023)

Final grading and assessment requirements: practical assignments on the use of algorithms and software suites to study the innovation market, as well as on the application of software in marketing studies and analysis of various businesses, markets, and stages of development and market entry of new products or enterprises.

Master's programs:

Digital competency: can take determined, independent actions towards fulfilling their personal and professional needs using digital technologies and AI.

Fields of study that the courses or modules are intended for: all Master's programs offered at ITMO University.

Number of students: 6,025 (2021), 6,060 (2022), 6,060 (2023)

Final grading and assessment requirements: completion of online exercises included in the course, as well as a comprehensive proctored final assignment.

Digital competency: can access and use information related to their professional field with the help of digital technologies.

Fields of study that the courses or modules are intended for: 19.04.01 Biotechnology

Number of students: 250 (2021), 250 (2022), 250 (2023)

Final grading and assessment requirements: defense of a research paper aimed at identifying patterns in information processes in physical, non-physical, chemical, and biological systems, including with the use of mathematical models.

Digital competency: can perform independent research for scientific and industrial purposes using contemporary software and information technologies.

Fields of study that the courses or modules are intended for: 45.04.04 Intelligent Systems in Humanities

Number of students: 47 (2021), 47 (2022), 47 (2023)

Final grading and assessment requirements: practical assignments aimed at evaluating students' skills in user behavior analysis, collection and development of technical requirements for a UX, development of complex 3D visualization apps using stereo effects, UX design, creation of imagery based on visualization tools of mathematical software suites, and development of GUI apps through the use specialized high-level graphics environments.

7.2. Implementation of professional retraining programs for students of non-IT fields aimed at developing digital competencies and related skills necessary for the new profession, including the opportunity to receive training for several professional fields simultaneously

As a result of mastering these programs, students acquire digital competencies and related skills needed for their new profession.

Admission to the programs is based on the openness and availability of information, equal entry requirements for all applicants, and collaboration with leading IT specialists to promote these programs.

Professional retraining programs are offered in various formats, including those that feature preliminary assessment of students' digital competence level to form groups based on this assessment. Each program features optional modules that students can choose based on their specific demands. Final examination can take various forms: thesis defense, including project-based works; an exam in the form of a comprehensive project-based task (an integrated evaluation of competencies acquired at the program). An important prerequisite for the final examination is the participation of digital economy companies as

clients of the defended projects and reviewers, which allows for independent assessment of the competencies acquired at the program.

Students who complete a professional retraining program can also receive credit for one or several disciplines of their primary educational program when enrolled in both at the same time.

Professional retraining program Technologies of Data Analysis

Digital competencies the program is planned to develop: students can work with data, code in Python, work with RDBMS and NoSQL databases, and use machine learning for intelligent data analysis.

Fields of study that the program is intended for: any non-IT field in which professional activities involve data analysis.

Number of students: 200 (2021), 250 (2022), 300 (2023)

Program workload: 270 hours

Final grading and assessment requirements: completion of a complex project-based task.

Professional retraining program Specialist in the Field of Computer Graphics and Web Design

Digital competencies the program is designed to develop: students can use software to work with raster and vector graphics; create illustrations for books, booklets, catalogues, and periodicals; develop and implement corporate style and graphics for business, research, and project documentation, as well as technical drawings; create mockups for web pages; create animations; publish websites to virtual hosting platforms; design graphic interfaces for web pages; create landing pages, business card websites, and online commerce platforms; use programming languages to create client- and server-side scripts; efficiently work as part of a team.

Fields of study that the program is intended for: any non-IT field in which professional activities involve graphics and design.

Number of students: 150 (2021), 175 (2022), 200 (2023)

Program workload: 780 hours

Final grading and assessment requirements: final examination in the form of a project that tasks students to develop a corporate style (from a logo to a complete brand book, including business cards, booklets, flyers, blank forms, souvenirs, etc.).

Professional retraining program Developer of Professional Digital Technologies

Digital competencies the program is planned to develop: students can develop software using programming languages (C#, C++, Java) and databases (Microsoft SQL Server, Oracle).

Fields of study that the program is intended for: any non-IT field.

Number of students: 35 (2021), 35 (2022), 35 (2023)

Program workload: 750 hours

Final grading and assessment requirements: final examination in the form of a practical task from a specific professional field.

Professional retraining program Motion Design

Digital competencies the program is planned to develop: students can apply the guidelines and technologies of 3D animation and polygonal and parametric modelling for tasks of contemporary motion design; can work with project briefings, as well as develop and present their ideas while taking into account the technical requirements and limitations.

Fields of study that the program is intended for: any non-IT field in which professional activities involve the use of CAD.

Number of students: 30 (2021), 40 (2022), 50 (2023)

Program workload: 564 hours

Final grading and assessment requirements: final project in the form of a short video (30 seconds to 2 minutes long) on a chosen topic (commercial clip with 2D and 3D graphics, educational video, video art, etc.).

