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An Empirical Analysis of the Interactions Between Research Units and Commercialization Units of Innovative Projects of a National Research University

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Abstract: This study examines the challenges in collaboration between departments at national research universities, particularly between research units and those focused on commercializing knowledge-intensive products. Numerous barriers impede the market implementation process, which reduces the effectiveness of the university's commercialization model. This inefficiency, in turn, adversely affects the regional economy, the training of personnel competent in marketing, and the university's sustainable development. Through empirical analysis, this research identifies the underlying mechanisms of these departmental processes and provides recommendations to address them. Furthermore, this article underscores the prevailing disunity and proposes measures to enhance collaboration between academia, industry, and business. These proposed solutions are demonstrated through the application of specific instruments, including the HADI cycle, Customer Development methodology (featuring problem-based interviews), and qualitative empirical analysis.

1 INTRODUCTION

In the context of the developing digital economy, especially the development of new methods for generating, processing, storing, and transmitting data, as well as digital computer technologies (Filippova, 2018), universities play a key role. Over a long period, universities have been developing internal infrastructures that enable them to address new market challenges and flexibly adapt their scientific environment to emerging industry challenges, including the active phase of digital economy development (Edronova, 2019). This study examines the existing coordination infrastructure model of commercialization, which enables the effective introduction of knowledge-intensive projects to the market — that is, a product, service, or technology that reflects the degree of connection with scientific research and development (Avdolov, 2002).

This study aims to examine the interactions between the infrastructure of a national research university, its research and commercial divisions, to identify barriers to the effective commercialization of knowledge-intensive products. The relevance of analyzing existing barriers in the university environment has been noted by many scholars and practitioners. For example, M.V. Vladyka notes the underdevelopment of forms and methods for integrating links between industry and business (Vladyka, 2009), and V.B. Dzobelova raises the issue of inconsistent roles and responsibilities. According to the author, scientists should engage in research,

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while business should be handled by competent individuals in the field (Dzobelova, 2015).

Despite the active development of an entrepreneurial culture among university students and scientific communities, the emergence of impetus in the field of start-ups and entrepreneurship (Zobnina et al., 2019) is still insufficient to achieve practical results in the commercialization of university products. This study allows us to delve into specific gaps and barriers that have a significant impact and emphasizes practical mechanisms that positively influence the commercialization of university developments.

2 MATERIALS AND METHODS

Analyzing the problem under study, two key hypotheses were developed (see Table 1) for the study's structures: ITMO University's research centers and laboratories (RCs) and commercialization centers (CCs). The study was conducted using the HADI cycle methodology, a hypothesis testing technique based on four stages: hypothesis, action, data, and conclusions (Shendeleva et al., 2018).

Table 1: Hypotheses of the conducted research based on HADI-cycles.

Hypothesis 1. The primary barriers to commercialization perceived by research centers and laboratories (RCs) are a lack of business competencies and concerns over intellectual property control, while their primary motivation is access to market resources and expertise.	**Hypothesis 2.** The main frustrations for Commercial Centers (CCs) when collaborating with RCs are rooted in communication gaps and a lack of structured, market-oriented information from the researchers, rather than a fundamental lack of viable projects.
Actions: Conduct problem-focused interviews and surveys with representatives of RCs.	**Actions:** Conduct interviews with representatives of CCs to map their interaction with RCs.
Data: Collect qualitative data on perceived barriers to collaboration; internal motivations for commercialization; expectations from CC partners; and identified resource deficits.	**Data:** Collect qualitative data on difficulties in communication; key criteria for project evaluation; frustrations with process inefficiency; and attributes of successful past collaborations.
Conclusion: The data will validate Hypothesis 1 if the analysis reveals a statistically significant prevalence of "business competency gaps" and "IP control concerns" among the top barriers. If other factors (e.g., institutional bureaucracy, lack of trust) dominate, the hypothesis will be refuted and require adjustment.	**Conclusion:** The data will validate Hypothesis 2 if communication issues and unstructured information flow are identified as the central pain points. If the data instead emphasizes a primary issue of "project immaturity" or "technology misalignment with market needs," the hypothesis will be refuted.

Note: The table was compiled by the author and the research team.

To test the research hypotheses, we used Customer Development, a key tool for creating in-demand products, minimizing risks, and successfully launching new solutions to the market (Lekomtseva et al., 2025). This study utilized problem-based interviews, an empirical method for collecting qualitative data. Three key objectives were set.

