

UDC 004

## POTENTIAL OF INTERNATIONAL PROJECT ACTIVITY FOR DIGITALIZATION OF NORTHERN REGIONS

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In the northern areas, the implementation of digital technologies is of particular relevance, given the specific environment in which they operate. This article uses the example of NArFU to discuss the role of international cooperation and cross-border projects towards intensification of digital technology implementation.

### Introduction

The issues of development and implementation of digital technologies are of particular relevance to the North and the Russian Arctic, in particular, given their specific conditions – severe natural and climatic environment, extremely low population density and poorly developed transport and social infrastructure. [1]. In addition, as prescribed by the regional strategy, the Arctic development should unfold as a multifaceted process and rely on digital control technologies, i.e. digital platforms and services.

In the process of advancing the IT ecosystems, implementing high technologies, promoting digital transformation of manufacturing and social services sectors within the Russian economy, and creating cross-cutting digital technologies – also by way of providing qualified manpower – universities and research organizations maintain a leading position as holders of expertise and competence centers for sharing and transfer of the world's best practices.

The study is novel in that it explores and evaluates NArFU-led innovation-related projects as an input to the decision-making concerning digitalization of the North and the Russian Arctic.

### Results, their discussion and perspectives

The strategic pursuits of Northern (Arctic) Federal University (NArFU) are designed to contribute to the national strategies of the Russian Federation in the field of education, research and digital economy. One of the main advantages that makes NArFU a promising facilitator of international collaboration with the Arctic countries is its geographical location.

An effective format for strengthening the (Arctic) research cooperation, the international project activity is seen as a pathway to global integration.

When a project unfolds within an international dimension, it allows for an expanded vision of its tasks – from the perspective of the national approaches and that of global attitude, the latter building on the best available practices and the consolidated resources available to partners internationally. [2]

In 2020, NArFU continued to be a party to 76 international projects that involve a total of 189 organizations in 42 countries.

As of 2020, more than ten of these projects deal with introduction and development of IT technologies as their core or cross-cutting theme. In these projects, NArFU and stakeholders in the Nordic countries – academics and business community – seek to address their common challenges, explore the promising industries and technology markets in the Arctic Zone of the Russian Federation, and facilitate transition to advanced digital, knowledge-intensive manufacturing for integrated development of the Arctic.

### Overview of key projects

One cross-border cooperation programme that runs its projects with an active input from NArFU, along with Murmansk and Arkhangelsk Regions, Nenets Autonomous Area and as the border territories of Finland, Sweden and Norway, is EU-Russia CBC Kolarctic (NArFU currently partners 12 Kolarctic-funded projects) [3]. Examples of the innovation-driven projects where northern partners bring together their expertise for greater digital progress in their home areas include *I2P: From Idea to Printing of Metal Products*, *Disruptive Information Technologies for Barents Euro-Arctic Region*, and *Ice Operations*.

*I2P: From Idea to Printing of Metal Products (I2P)* has a timeline of 2019-2022 and is aimed at promoting the innovative industry of 3D metal printing, as well as the potential of small- and medium-sized enterprises for applying the latest additive manufacturing technologies and R&D achievements of the universities and their laboratories. Partnering this project are Luleå University of Technology (Sweden), NArFU, Oulu University (Finland), and UiT – The Arctic University of Norway.

In Arkhangelsk Region, *I2P: From Idea to Printing of Metal Products (I2P)* is a groundbreaking project.

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In its first year (2020), the project tasked its Russian partner with identifying, within the Russian side of the Kolarctic Programme (Arkhangelsk, Murmansk, NAO), the manufacturing industries that might be interested in promoting innovation, with subsequent mapping and questionnaire survey so as to identify their potential for the use of 3D printing. Additive technologies for metal products have been a theme for a series of international webinars and cyberlabs. The October of 2020 saw Luleå University of Technology hosting Metal Additive Manufacturing Seminar and Workshop which was joined by 40 universities and businesses in Sweden, Finland, Norway and Russia; those based in Russia included Arkhangelsk Pulp and Paper Mill (JSC), Ship Repair Center ZVEZDOCHKA (JSC), Tractor-Detail, IC Scada (LLC), EnergoService (LLC), Automatika Vector (LLC), Forest-Center (LLC), and Severny Reid (JSC). An active input is being provided by Oil and Gas Suppliers Association SOZVEZDYE, that supports the project by disseminating its results and searching for more companies willing to take up 3D printing in the Arctic region. Work is in process to create I2P Collaboration Platform for additive technologies for metal manufacturing: series of samples have been produced for testing, experimenting and evaluating the 3D printing options jointly with the participating companies. Also, a dedicated web portal, [www.i2metprint.com](http://www.i2metprint.com), has been launched by teams at NArFU and Luleå University of Technology to introduce its users to the cases and experience of advanced manufacturers.

***Disruptive Information Technologies for Barents Euro-Arctic Region (DIT4BEARs)***, a project with a timeline of 2020-2022, is partnered by organizations in all the four countries of the programme – Luleå University of Technology (Sweden), NArFU, UiT – The Arctic University of Norway, St. Petersburg National Research University of Information Technologies, Mechanics and Optics, Lapland University of Applied Sciences, and Non-Profit Software Developers Partnership RUSSOFT (Russia).

Started in 2020, this project is designed to make the northern areas better prepared to face the challenges inhibiting the operation of disruptive technologies within municipal management – transport services, waste management, freedom of movement of people and goods, safety of winter roads, reindeer breeding – by unfolding their potential within **Living Laboratory**, an open-access regional innovation ecosystem and the project's core.