Professional retraining program Digital Governance and Smart Cities

Digital competencies the program is planned to develop: students can manage and implement digitalization projects in state management, organize the implementation of smart city technologies in regions.

Fields of study that the program is intended for: any field in which professional activities involve the application of digital technologies in city management.

Number of students: 0 (2021), 50 (2022), 50 (2023)

Program workload: 250 hours

Final grading and assessment requirements: final exam in the form of a complex project-based task.

Professional retraining program BIM Design Automation

Digital competencies the program is planned to develop: students can write functional applications (plug-ins) for Autodesk Revit in C#

Fields of study that the program is intended for: any non-IT field in which professional activities include engineering and construction.

Number of students: 50 (2021), 70 (2022), 100 (2023)

Program workload: 360 hours

Final grading and assessment requirements: final interdisciplinary examination.

7.3. Implementation of academic mobility programs for students of other universities in educational programs offered at ITMO University

Incoming academic mobility of students from other educational organizations is implemented in order to provide them with access to the courses and modules available at ITMO University, particularly using online learning and remote learning technologies, as well as to take part in joint projects or gain access to CPD and professional retraining programs. As a result of mastering these courses, students will acquire digital competencies.

Incoming academic mobility to ITMO University:

Program duration: one semester

Program features: classes with students of the subject area 01.04.02 Big Data and Machine Learning

Partner universities: Technische Universität Darmstadt, Germany; ISEL Toulon, France; Aalto University, Finland.

Program duration: one semester

Program features: classes with students of the subject areas 09.03.01 Computer Science and Engineering, 09.03.03 Applied Computer Science, 12.03.04 Biotechnical Systems and Technologies, 19.03.01 Biotechnology

Partner universities: The Ammosov North-Eastern Federal University

Program duration: one semester

Program features: classes with students of the subject area 09.04.03 Applied Computer Science

Partner universities: Novosibirsk State Academy of Architecture and Fine Arts

Program duration: one semester

Program features: classes with students of the subject area 09.04.04 Software Engineering

Partner universities: Pacific National University

Program duration: one semester

Program features: classes with students of the subject area 10.04.01 Information Security

Partner universities: Pacific National University; the University of Jyväskylä, Finland; Ecole Nationale Supérieure des Mines d'Alès, France; EPITECH, France

Program duration: one semester

Program features: classes with students of the subject area 15.04.06 Mechatronics and Robotics

Partner universities: the University of Seoul, South Korea; Ecole Nationale Supérieure des Mines d'Alès, France

Program duration: one semester

Program features: classes with students of the subject area 18.04.02 Energy- and Resource Saving Processes in Chemical Technology, Petroleum Chemistry and Biotechnology

Partner universities: Gubkin Russian State University of Oil and Gas

Program duration: one semester

Program features: classes with students of the subject areas 27.04.05 Innovation Science, 38.04.01 Economics

Partner universities: the European University at St. Petersburg

ITMO students also take part in outgoing academic mobility programs with universities and international laboratories that develop interdisciplinary studies and education. This supplements their professional competencies with those in systems, design,

and product thinking and entrepreneurial culture, as well as experience in using digital tools and services in their professional activity. Such focus on partner universities allows students to complete their set of competencies; it should be noted that their digital competencies are fully formed thanks to ITMO's own educational products. Outgoing mobility can take the form of academic exchange, joint research projects, summer and winter schools, etc.

Outgoing academic mobility of ITMO University students:

Program duration: one semester

Subject areas that the programs are intended for: 09.00.00 Computer Science and Engineering

Partner universities: Higher School of Economics, Ammosov North-Eastern Federal University, Novosibirsk State Academy of Architecture and Fine Arts, Keldysh Institute of Applied Mathematics of the RAS, Ivannikov Institute for System Programming of the RAS, Far Eastern Federal University, Yaroslav-the-Wise Novgorod State University, Lobachevsky State University of Nizhny Novgorod, Moscow State University of Technology STANKIN.

Program duration: one semester

Subject areas that the programs are intended for: 12.00.00 Photonics, Instrumentation Technology, Optical and Biotechnical Systems and Technologies

Partner universities: Sirius University of Science and Technology, Skolkovo Institute of Science and Technology, Ammosov North-Eastern Federal University, Institute of Solar-Terrestrial Physics of the Siberian Branch of the RAS, Special Astrophysical Observatory of the RAS, Steklov Mathematical Institute of the RAS

Program duration: one semester

Subject areas that the programs are intended for: 16.00.00 Physics and Engineering Sciences and Technologies

Partner universities: Sirius University of Science and Technology, Skolkovo Institute of Science and Technology, Ioffe Physical-Technical Institute of the RAS, Steklov Mathematical Institute of the RAS