Objective 1. Conduct problem-solving interviews with NC representatives to identify the following:

1. Awareness of existing CCs.
2. Frequency and reasons for contacting CCs were assessed.
3. Effectiveness of the support provided to CCs.
4. Mechanisms for finding customers and grants.
5. Availability of business consultants/managers for interaction with external partners.

Objective 2. Collect and analyze statistics on the following points:

1. Number of projects implemented by the centers and laboratories.
2. Number and proportion of projects successfully commercialized with the support of specialized departments.
3. Effectiveness of commercialization structures in the past five years.

Objective 3. Conclusions were drawn on the following points:

1. The main challenges in the commercialization process are as follows.
2. Frequency of requests from the scientific community to the relevant departments.
3. Number and share of projects that reached the market.
4. Confirmation or refutation of hypotheses.
5. This study provides opportunities for formulating new hypotheses and needs. During the study, a Road map method was also used, to illustrate a logical structure of the research process (formula 1).

$$\rightarrow \textbf{preparation of hypotheses} \rightarrow \textbf{data collection} \rightarrow \textbf{analysis} \rightarrow \textbf{formulation of conclusions and future implementation} \quad (1)$$

This study aims to examine the interactions between commercialization units, research centers, and laboratories within a national research university. The subject of this analysis is the processes and mechanisms for commercializing scientific developments and innovative projects among these units.

To achieve this objective, the research employs a systematic, transparent approach structured into distinct stages. The overarching goal of this process is to identify and dismantle the barriers to effective

collaboration between scientific research and commercial application.

Methodologically, the study utilizes a qualitative empirical analysis, supported by elements of desk research. This mixed-method approach involves collecting primary data through problem-solving interviews and triangulating these findings with existing internal data and statistics from recent years.

3 RESULTS AND DISCUSSION

The study identified three key stakeholder groups within the university's innovation ecosystem, each representing a critical node in the commercialization value chain:

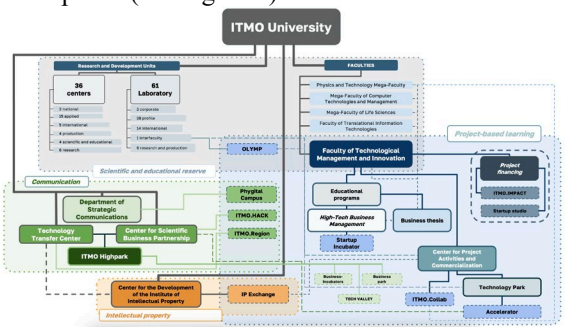
1. Young Researchers and Associates: The source of scientific developments and technical knowledge, who often encounter barriers in translating their solutions to the market.

2. Commercialization Specialists: The intermediaries between science and the market, responsible for packaging, promoting, and supporting projects through the commercialization process.

3. Students: Potential participants in research and entrepreneurial activities, who represent the future pipeline of startup founders and developers for knowledge-intensive products.

These groups were selected because the most significant interaction gaps and communication breakdowns, which are critical to successful commercialization, are frequently observed at the interfaces between them.

Let us consider the departments of the university under study – the Federal State Budgetary Educational Institution of Higher Professional Education "Saint Petersburg National Research University of Information Technologies, Mechanics, and Optics" (see Figure 1).



Note: The table was compiled by the author and the research team.

Figure 1: Scheme of the commercialization model for interactions between ITMO University departments.

Thus, 27 centers (4 production, 2 national, 15 applied, and 6 research centers), 44 laboratories (38 specialized, 6 research, production, and research), and 10 departments engaged in the commercialization activities (the Project Activity and Commercialization Center, the Intellectual Property Institute Development Center, the Technology Transfer Center, the Strategic Communications Department, the Scientific Business Partnership Center, the IP Exchange, the ITMO Technology Park, ITMO.IMPACT, ITMO Business Thesis, and the ITMO Accelerator) were considered for this study. Interview tools were selected based on the nature of the target audience and research objectives. A combination of in-depth and problem-based interviews, as well as desk analysis, provided a comprehensive understanding of the current state of interaction between the scientific community and commercialization divisions in the country. During the interviews with representatives of the research centers, a survey was conducted regarding the presence of examples of interaction with any center in the field of development commercialization.

Most centers (59%) indicated that they prefer to collaborate with organizations outside ITMO University to bring their products to market (which is to collaborate directly with businesses, other technology units in St. Petersburg and work under governmental contracts). Regarding the University's internal commercialization departments, centers, and laboratories, they most frequently collaborate with Accelerator and FTMI students (32% of respondents for each center).

