Государственное управление интеграционными процессами в Союзном государстве России и Беларуси: формирование единого научно-технологического пространства в цифровую эпоху

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Аннотация. В данном исследовании рассматривается государственное управление интеграционными процессами в Союзном государстве России и Беларуси с акцентом на формирование единого научно-технологического пространства в цифровую эпоху. Несмотря на обширные исследования, посвященные российско-белорусской интеграции, остается значительный пробел в понимании конкретных проблем и возможностей, связанных с научно-технической интеграцией в цифровую эпоху. Целью исследования является выявление ключевых проблем, возможностей и стратегий для расширения сотрудничества и инноваций в этих рамках. Используя смешанный методологический подход, в исследовании анализируются данные официальной статистики, программные документы и мнения экспертов. Ключевые выводы свидетельствуют о значительных различиях в объеме инновационной деятельности: Россия опережает Беларусь по количеству патентных заявок (25 188 против 980 в 2022 году) и плотности инноваций (на 251,6% выше). Исследование также выявило сильную положительную корреляцию (r = 0,97) между долей России во внешней торговле и инвестициях Беларуси, что указывает на глубокие экономические связи. Проблемы включают экономическое неравенство, несоответствия в законодательстве и неравномерное развитие цифровых технологий. Однако совместные инициативы в области космических исследований, информационных технологий и цифрового развития демонстрируют стремление к интеграции при сбалансированном распределении по секторам (по 28,6% в области цифровых технологий, медицины и образования). Рекомендации включают устранение различий в инновациях с помощью целевых программ, гармонизацию нормативно-правовой базы и усиление институциональной поддержки сотрудничества. В исследовании предлагается комплексная стратегия использования цифровых технологий для интеграции, включая разработку общих платформ обмена данными и услуг электронного правительства. Это исследование позволяет по-новому взглянуть на сложности формирования единого научно-технологического пространства в рамках наднационального образования и является ценным руководством для политиков и исследователей в области международной интеграции и управления инновациями.

Ключевые слова: Россия; Беларусь; Союзное государство России и Беларуси; Союзное государство; российско-белорусская интеграция; научно-техническое сотрудничество; единое научно-технологическое пространство; цифровая трансформация; инновационное неравенство; государственное управление

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Introduction

The Union State of Russia and Belarus, established in 1999, represents a unique integration project in the post-Soviet space, aiming to create a supranational entity with a common political, economic, military, customs, and humanitarian space [2]. Despite facing various challenges over the past two decades, the Union State continues to serve as a platform for deepening cooperation between the two countries, particularly in the realm of scientific and technological development [5]. The Union State of Russia and Belarus represents an ambitious integration project between the two countries, aiming to deepen socio-economic cooperation in areas like scientific and technological development. In the digital era, state management of integration processes between Russia and Belarus faces both opportunities and challenges in forming a unified scientific and technological space, as the countries work to align their economic models and leverage their combined innovative potential [3, 5, 25].

In the rapidly evolving global landscape, characterized by technological advancements and digital transformation, the formation of a unified scientific and technological space within the Union State has become a strategic priority. This integration effort is not merely an academic exercise but a crucial endeavor with far-reaching implications for the economic competitiveness, innovative capacity, and geopolitical standing of both Russia and Belarus. As Morozov et al. [13] argue the development of this unified space is essential for aligning the federal and regional innovation policies of the two countries in the medium term, especially in light of recent external challenges and the need for import substitution programs.

The current state of scientific and technological cooperation between Russia and Belarus within the Union State framework is marked by a complex web of policies, agreements, and joint initiatives. Peregudova [14] highlights the increasing importance of interregional communications in expanding internal opportunities for economic growth and adapting best management practices in the transition to a digital economy. Joint programs affected by the trends of digitalization within the unified scientific and technological space of the Union State have been identified, reflecting strategic priorities for the development of economic sectors.

However, the path towards a fully integrated scientific and technological space is not without obstacles. Identifying and evaluating the main challenges and barriers to this integration process is crucial for developing effective strategies to overcome them. These barriers may include regulatory discrepancies, institutional inertia, and cultural differences that hinder seamless collaboration. Sokolov [21] points out that youth innovative entrepreneurship could serve as a driver for the digitalization of the unified scientific and technological space, but certain limitations need to be addressed to fully harness this potential.

The role of digitalization in facilitating integration processes and fostering innovation within the Union State cannot be overstated. E-government initiatives, the development of digital infrastructure, and the creation of a common digital market are pivotal elements in this transformation. Morozov et al. [13] emphasize that the transition of the national economies of Russia and Belarus to a digital model of development necessitates a reevaluation of the institutional framework governing integration processes within the Union State.

Analyzing the effectiveness of current state management approaches in promoting scientific and technological integration is essential for refining strategies and maximizing outcomes. This includes scrutinizing funding mechanisms, coordination structures, and policy harmonization efforts. Astratova, et al. [2], Sharueva [20] and Bengraf, et al. [5] notes in their researches that while progress has been made in certain areas of educational and digital integration, there is still a need for more comprehensive and systematic approaches to linking digital and educational spaces within the Union State.