Program duration: one semester

Subject areas that the programs are intended for: 18.00.00 Chemical Technologies, 19.00.00 Industrial Ecology and Biotechnologies

Partner universities: Sirius University of Science and Technology, Ammosov North-Eastern Federal University, Institute of Engineering, Environmental Studies, and Hygiene

Program duration: one semester

Subject areas that the programs are intended for: 27.00.00 Technical Systems Management, 38.00.00 Economics and Management

Partner universities: Higher School of Economics, European University at St. Petersburg, Innopolis University, Institute of Problems of Mechanical Engineering of the RAS, St. Petersburg Stieglitz State Academy of Art and Design

Program duration: one semester

Subject areas that the programs are intended for: 45.00.00 Language and Literature Studies

Partner universities: Skolkovo Institute of Science and Technology, Higher School of Economics, Lomonosov Moscow State University

Program duration: one semester

Subject areas that the programs are intended for: all subject areas and specializations available at ITMO

Partner universities and the competencies they are responsible for:

- University of Chemistry and Technology, Prague, Czech Republic: competencies in the field of chemical technologies, nano- and biotechnologies;
- Tallinn University, Estonia: competencies in cyber security, entrepreneurship, high tech materials, pilotless aircraft, design and creative thinking;
- ECAM Lyon, France: competencies in robotics and automation, sustainable energy and environmental engineering, industrial design, and engineering;
- University of Verona, Italy: competencies in life sciences and medicine;
- Swiss Federal Institute of Technology in Lausanne (EPFL), Switzerland: competencies in computer science, physics, chemistry, biology, electronics, and critical thinking;

- Karlsruhe Institute of Technology, Germany: competencies in biology, engineering chemistry, electronics, and digital competencies;
- University of Liège, Belgium: competencies in natural and engineering sciences, entrepreneurship, critical thinking, teamwork, and leadership;
- Aalto University, Finland: competencies in research, art and design, entrepreneurship, creative thinking, and soft skills.

7.4. Organization of intensive courses, project sessions, modules, hackathons, contests, etc. aimed at accelerating the development of digital competencies

Extracurricular events and activities also contribute to the development of digital competencies. Such events include the ITMO.Future contest for student-driven university development projects (including through IT solutions); hackathons (in machine learning, digital healthcare, etc.); contests and championships in competitive programming and ethical hacking; student research and engineering clubs (for instance, ITMO.Hack, Digital Generation, Artificial Intelligence Researchers) and laboratories (Robotics Laboratory, OLIMP open laboratory); and startups (including the Startup as Thesis initiative) that involve representatives of high tech business and digital economy companies as experts.

Name of the event: International Collegiate Programming Contest: Northern Eurasia

Event duration (in days): 4 (qualifying round and finals)

Digital competencies the event is aimed at: students can solve unconventional applied tasks in teams using mathematical modelling and programming within a limited amount of time

Partner universities: St. Petersburg State University, Petrozavodsk State University, Lomonosov Moscow State University, Moscow Institute of Physics and Technology, Saratov Chernyshevsky State University, Ural Federal University, Yaroslavl Demidov State University, Altai State Technical University, Siberian Federal University, Far Eastern Federal University, Novosibirsk State Technical University, Belarusian State University, Free University of Tbilisi, Yerevan State University, Baku State University

Partner companies: Devexperts, Megafon, Sberbank, Jug.ru Group, Yandex

Name of the event: High School Computer Science and Programming Contest

Event duration (in days): 10 online rounds, onsite qualification rounds, 2 days for the onsite round: 1 for team finals and 1 for individual finals

Digital competencies the event is aimed at: students can solve unconventional applied tasks in teams using mathematical modelling and programming within a limited amount of time

Partner universities: St. Petersburg State University, Petrozavodsk State University, Lomonosov Moscow State University, Moscow Institute of Physics and Technology, Saratov Chernyshevsky State University, Ural Federal University, Yaroslavl Demidov State University, Altai State Technical University, Siberian Federal University, Far Eastern Federal University, Novosibirsk State Technical University, Belarusian State University, Free University of Tbilisi, Yerevan State University, Baku State University

Name of the event: I am a Professional contest (tracks: Machine Learning, Programming and Information Technologies, Information and Cyber Security, Robotics)

Event duration (in days): 120

Digital competencies the event is aimed at: students can set research and business tasks for machine learning, apply software development tools, know the foundations of systems engineering and software systems development; create applied and systems software and design information systems; develop preventive security software, proactively detect and fix potential security breaches; develop technical devices based on motion control software for electronic mechanisms.