Out of 22 respondents, the majority (14 departments, or 64% of respondents) had negative experiences interacting with the CCs at ITMO University. The remaining 36% of respondents were split evenly: four research departments considered their experience of collaboration to be positive or partially positive, while another four departments had not interacted with the CCs at ITMO University.

Moving on to the main challenges of commercializing university research identified after the study.

The analysis revealed significant, mutually acknowledged barriers from both sides of the collaboration. The research centers identified the following primary challenges in engaging with Commercialization Centers:

Knowledge & Expertise Gaps: A perceived lack of understanding of the scientific specifics and DeepTech nature of the research among CC managers.

A scarcity of mentors or project managers with dual expertise in both DeepTech markets and the scientific domain.

Structural & Process Deficits: No clear, formalized process for engagement, creating uncertainty about initial points of contact and procedural steps.

Opaque operational and financial practices within CCs, which, coupled with a lack of information on successful case studies, erodes trust.

Relational & Control Concerns: A fear among researchers of losing control over their intellectual property and the scientific direction of the project.

Conversely, interviews with CC representatives highlighted internal organizational issues that frustrate collaboration:

Internal Coordination Failures: A lack of a clear coordination system between different CCs and distribution of roles and responsibilities within teams.

Pipeline & Project Challenges: A scarcity of "investment-ready," mature projects, particularly in complex DeepTech fields where longer development cycles are the norm.

Systemic Uncertainties: Unresolved legal and financial questions, including equity shares, intellectual property rights, and participant motivation structures, which stall project advancement.

CCs representatives identified the following problems in working with RCs:

- Low engagement of scientists
- Scientists' lack of understanding of the role of Commercialization Centers
- Scientists' reluctance to share key developments
- Communication difficulties – scientists ignore analysts if they do not speak scientific language.
- Disunity between CCs: lack of a common tracking system and confusion about roles
- Project teams get lost or do not reach the commercialization stage.

The analysis reveals a commercialization pipeline hampered by a cycle of mutual misunderstanding and structural inefficiencies. The challenges are deeply bidirectional:

- Research Centers (RCs) perceive a lack of market expertise and transparency from Commercialization Centers (CCs), leading to distrust and a fear of losing control over their intellectual property.
- Commercialization Centers (CCs), in turn, are frustrated by the lack of "market-ready" projects from RCs and face internal organizational chaos, which is exacerbated by scientists' perceived disengagement and communication barriers.

This creates a deadlock where RCs are hesitant to engage due to a lack of trust and clear process, while CCs cannot find mature projects to advance, partly because of their own ineffective engagement methods.

The barriers can be categorized from the perspective of each stakeholder group and those that are shared.

A. From the Research Centers' (RCs) Perspective: Barriers to Engaging with CCs

- Expertise and Communication Gap: CC managers lack understanding of deep science and cannot communicate in "scientific language," leading to ignored outreach.
- Lack of Specialized Intermediaries: A scarcity of mentors or managers who bridge the gap between deep tech and the market.
- Unclear and Opaque Processes: No formal, transparent pathway for engagement, creating confusion on how to start.
- Lack of Trust and Transparency: Opaque CC operations and a lack of visible success stories reduce researchers' confidence in the process.

B. From the Commercialization Centers' (CCs) Perspective: Barriers to Working with RCs

- Pipeline Immaturity: A scarcity of mature, "investment-ready" projects, especially in complex DeepTech areas.
- Researcher Disengagement: Scientists show low engagement and a lack of understanding of the CCs' role.
- Communication Failures: Difficulties in engaging scientists when analysts cannot understand or discuss the research specifics.

C. Shared & Systemic Barriers (The Core Deadlock)

- Fear of Losing Control (RCs) vs. Reluctance to Share (CCs): This is a critical, mutually reinforcing barrier. RCs fear losing IP and project control, which the CCs interpret as an unwillingness to share key developments.
- Internal CC Disorganization: A lack of coordination between CCs, role confusion, and no common tracking system, leading to projects getting "lost."
- Systemic Legal & Financial Uncertainties: Unresolved issues regarding equity, IP rights, and participant motivation stall projects for both sides.
- Broken Engagement Cycle: The combination of the above barriers creates a cycle where distrust and poor processes prevent the collaboration needed to build trust and refine those very processes.

The next step in the study was to formulate the identified needs of the RCs and CCs in the study. First, the motivations for the RCs' activities were examined to clarify the relevance of the study.

- 68% of respondents indicated "commercialization" as one of the key goals.
- 68% were also engaged in scientific activities for applied research.
- Many RCs representatives' express interest in commercialization but face formidable obstacles when attempting to bring products to market.