Within NArFU projects, the Living Laboratory serves as a platform to involve businesses, municipalities and related stakeholders in the use of the disruptive technologies and the opportunities they offer. Its basic function is to be an intermediary between residents, research centers, innovation-driven businesses, city authorities and the region for more effective integration of research and innovation into real life of the communities and their environments.

DIT4BEARs is using the Living Laboratory as a provider of international expert counselling to businesses and their specific cases.

One highly productive format of activity within Living Laboratories is hackathons, i.e. venues for researchers to present their developments within select sectors of technology. In this sense, Living Laboratories serve also as platforms for subsequent adaptation and local implementation of the proposed technologies.

Each case on Living Laboratories' agendas relates to a specific challenge in the Barents Euro-Arctic region:

- **SmartID**: Blockchain-based citizen identification system for public and municipal service sector.
- **SmartWaste**: Smart waste management system for northern municipalities.
- **SmartRoad**: Winter road maintenance in challenging conditions of the North.
- **ConnectedDeer**: IT services for reindeer breeding (IT monitoring, GPS, software).

One example of the venue designed to promote IT transfer is *Smart Solutions for the North*, an international online hackathon held on 14-15 November 2020. This 36-hour event had its participants working out the solutions for the blockchain-based and digital technologies for sectors as diverse as forestry, waste collection, transport safety and reindeer breeding, posed to them by businesses in Russia, Finland, Sweden and Norway. Competing in the hackathon were 13 teams based in different universities.

Another project that promotes the use of information technologies is ***Ice Operations***, a collaborative research consortium to model and forecast the ice conditions in the northern seas, that has among its partners Norway's major research provider SINTEF Narvik A.S., Luleå University of Technology, Finnish Meteorological Institute, Maritime Forum Nord, Storvik & Co OY, and Oil and Gas Suppliers Association SOZVEZDYE. The project has as its common goal to promote industrial development in the Arctic areas. Its international team are based in four countries and are working to accumulate the data on the ice conditions in the northern seas; improve ice situation forecast models for industrial and environmental safety during field development; and support the navigation in the Arctic seas. A series of analytical reports has been provided by the NArFU team that cover ice conditions of the Barents Sea, Pechora Sea, and the 2015-2020 ice dynamics in the water area of the Barents Sea. Work is in progress to elaborate relevant recommendations for oil and gas industry and to provide expert judgement on specific business cases. The risk assessment database, which is currently under development, is expected to enhance the safety of maritime transport in the Barents Sea with regard to Polar Code requirements.

Of particular importance are the IT projects that deal with **social challenges**.

Among them is the 2019-2024 collaborative effort between NARFU and the University of Deusto (Spain) to promote **Computer Vision technologies** and dual supervision framework for graduate students. This cooperation uses as its basic formats internships at DEUSTO TECH (Spain), joint conferences, publications, and visiting lecture series.

Another notable project is *Creation of Sustainable Platform for Rendering Online Professional Support on Mental Health for Population of Arkhangelsk Region*, aiming to promote telemedicine, enhance the use of IT for diagnostics purposes, improve competencies of medical community, and offer dual research supervision to graduate students at NARFU and the University of Applied Sciences Emden/Leer (Germany). Partnering this project is the Norwegian Centre for Integrated Care and Telemedicine.

The year 2021 will see the start of one more Kolarctic-funded project, *Wood Industry 4.0*. A collaborative effort between Luleå University of Technology, NARFU and FlexBridge AB (Sweden), it seeks to introduce the forest industry, which remains a pillar of sustained growth in Sweden, Finland and North-Western Russia, to blockchain technologies by way of:

- developing blockchain software for tracking of timber from the forest to the final product; and
- implementing digital technologies across business processes within the forest industry for greater transparency of forest management.

In addition, 2021 will see more IT-related projects focusing on the **environmental challenges and climate change monitoring** – *Arctic Climate Change Laboratory*, funded by NEFCO-administered Nordic-Russian Programme for Environment and Climate Co-Operation (PECC); and *Living Laboratory in Climate Change*, funded by Erasmus+ Capacity Building.

With a wide range of tools for international activities, the above projects have a huge potential as generators of living laboratories, educational products (Massive open online course on disruptive IT that spans blockchain technologies, artificial intelligence, the Internet of Things and machine learning), infrastructure improvement and publications, among other things, which ultimately define these project activities as a highly effective tool for yielding multiplier effect for both the university and its home region.

As indicated in one of the recent studies, “apart from IT specialists, the training efforts should focus on skills for effective running of and interaction within human-machine ecosystem, i.e. a system organization where all routine operations can be done by the machine and knowledge-intensive adjustment and control by humans.” [4]

Universities will have resources and “ability to operate as nuclei of regional educational systems, providers of research to sector-specific clusters, competency centers for methodology, communication platforms, and owners of the infrastructure sufficient to generate innovation.” [5]

Work is currently in process at NARFU to create **high-tech industrial park** Digital Arctic.

Designed to set up the Arctic inter-regional IT ecosystem for increased digital awareness among the public, Digital Arctic will function also as a provider of training and facilitator of digital economy. The outcomes and the potential gained so far as a result of international projects are already being integrated into Digital Arctic IT Park's strategies and events roadmap.

### Conclusion

As can be seen from above, the international project activity has led to the emergence of new “science-business” partnership models that have an impressive potential as venues for meeting the challenges of digitalization in the northern areas, as well as promoting advanced information technologies for more effective urban management, smart city concept implementation and industry integration, while also increasing the availability of Russian and overseas IT developments for local growth. This article presents the case of Arkhangelsk Region as an area that maintains a vibrant international cooperation towards digital progress and that pursues collaborative efforts with its Nordic partners to address the challenges faced by remote northern areas.

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