Partner universities: Volga State University of Technology, Southern Federal University, Tomsk State University, Far Eastern Federal University, Russian Technological University (MIREA), North Ossetian State University, Samara National Research University, Novosibirsk State University, North-Caucasus Federal University, Tomsk Polytechnic University, Tyumen State University, South Ural State University, Ural Federal University, HigherSchool of Economics, The Russian Presidential Academy of National Economy and Public Administration, Don State Technical University, Innopolis University, MISIS National University of Science and Technology

Partner companies: The Russian Union of Industrialists and Entrepreneurs, Yandex, TMK company and Sinara Group, SberBank, VTB Bank, Rosatom, Inter RAO, Gazprombank

Name of the event: Blockchain.Hack hackathon

Event duration (in days): 50 (2 for the hackathon)

Digital competencies the event is aimed at: students can solve unconventional practical tasks in information security using blockchain technology

Partner universities: Innopolis University, Moscow Institute of Physics and Technology, St. Petersburg State University, Peter the Great St. Petersburg State Polytechnic University, Tomsk State University, Novosibirsk State University, Far Eastern Federal University, MISIS National University of Science and Technology

Partner companies: Gazprom Neft, Mail.ru Cloud Solutions, Yandex, Krokit startup accelerator, Transcapitalbank, Waves Enterprise

Name of the event: Winter School in Robotics and Control Systems

Event duration (in days): 4

Digital competencies the event is aimed at: students can solve unconventional tasks on control algorithms, machine learning methods, and smart robotics

Partner universities: Innopolis University; Far Eastern Federal University; University of Applied Sciences Emden/Leer, Germany; University of Bologna, Italy

Partner companies: Arrival

Name of the event: Bioinformatics Contest

Event duration (in days): 8 (7 for the qualification round and 1 for the final)

Digital competencies the event is aimed at: students can solve real-life unconventional cases in bioinformatics (DNA, RNA, and protein sequence analysis and other related fields) using programming.

Partner universities: Bioinformatics Institute

Partner companies: JetBrains, Genotek, Yandex, Serokell

Name of the event: Dataton

Event duration (in days): 2

Digital competencies the event is aimed at: students can solve unconventional tasks connected to humanities by structuring historical or cultural resources into data sets for subsequent training of neural networks.

Partner companies: Huawei Technologies

Name of the event: Codeforces Open Team High School Programming Contest

Event duration (in days): 67-70, 3 stages: long online round (around 60 days), short online round (4 days), onsite round (3 days).

Digital competencies the event is aimed at: students can solve unconventional applied tasks in teams using mathematical modelling and programming within a limited amount of time

Partner companies: Telegram Messenger Inc

Name of the event: CyBRICS

Event duration (in days): 2 (24 hours for the qualification round, 9 hours for the final)

Digital competencies the event is aimed at: students can work in a team to respond to information security threats; perform routine operations to investigate information security incidents; apply specialized software to ensure information security

Partner companies: SPbCTF, Chinese cyber security contests league XCTF

Appendix №8. Successful ITMO alumni engaged in the development of the Russian economy

Founders of international companies

1.	**Andrey Breslav**	Author and leading developer of the Kotlin programming language, which was approved by Google as the second official language for Android development in 2017. Founder of the app Alter, which helps users choose a psychologist based on an algorithm.
2.	**Alexander Shtuchkin** **Evgeny Yuzhakov** **Timofei Borodin**	Founders of the world's first 4G communicator WiMax Yota (2008). Alexander Shtuchkin has also taken third place in the finals of ICPC 2003.
3.	**Nikita Shamgunov**	Founder and chief technology officer at MemSQL (now called SingleStore and worth about $500,000,000), which specializes in database management systems and is a part of Y Combinator, the world's largest business incubator for startups.
4.	**Greg Tkachenko**	Founder of AI Factory, a startup engaged in the development of business solutions based on AI and identification, analysis, and further processing of images and video. In 2019, the company was bought by the US-based Snapchat owner Snap. Nominee for Forbes' 2020 list of 30 most promising Russians under the age of 30 in the Entrepreneurs category.
5.	**Arseniy Seroka**	Founder of Serokell Labs, a company that develops software in functional programming languages, particularly in Haskell. Serokell Labs has also developed the Cardano blockchain platform and its internal cryptocurrency ADA.

6. **Alexander Skidanov** Founder of NEAR Protocol, a smart contract-capable blockchain company with open-source code and high flow capacity. The platform is meant for the creation of decentralized applications (dApps).

Successful Russian entrepreneurs

7. **Daniel Galper** Founder and CEO of Grow Food, a massively popular food delivery service.

   Nominee for Forbes' 2020 list of 30 most promising Russians under the age of 30 in the Entrepreneurs category.

8. **Ilya Chekh** CEO at Motorica, Russia's first company to produce unique bionic prostheses, including those meant for children, which integrate the functions of smartphones and payment cards, as well as feature custom designs.

   Russian Entrepreneur of the Year 2019 according to the prominent international audit and consulting company Ernst & Young.

And many, many more.