The RCs need support of product commercialization specialists and the CCs need maximizing the involvement of scientists can be fulfilled in the following collaboration formats:

1. The "Embedded Navigator" Program

Format: Assign a dedicated "Technology Navigator" – a specialist with a dual background in science and business – to act as a single point of contact for a specific RC or project portfolio. This person is embedded within the RC's processes.

Addresses Barriers:

Knowledge Gap: The Navigator understands deep tech and can communicate effectively with both scientists and CCs.

Structural Deficit: Provides a clear, known point of contact and guides scientists through the process.

Trust and Control: Builds trust through consistent, knowledgeable interaction and helps mediate IP discussions.

2. The "Pre-Commercialization Sprint"

Format: A time-bound, structured program (e.g., 8-12 weeks) where RC and CC teams collaborate intensely. The goal is not full commercialization, but to achieve specific "de-risking" milestones: building a minimum viable prototype, conducting 10 customer discovery interviews, or clarifying the IP and equity structure.

Addresses Barriers:

Project Immaturity: Explicitly designed to mature projects and make them "investment ready".

Systemic Uncertainties: Forces early resolution of legal and financial questions in a low-stakes, structured environment.

Scientist Engagement: Provides a clear, finite commitment for scientists, making engagement more likely.

3. The "Joint Venture Studio"

Format: Create a neutral, shared space (physical or virtual) where RC scientists, CC specialists, and students form project-oriented programs. The studio is governed by a joint RC-CC committee.

Addresses Barriers:

Internal CC Disorganization: Creates a dedicated, well-defined structure outside of the chaotic default system.

Role Confusion: Clearly defines roles within each team.

Student Pipeline: Actively involves students as future entrepreneurs and bridges the gap between education and practice.

Beyond the general need to restructure collaboration formats, there is a resource deficit, which includes a shortage of:

- Managers, mentors specializing in DeepTech
- Access to clear market analytics data and industry feedback
- A unified process to enable scientific centers and laboratories to better understand the process and their role in it.

Based on the comprehensive analysis of the identified barriers, here is a conclusive assessment of the two initial hypotheses.

Original Statement of the first hypothesis: The primary barriers to commercialization perceived by Scientific Centers (NCs) are a lack of business competencies and concerns over intellectual property control…It was partially Confirmed and Refined.

The data strongly confirms that fear of losing control over IP and projects is a major, validated barrier for researchers. However, the hypothesis understated the broader context. The "lack of business competencies" was less a self-perceived lack in RCs and more a perceived lack of technical competency in the CCs. Furthermore, the data revealed critical additional barriers not initially hypothesized, primarily a crisis of trust stemming from the CCs' opaque operations and a structural deficit in the form of no clear process for engagement. Therefore, while the core concern about control was correct, the hypothesis was incomplete.

Original Statement of hypothesis 2: The main frustrations for Commercialization Centers (CCs) when collaborating with RCs are rooted in communication gaps and a lack of structured, market-oriented information from the researchers, rather than a fundamental lack of viable projects. It was fully Confirmed.

The empirical evidence fully supports this hypothesis. The CCs' primary frustrations were explicitly identified as communication difficulties (scientists ignoring non-technical managers) and a lack of structured information. While the "lack of mature projects" was a significant issue, the data from the CCs themselves framed it because of the deeper problems: low scientist engagement and poor communication. The internal disorganization of the

CCs (a factor not initially part of the hypothesis but revealed in the analysis) further exacerbated these communication and information gaps.

The study successfully identified a self-reinforcing deadlock in the university's innovation ecosystem:

RCs are hesitant to engage because they perceive CCs as lacking technical understanding, having opaque processes, and posing a threat to their intellectual control.

This hesitancy manifests as disengagement and a reluctance to share information, which the CCs then experience as a "lack of mature projects" and "communication barriers."

The CCs' own internal disorganization and lack of specialized intermediaries prevent them from effectively overcoming these barriers, thus reinforcing the RCs' initial negative perceptions.

Beyond these specific formats, resolving the identified resource deficit requires a systemic restructuring of interactions. Key measures include:

- Creating a Unified Information Space: A digital platform for project tracking and knowledge sharing to enhance transparency.

- Developing Transparent Legal and Process Models: Standardized agreements and a clear commercialization roadmap to reduce uncertainty.

- Building Intermediate Competencies: Formalizing the role of intermediary curators and investing in managers specializing in DeepTech.

In conclusion, this study provides a validated, evidence-based foundation for transforming the university's innovation ecosystem. By implementing these targeted formats and systemic improvements, the university can break the current deadlock, foster effective collaboration, and ultimately enhance the commercialization of its scientific developments.

