CHALLENGES TO DEVELOP LONG-TERM UNIVERSITY’S RESEARCH STRATEGY IN THE RAPIDLY CHANGING WORLD: HOW PURE CAN HELP

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AIM

TO START A DISCUSSION ON THE BEST WAYS TO BUILD UP A UNIVERSITY’S RESEARCH STRATEGY IN THE RAPIDLY CHANGING WORLD
OUTLINE:

1. Strategic context
2. Tomsk Polytechnic University (TPU) at a glance
3. Strategy Development Challenges
4. PURE as a tool to address strategic challenges
5. Pure Data to support decision making
Key Milestones of TPU

- Founded by the Decree of the Russian Emperor Nicholas II in 1986
- Added to the List of the Most Valuable Objects of Russian Cultural Heritage in 1997
- Awarded RF Governmental Prize in the field of quality in 2006
- Awarded National Research University status in 2009
- Entered «5-100» Initiative funded by the Russian Ministry of Education in 2013
Key Milestones of TPU

- **2015**: Entered ATLAS, CMS CERN
- **2016**: Entered LHbC, COMPASS CERN
- **2017**: 386
- **2018**: 301-350
TPU FACTS AND FIGURES

RESEARCH OUTPUT

- Papers per faculty (Scopus): 7.2
- Citations per faculty (Scopus): 17.3
- International collaboration: 28%

EDUCATION

- Schools: 10
- International students: 26%
- Faculty members: 1550
- Undergraduate and Graduate students: 14,000
KEY RESEARCH FIELDS

- Biotechnologies and medical engineering
- High energy Physics
- Nuclear engineering
- Information technologies and Big Data
- Surface modification, new materials
- Nondestructive testing
- Water treatment
- Power engineering and energy efficiency
- Mechanical engineering

International Partners:

Universities in 30 countries worldwide:
- University of Southampton
- Aalborg University
- École Polytechnique Fédérale de Lausanne (EPFL)
- Technion – Israel Institute of Technology,
- Jilin University, China e.t.c.
STEPS TPU MADE TO GET CURRENT POSITION IN RESEARCH

1. Built up an extensive research infrastructure by raising additional funds
2. Invested into international research mobility programs
3. Expanded international collaborations by working in Mega Science projects
4. Provided financial incentives for research productivity
5. Implemented Open Access & Visibility Enhancement Policy
STRATEGIC CONTEXT
Global trends

1. 90% of successful research projects tend to be multidisciplinary.
2. The global research agenda has switched towards more interdisciplinary research.
3. Research priorities are changing every year, esp. in computer & life sciences.
4. The world is getting totally digitalised & blockchained.
5. The amounts of data on research productivity is growing extremely fast.
6. The number of research intelligence tools are growing.
QUESTIONS

1. Is our university’s research more applied or fundamental?

2. And if it’s both, where should we head for?

3. What should we do to be more interdisciplinary & multidisciplinary?

4. How to expand collaboration network?

5. Is universities research cutting-edge?

6. What should research management do to keep up the pace of the global research?
THERE IS A NEED TO DIVERSIFY THE UNIVERSITY’S RESEARCH PORTFOLIO
KEY QUESTION

HOW TO DIVERSIFY UNIVERSITY RESEARCH PORTFOLIO?

1. Demand for Innovation from Enterprises
2. Create new research projects that can fit the market
3. Create new markets by having a deeper insight into global trends
NATIONAL TECHNOLOGY INITIATIVE (AGENCY OF STRATEGIC INITIATIVES)