Appendix 9. English Glossary Terms, definitions and abbreviations used in the text of ITMO University's Development Strategy for 2021-2030

6G education – an educational standard that takes into consideration the rapid changes in global environment and accessibility of education

A* – the highest rank given to conferences in the field of computer science by CORE rankings; denotes a leading event in its profile area

Academic degree council – a body established by ITMO University to review and participate in thesis defenses for PhDs and DScs.

Actor – a participant in an action or process

AdTech (Advertising Technologies) – advertising technologies and technological solutions that combine various types of analytical digital tools for management and analysis of advertising campaigns

Advanced Materials – a weekly peer-reviewed scientific journal on materials science

AIR (Art.ITMO.Residency) – an artist residency and venue for events in the field of art and science

Alumni.Impact – a development project focused on interaction with alumni

AR – augmented reality

ARWU – the Academic Ranking of World Universities

AI – artificial intelligence

CFS – consolidated financial statement

Citizen science – scientific research conducted with the involvement of members of the general public

CJSC – closed joint-stock company

CodeForces – an online platform that hosts competitive programming contests; maintained by a group of competitive programmers from ITMO University led by Mikhail Mirzayanov

CPD – continuous professional development

CPS – cyberphysical systems

CTF – Capture the Flag; a type of computer security competition that tasks teams with acquiring others' data while securing their own

CulTech (Culture Technologies) – technologies and solutions for cultural institutions

CyBRICS – an international sports hacking competition co-organized by ITMO University

Data set – a collection of data

Data-driven decision support system – a decision-making strategy based on Big Data, predictive analytics, and AI

Deep tech – unique technological solutions that often combine knowledge of various fields and are characterised by a deep and long process of R&D, usually contributing to solutions for global scientific or engineering challenges

Design documentation – a collection of documents and resources that covers all aspects of product design

DH project (digital humanities project) – one of the ways to prepare and defend a thesis; the implementation of a project at the intersection of humanities and IT

Digital Avatar – an environment for the design and development of an ecosystem of digital entities with social reflection and community adaptation

Digital Verifier – an environment for the creation and investigation of proofs using the data of public cyberspace

ITMO.Edu.Lab – a laboratory for digital education with an open testing ground for the development and validation of new educational technologies and the launch of experimental educational projects.

European XFEL – European x-ray free electron laser

Foresight Configurator – an environment for generative modeling and design of digital objects in real world-systems through reproduction of the creative functions of constructor and design software

Frontier – brand-new cutting-edge scientific fields

Gamification – the use of game mechanics in non-game environments to increase participation

Generation Z – a generation of individuals born between the late 1990's and the early 2010's

GitHub – a web service for the hosting and development of IT projects

Greenfield project – a project implemented within an undeveloped environment that lacks constraints imposed by prior work

Green Zoom – the first Russian environmental and energy-saving standard for construction

h-index – Hirsch index

Hackathon – a competition that tasks teams with quickly developing a product prototype for a specific purpose

Hacking – the art of creative problem-solving that entails an unorthodox approach to complex tasks and the exploitation of software and hardware vulnerabilities

HDU-ITMO Institute – a double-degree program between Hangzhou Dianzi University (China) and ITMO University

HE - higher education

Human digital (HD) - the concept of humanizing technology

ICO (Initial Coin Offer) – a fundraising method: a preliminary offering of software tools (coins) for purchase

IPO (Initial Public Offer) – a public offering in which a company's shares become available for the public; the initial offering of shares for a wide audience

ICPC (International Collegiate Programming Contest) – the world's oldest, largest, and most prestigious programming contest for university students

ICT – information and communications technology

Impact Entrepreneurship – an ITMO project that aims to train specialists capable of going from research to development of solutions for the benefit of society and economy

INO – independent non-profit organization

Introduction Days – an ITMO event for first-year students during which they can get to know the university

IP – intellectual property

IPChain – a solution for intellectual property management and protection

IT – information technology

ITMO PL – ITMO's public licenses available for free to the university's partners

ITMO Avatar – a digital assistant for students and lecturers of ITMO University

ITMO.Advisor – a program for recruitment and training of tutors and academic advisors

ITMO.AI – an SIE serving as the university's commercialization agent of AI-based intellectual property

ITMO.Approved – ITMO's tech validation system that verifies products' compliance with information and functional security standards

ITMO Code (V+F+PS+SS) – ITMO's combination of elements that determine the university's uniqueness; V – values, F – fundamentals, PS – professional skills, SS – soft skills

ITMO.Developer – a digital platform that provides developers with access to instruments for storage, documentation, and implementation of various digital services

ITMO.EduLeaders – a competition for ITMO University lecturers who have successfully implemented original education projects

ITMO.EduStars – a competition-based support program for ITMO University lecturers based on mutual and comprehensive year-round assessment

ITMO.Expert – a program for the professional development of ITMO's faculty and PhD students

ITMO.Family – a united community of students, staff, graduates, prospective students, and partners of ITMO University who are committed to its mission and values and actively participate in the life of the university.