4 CONCLUSIONS

This study has provided a comprehensive examination of the systemic disconnect between Research Centers (RCs) and Commercialization Centers (CCs) within the university ecosystem. The research objectives have been successfully met through a series of in-depth interviews with representatives from both sides, which allowed for the systematic identification of key barriers and the subsequent development of targeted recommendations.

Substantial and well-supported answers were obtained for the core research questions, revealing several critical insights:

- While most Research Centers are aware of the Commercialization Centers' existence, they rarely engage with them systematically for patenting or investor search, primarily due to a perceived lack of effectiveness in the support provided.

- Scientists predominantly rely on their own informal networks and professional contacts to secure projects and research results, bypassing the formal commercialization infrastructure.

- The fact that only a few RCs have dedicated commercialization staff underscores a systemic gap and confirms the pressing need to establish a structured system of intermediary curators.

The practical significance of this work lies in the concrete set of measures proposed to optimize RC-CC interactions. Among the most critical recommendations are the creation of a unified information space to enhance transparency, the implementation of clear and standardized legal models to build trust, and the formal introduction of a curator system to bridge the communication and expertise gap. The implementation of these proposals is expected to directly address the identified communication barriers and significantly improve the efficiency of commercializing university developments.

Building upon these findings, this study naturally identifies several promising avenues for future research:

- Implementation Analysis: A pilot study to assess the effectiveness of the proposed ecosystem, involving long-term monitoring of RC-CC interactions. This would include a comparative analysis of commercialization metrics before and after the intervention, complemented by in-depth case studies of both successful and failed projects.

- Comparative Model Research: A systematic comparison of commercialization models at leading Russian and international universities to identify and adapt best practices suitable for the specific context of this institution.

- Scientist Motivation: An investigation into the motivational drivers – including financial, reputational, and career-related incentives — that could effectively increase researchers' active engagement in the commercialization process.

- Internal Process Optimization: A detailed audit of the internal processes within CCs, assessing staff workload, competency gaps, and resource allocation. This should be coupled with the development of sophisticated success metrics that go beyond simple project counts to capture true market impact, and the formalization of the "DeepTech Business Manager" role.

- External Environment Study: An analysis of external factors, including:

The perception of university developments by industrial partners and the barriers to more active industry collaboration.

The tangible impact of state programs and grants on accelerating the commercialization of research outcomes.

In summary, this research has laid a necessary foundation for systematic efforts to enhance the commercialization of scientific developments at the university. The pursued follow-up studies will not only deepen the understanding of the existing challenges but are also poised to translate into specific organizational changes, thereby strengthening the entire technology transfer pipeline and its long-term economic impact.

REFERENCES

Filippova, I.A., 2018. Development of the Digital Economy in Russia, UlSTU Bulletin. Russia, No. 3.

Yedronova, V.N., 2019. Digital Economy: Analysis of Internet Market Volume Statistics, Economic Analysis: Theory and Practice. Russia, No. 9 (492), pp. 1596-1612.

Avdolov, A.N., 2002. Knowledge-Intensive Technologies and Their Role in the Modern Economy, Bulletin of the Russian Foundation for Basic Research. Russia, No. 3 (29), pp. 4-27, EDN PBVRTV.

Vladyka, M.V., 2009. Commercialization of the Results of Scientific and Technical Activities of Universities: Goals, Forms, Problems, University Management: Practice and Analysis. Russia, No. 5, pp. 54-63.

Dzobelova, V.B., 2015. Formation of a Sustainable Innovation Environment in a University and the Problem of Commercialization of the Results of Scientific and Educational Activities, Bulletin of the North Ossetian State University named after K. L. Khetagurov. Rossiya, No. 3, pp. 224-226, EDN VAUTMR.

Zobnina, M., Korotkov, A., Rozhkov, A., 2019. Structure, Challenges, and Opportunities for the Development of Entrepreneurial Education in Russian Universities, Foresight. Russia, No. 4, Vol. 13, pp. 69-81.

Shendeleva, A.R., Novikova, E.A., Kovtun, D.A., 2018. Hypothesis Testing Using the HADI Cycle Methodology, Using Innovative Technologies in the Development and Implementation of Economic Reforms. Russia, pp. 175-177.

Lekomtseva, S.A., Stepanova, S.A., Boytsova, Yu.S., 2025. Analysis of the Impact of the NPD Approach on the Commercialization of Innovative Foodtech Projects, Progressive Economy. Russia, No. 5, pp. 8-25.