**ENERGYNET**
- Distributed power from personal power to smart grid and smart city

**FOODNET**
- Personal production and food & water delivery

**SAFEYNET**
- New personal security systems

**HEALTHNET**
- Personal medicine and health care

**AERONET**
- Distributed systems of unmanned aerial vehicles

**MARINET**
- Distributed systems of unmanned maritime transport

**AUTONET**
- Distributed network of unmanned management of road vehicles

**FINNET**
- Decentralized financial systems and currencies

**NEURONET**
- Distributed artificial components of consciousness and psycho
STRATEGIC CHALLENGES

1. What to do if there is a lack of demand for innovations from Russian large corporations?

2. How to do a better foresight for research trends? How often?

3. Should we stitch to more fundamental issues in research?

4. How to be more visible and expand collaborations if the University is located far from metropolitan cities?

5. What research data are the most important for the foresight?

6. What are the tools that can be helpful to predict the future of the research?
HOW PURE CAN HELP

STUDENTS, ACADEMIC AND RESEARCH STAFF

01
To find partners in other universities and organizations across Russia and worldwide

02
To enhance visibility of research output

03
To find research mentors for scholarly projects

04
To track the activities of colleagues
DETAILED VIEW
ON GEOGRAPHY OF VISITS (JAN 1 - October ’18)

2971 cities 150 countries
HOW PURE CAN HELP

UNIVERSITY RESEARCH MANAGEMENT
AND UNIVERSITY MEDIA

01 To be aware of the recent publications and research projects

02 To know the “stars” and staff that contributes to university research every day

03 To create any kind of reports connected with research productivity at any time
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<tr>
<th>SciVal</th>
<th><strong>vs</strong></th>
<th>PURE</th>
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<tbody>
<tr>
<td>Only Scopus Data</td>
<td><strong>More comprehensive set of data from different sources</strong></td>
<td></td>
</tr>
<tr>
<td>Only separated pieces of landscape can be visualized</td>
<td><strong>Totally Visualized research landscape</strong></td>
<td></td>
</tr>
<tr>
<td>You need to create groups and units manually</td>
<td><strong>Organization and group structure has already been created</strong></td>
<td></td>
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<tr>
<td>Collaborations can be regarded either for the whole University or individuals only</td>
<td><strong>You can track threads and connections between every researcher</strong></td>
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The university needs deeper insight into research landscape
HOW PURE CAN HELP

ALGORITHM TO BUILD UP A PROJECT & CREATE NEW RESEARCH IDEAS

1. New Market Key Words
2. Search for relevant publications & projects based on fingerprints
3. Build up an authors network from different departments
4. Create projects
5. Meet with people to find challenges & possibilities to work together
CREATING NEW PROJECTS IN PURE

INTERNET OF ENERGY
S.A. Baidaly
Division for Nuclear-Fuel Cycle
S.N. Mihaylenko
School of High-Energy Physics

VIRTUAL POWER PLANT
D.M. Sonkin
School of Computer Science & Robotics
O.A. Kozhemyak
School of Non-Destructive Testing & Security

MICROGRID
A.G. Garganeev
Division for Power and Electrical Engineering
A.V. Prokhorov
Division for Power and Electrical Engineering
Creating New Projects in Pure

Identification

<table>
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<tr>
<th>Title</th>
<th>EnergyNet</th>
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<tr>
<td>Key findings</td>
<td>Internet of Energy, Virtual Power Plant, MicroGrid, Vehicle-to-grid</td>
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Classifications

<table>
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<tr>
<th>Project type</th>
<th>Research project</th>
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<tr>
<td>Nature of activity type</td>
<td>Research inputs</td>
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Related project participants

- **Anton Victorovich Prokhorov**, PI
  - Internal person
  - Division of Power and Electrical Engineering
    - Organisational unit: Division

- **Alexander Grigoryevich Garganeev**, PI
  - Internal person
  - Division of Power and Electrical Engineering
    - Organisational unit: Division

- **Semen Nikolaevich Mikhailenko**, PI
  - Internal person
  - Research School of High-Energy Physics
    - Organisational unit: School

- **Dmitry Mikhailovich Sonkin**, PI
  - Internal person
  - Division of Information Technology
    - Organisational unit: Division

- **Maxim Ivanovich Pushkarev**, PI
  - Internal person
  - Division for Automation and Robotics
    - Organisational unit: Division

- **Alexander Ivanovich Pushkarev**, PI
  - Internal person
  - Division of Network Science

Life cycle

1.10.18 – ...

Research outputs

- Reduction of Three-phase Voltage Unbalance Subject to Special Winding Connections of Two Single-phase Distribution Transformers of a Microgrid System Using a Designed D-STATCOM Controller
- Hybrid microgrid in islanded operation based on renewable energy sources
- Research output: Chapter in Book/Report/Conference proceeding
  - Conference contribution
- Stability Analysis of a Microgrid System with a Hybrid Offshore Wind and Ocean Energy Farm Fed to a Power Grid through an HVDC Link
- Research output: Contribution to journal
  - Article
- Smart Grid Technologies: Trends and Perspectives
  - Research output: Contribution to journal
  - Article
1. Create new research areas to be leaders
2. Improve foresight & constant monitor trends across the organization
3. Identify interdisciplinary collaborations across the organizations quarterly
4. Identify strategic themes and frameworks every year
THANK YOU

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