ITMO Fellowship & Professorship – ITMO University's program for the recruitment of teaching and research staff with experience at leading international universities and research centers.

ITMO.Future – a digital platform for the selection and implementation of projects for the development of ITMO University

ITMO Highpark – the development project of ITMO's second campus in satellite city Yuzhny

ITMO.Media – a tool for the production and usage of high-quality content at ITMO University

ITMO.Megapolis – an initiative that uses data analysis algorithms created at ITMO to assist St. Petersburg residents in finding jobs with commercial companies and the university itself.

ITMO.Mentors – a program that aims to provide students with job opportunities and professional training while supporting lecturers with their teaching work and training future specialists

ITMO.OPEN.Campus – ITMO's project on sharing practices for transforming university spaces based on new educational approaches, current demands of young people, and the green campus model

ITMO.Relocation – a relocation support program for new faculty from other regions and countries

ITMO.Talents – a program for for recruitment of new new and support ofexisting postdocs

ITMO.Sharing – a rental service for laptops and tablets.

ITMO.Stars – a competition for promising applicants who have a chance to gain a tuition-free position at ITMO's Bachelor's programs

ITMO.Validation – the communication of ITMO's findings to other Russian universities and organizations. Quick adoption of digital services using the ITMO model: open software, open research tools, shared digital space with partners, and open validation

ISU – ITMO University's information management system

Jigsaw Education – A multi-level educational program that combines the educational products of ITMO, its partners, and other universities and provides them to a target audience diverse in age and experience.

JSC – joint-stock company

KronBars.Stars – a stipend competition for applicants with unique achievements in sports

LLC – limited liability company

LLL – lifelong learning

LMS – learning management system

Low-code – app development approach that aims to use as little manual programming as possible

LXP – learning experience platform

M-platforms – ITMO University's structural units based on the paradigm of today's platform economy; the M-platforms serve as a foundation for interdisciplinary, interindustry consortia and aim to develop solutions to global scientific, technological, social, and economic challenges.

MarTech – marketing technologies

Megascience – large-scale, high-budget international research projects and installations

Microdegree – a short specialized educational program

Minor – a supplementary educational program for university students that provides them with additional competencies; includes the possibility of additional qualification

MOOC – Massive Open Online Course

MR – mixed reality

MRI – magnetic resonance imaging

Nature – one of the oldest and prestigious scientific journals in the world, publishing weekly peer-reviewed research from a variety of academic disciplines

Nature Index – an index for evaluation of the scientific output of institutions, published by Springer Nature

NICA (Nuclotron-based Ion Collider Facility) – a particle accelerator complex being constructed by the Joint Institute for Nuclear Research in Dubna

No-code – a GUI-based website development technology

NTI - National Technology Initiative

Olymp – an open platform for competitions among school students

Outstaffing – employing staff from outside the institution to carry out specific jobs

Phygital (physical + digital) – an organic combination of physical and virtual reality

PI (principal investigator) – a non-official research team leader/project manager responsible for achieving results

PJSC – public joint-stock company

Postdoc – a researcher who has received a PhD or Candidate of Sciences degree

Proctoring – the procedure of monitoring and control over remote exams and tests

Project 5-100 – Russian Academic Excellence Project, conducted by the Ministry of Science and Higher Education of the Russian Federation from 2013 till 2020.

Q1 – the top 25% of journals within a specific field based on citation impact

QS – QS World University Rankings

R&D – research and development

R&D&I – research, development, and innovation; full- or high-TRL projects that aim to result in products ready for release onto the market

RoboForces – an open platform for competitions

School – a structural unit of ITMO University with a focus on a specific subject area of science

Science – one of the world's top peer-reviewed academic journals

SE – supplementary education

SP – a strategic project

Startup – a creative and innovative enterprise that entails the introduction of a wholly novel product onto the market; a temporary business structure that develops under uncertain conditions and aims to scale up and convert itself into a corporation

Super-app – an application that combines the features of several other apps

Superjob – a Russian online recruitment platform

Technical committee No. 164 – the committee on standardization in the field of artificial intelligence

Technical committee No. 194 – the committee on standardization in the field of cyberphysical systems

THE – Times Higher Education World University Rankings

TRL (Technology Readiness Level) – a method of indicating the stage of a technology's life cycle from an idea to an actual product

Umbrella program – an educational program that covers several subject areas

UI – user interface

USE (Unified State Exam) – standardized exams taken by Russian high school students and used as a basis for enrollment into university or vocational education

UX – user experience

VR – virtual reality

VUCA – Volatility, Uncertainty, Complexity, Ambiguity

Appendix №10. University participation in Programs and Grants

The National Research University excellence program

ITMO's objectives as a participant

ITMO University is a national research university and between 2009 and 2018 it participated in The National Research University excellence program. The program aimed to develop ITMO University as a world-class research and educational hub in the field of IT and optical technologies. The main objective of the program was to improve Russia's competitive advantages in the field of IT and optical technologies given the globalization of the world economy and accelerated research and technological progress.

Results of the participation

The excellence program facilitated the creation of conditions that allowed ITMO to become one of Russia's leaders in R&D revenue per researcher (3356.3 thousand rubles), increase the number of researchers with PhDs by 35.6% (503 people in 2009, 682 – in 2018), and actively engage in the implementation of national programs and projects. Efficient use of the purchased equipment is demonstrated by the twelve-fold increase in the revenue from R&D projects (225.54 million rubles in 2009 and 2,859.23 million rubles in 2018, the share of income generated by R&D projects in 2018 was 43.55%), expansion of partner networks, and attraction of international researchers and talented youth to the university. ITMO transformed into a Master's and PhD program-oriented university with the share of students of these levels coming from other universities at 64% in 2018.

Project 5-100

ITMO's objectives as a participant

Between 2013 and 2020 ITMO University participated in Project 5-100 and since 2015 was among its leaders. The main objective of ITMO's participation in the project was to build a world-class global university.

Results of the participation

Key qualitative and quantitative results:

1) ITMO Global Education: harmonious development of achievement-oriented individuals based on ITMO Code V+F+PS+SS:

- scope of the global admission campaign – 3 million people annually, average USE points in 2020 – 93.1 (top-five in Russia), ITMO University is the leader in student academic competitions;
- implementation of individual learning tracks for Master's and PhD programs;
- wide presence in online education (over 1 million students in ITMO's MOOCs on various platforms);
- internationalized education: short-term international education modules, joint Master's and PhD programs with leading universities, the share of international students in 2020 was 21.9% (7.9% in 2013);

2) ITMO Global Research:

- creation of international research departments focused on global challenges;
- attraction of leading researchers with experience from Russian and international universities and research organizations (15.24% international faculty members, including Russian specialists with PhDs from foreign universities in 2020 compared to 2.4% in 2013);
- revenue derived from R&D projects, per one researcher, was over 4 million rubles in 2020 (1.373 in 2013);
- qualitative and quantitative growth of the university's publication activity: number of Web of Science publications per one researcher in 2020 was over 10 (1.03 in 2013), number of Scopus-indexed publications per researcher was 13 (1.47 in 2013);
- four university-issued journals included in international indexing bases;
- the university's researchers take part in projects implemented on megaclass equipment;
- the university now has the right to issue its own degrees.

3) ITMO Global Ecosystem:

- creation and development of ITMO.Family, an aggregated community of members taking part in the university's growth by sharing its mission and values as the foundation of their interaction;

- ten corporate institutes and laboratories are active in the university as part of various research collaborations with partners;
- the university underwent a rebranding and created an efficient marketing system;

4) ITMO Management: new models, tools, and environment:

- transformation of the university's structure: creation of Supervisory and International Councils, as well as two overseas offices, reorganization of the university's research and educational departments (creation of four schools);
- the university's management system features individual management systems for each school, as well as program-based education management;
- the university carried out a complex of initiatives to develop and implement intelligent IT services for internal and external use;
- a CPD program was implemented for the university's professors and teaching staff.

In 2016, ITMO University was ranked 56 in the THE Computer Science subject ranking, and in 2019 the university entered the top-100 of the ARWU Automation & Control subject ranking (76-100), securing this place again in 2020.

In 2020, ITMO University is featured in the top-400 and top-600 of global university rankings: QS – 360th place, THE – 501-600th places, and ARWU – 901-1000th places. ITMO University is also featured in 21 international subject or field rankings, including positions in the top-100 in one ranking, top-200 – in three rankings, and top-300 – in nine rankings.

Decree of the Government of the Russian Federation No. 220 of April 9, 2010 On measures of engagement of leading scientists in Russian educational institutions of higher education, scientific foundations and state research centers of the Russian Federation

ITMO's objectives as a participant

Creation of laboratories headed by world-class researchers conducting research at the frontiers of science at ITMO University.

Results of the participation

Since 2010, ITMO University has created 11 laboratories headed by world-class researchers within the framework of the Megagrant program:

1. Dr. Yuri Kivshar, Australia (Laboratory of Metamaterials, 2010-2014)
2. Dr. Peter M.A. Sloot, the Netherlands (Laboratory of Promising Computational Technologies, 2010-2014)
3. Dr. Yuri Gunko, Belarus (Anisotropic and Optically Active Nanostructures, 2013-2017)
4. Dr. Romeo Salvador Ortega Martinez, Mexico (Laboratory of Nonlinear Adaptive Control Systems, 2014-2018)
5. Dr. Anvar Zakhidov, the USA/Russia (Laboratory of Hybrid Nanophotonics and Optoelectronics, 2017-2021)
6. Dr. Maurice Skolnick, the UK (Laboratory of Low-Dimensional Quantum Materials, 2017-2021)
7. Dr. Andrey Rogach, Germany (Light-Emitting Carbon Quantum Nanostructures, 2018-2020)
8. Dr. Eugenia Kumacheva, Canada (Laboratory for 3D Printing of Functional Nanomaterials, 2019-2021)
9. Dr. Hilmi Volkan Demir, Turkey (Nanolasers and Microlasers Based on Next-Gen Nanomaterials and Modern Optical Architectures, 2021-2023)
10. Dr. Michel Menu, France (Russian Mobile Laboratory for Heritage Science based on Advanced Optics, 2021-2023)
11. Dr. David Bendahan, France (Promising Quantitative Technologies in MRI for Determining the Stages of Inflammation and Fibrosis as Disease Markers, 2021-2023)

Decree of the Government of the Russian Federation No. 218 of April 9, 2010 On approving the Regulations for subsidies provision to promote collaboration between Russian higher education institutions, state research organizations, and real economy

organizations aiming towards implementation of complex projects on developing high tech industries

ITMO's objectives as a participant

Developing collaboration between ITMO University and industrial organizations, joint research and educational activities, and stimulation of industrial applications of ITMO University's potential to develop science-intensive fields.

Results of the participation

A number of projects with six major partners (LOMO, Diakont, CSRI Elektropribor, Laserny Center, SMARTS, and Alkor Bio Company) has been implemented since 2010 as part of the initiative of developing cooperation with industrial organizations.

Federal Targeted Program for Research and Development in Priority Areas of Development of the Russian Scientific and Technological Complex for 2014-2021

ITMO's objectives as a participant

Efficient functioning of ITMO University in the field of applied research and solutions with the outcome of specific solutions and products.

Results of the participation

ITMO University has implemented 53 projects in various areas of the program in collaboration with industrial and international partners and consortiums.

State support for the National Technology Initiative centers at higher education institutions and research organizations (Decree of the Government of the Russian Federation No. 1251 of October 16, 2017)

ITMO's objectives as a participant

Within the framework of the program, ITMO University together with its partners is solving a number of knowledge-intensive, educational, and infrastructural tasks to ensure the overcoming of technological challenges related to systematic promotion of cognitive technologies on promising markets of the National Technology Initiative (NTI).

Results of the participation

The National Center for Cognitive Research has shaped its own ecosystem of digital platforms in the field of implementing elements of strong AI: big data management, model development and optimization, generative machine learning, and intelligent interaction with users. All platforms laid the groundwork for the environment for generative modelling and design of digital objects in real-world systems.

Over the years, the National Center for Cognitive Technologies has developed a unique world-class information technology solution, as well as a line of software products based on it to create and use personal digital assistants (avatars) for various purposes. These assistants can develop and learn while interacting with user communities.

Development of a model of network entrepreneurial programs (in the field of tech entrepreneurship), implementation of the Startup as Thesis project and a system of digital bonuses (within the Human Resources for the Digital Economy federal project of the Digital Economy of the Russian Federation national program)

ITMO's objectives as a participant

Development of a model of network entrepreneurial programs, implementation of the Startup as Thesis project and a system of digital bonuses.

Results of the participation

Development of courses (modules) in the field of tech entrepreneurship, improvement of methodological recommendations on implementing the Startup as Thesis project, development of methodological recommendations on IP registration and a concept for a digital credit system. The results of this work are recommended for application in the higher education system.

Decree of the Government of the Russian Federation No. 551 of May 3, 2019 On state support for activities of leading research centers in Russian organizations implemented in order to ensure the development and implementation of roadmaps for the development of promising end-to-end digital technologies (within the framework of the Digital Technologies federal project of the Digital Economy of the Russian Federation national program)

ITMO's objectives as a participant

Creation of a balanced national ecosystem for the development and implementation of quantum communications as a basis for the formation of high tech products and services on promising markets, as well as the digital transformation of the industrial landscape within the framework of integrating photonic quantum technologies, the Internet of Things, wireless connection technologies, sensorics, machine learning, and AI.

Consolidation of the scientific community and real economy organizations to produce solutions in the field of quantum internet. National and international standardization of the solutions created in Russia in order to further implement them into the developing national quantum infrastructure.

Results of the participation

The creation of the National Center for Quantum Internet. The program is implemented in collaboration with the strategic industrial partner Russian Railways, which was chosen by Russia’s main competence center in the high tech field of quantum communications.

A crucial result of the program is the development and implementation of the digital platform software-hardware solution for a network system for secure data transfer, processing of superbig data, management, and decision-making. A pilot section of the quantum “highway” was built based on the platform.

On June 8, 2021 the work of the secure quantum network was demonstrated for the first time: a video call was held via the secure quantum “highway” between St. Petersburg and Moscow. This 700-km long highway is the second-longest in the world and is based on original Russian solutions.