The problem at hand is multifaceted and of pressing relevance. Despite the existence of numerous studies on various aspects of Russian-Belarusian integration, there is a notable gap in the literature regarding the specific challenges and opportunities presented by the formation of a unified scientific and technological space in the digital era. The urgency of this research is underscored by the rapidly changing global technological landscape and the increasing economic and geopolitical pressures faced by both countries [15]. As Bakhlova et al. [4] point out, external challenges and threats articulated by the member countries of the Union State have catalyzed integration efforts, but also introduced additional complexity and instability to the motivations of internal actors.

In light of these considerations, this article aims to provide a comprehensive analysis of the state management of integration processes in the Union State of Russia and Belarus, with a specific focus on forming a unified scientific and technological space in the digital era. By addressing the aforementioned objectives, this research seeks to contribute valuable insights to policymakers, scholars, and practitioners involved in shaping the future of Russian-Belarusian integration and innovation ecosystems.

Research Objectives

To analyze the state management of integration processes in the Union State of Russia and Belarus, with a focus on the formation of a unified scientific and technological space in the digital era, in order to identify key challenges, opportunities, and strategies for enhancing cooperation and innovation.

Specific Objectives

1. To assess the current state of scientific and technological cooperation between Russia and Belarus within the framework of the Union State, including existing policies, agreements, and joint initiatives.
2. To identify and evaluate the main challenges and barriers to the formation of a unified scientific and technological space, including regulatory, institutional, and cultural factors.
3. To examine the role of digitalization in facilitating integration processes and fostering innovation within the Union State, with particular attention to e-government, digital infrastructure, and the development of a common digital market.
4. To analyze the effectiveness of current state management approaches in promoting scientific and technological integration, including funding mechanisms, coordination structures, and policy harmonization efforts.

Research Methodology

This study employs a mixed-methods approach to examine the state management of integration processes in the Union State of Russia and Belarus, with a particular focus on forming a unified scientific and technological space in the digital era. The research design incorporates both quantitative and qualitative elements to provide a comprehensive analysis of the subject matter. The Union State of Russia and Belarus serves as an ideal case study for investigating integration processes in the post-Soviet space. As noted by various researchers [3, 5, 13, 15], this unique supranational entity aims to create a common political, economic, military, customs, and humanitarian space between the two countries. The focus on scientific and technological integration within this framework is particularly relevant given the increasing importance of digital transformation in shaping economic competitiveness and innovative capacity.

Data Sources

The study utilizes data from multiple official and reputable sources to ensure comprehensive coverage and reliability:

1. Belstat (National Statistical Committee of the Republic of Belarus)
2. Rosstat (Federal State Statistics Service of the Russian Federation)
3. World Intellectual Property Organization (www.wipo.int)
4. Centre for Eastern Studies (www.osw.waw.pl)
5. Rossiyskaya Gazeta (https://rg.ru)

These sources provide a wide range of statistical data, policy documents, and analytical reports pertaining to the scientific, technological, and economic aspects of Russia-Belarus integration.

Data Collection Methods

The research employs a combination of data collection methods:

1. Document analysis: A systematic review of official documents, legal agreements, and policy papers related to the Union State's scientific and technological integration efforts.

2. Secondary data analysis: Collection and analysis of statistical data from Belstat and Rosstat on key indicators of scientific and technological development, such as R&D expenditure, patent applications, and high-tech exports.

3. Content analysis: Examination of reports and analyses from www.osw.waw.pl and https://rg.ru to gauge expert opinions and media coverage of integration processes [9].

Data Analysis Methods

The study utilizes both quantitative and qualitative analytical techniques:

1. Descriptive statistics: To summarize and present key trends in scientific and technological indicators for both countries.

2. Chi-square tests: To examine the association between various factors influencing integration processes and outcomes.

3. Percentage differences: To compare and contrast the performance of Russia and Belarus across different scientific and technological metrics.

4. Thematic analysis: To identify recurring themes and patterns in policy documents and expert opinions regarding integration challenges and opportunities [19].

This mixed-methods approach allows for a robust examination of the research objectives. As Peregudova [14] suggests, the digital transformation of national economies requires a multifaceted analysis of interregional interactions within the scientific and technological space of the Union State. By combining statistical analysis with qualitative insights, this methodology provides a comprehensive framework for assessing the current state of integration, identifying challenges, and evaluating the effectiveness of state management approaches in fostering a unified scientific and technological space.

The use of multiple data sources and analytical techniques enables triangulation, enhancing the validity and reliability of the research findings. This approach aligns with Bakhlova et al.'s [4] recommendation to consider both internal and external factors influencing integration processes within the Union State.

Results

The results in Table 1 indicate a comprehensive and multifaceted approach to scientific and technological cooperation between Russia and Belarus within the Union State framework. The focus on joint initiatives in space research, IT, and digital development demonstrates a strong commitment to technological advancement and integration [13]. The emphasis on research projects in cutting-edge fields like AI, biotechnology, and advanced materials aligns with global scientific trends [6].

Table 1 – Current State of Scientific and Technological Cooperation between Russia and Belarus

Aspect	Details	Implications
Union State Programs	- Joint initiatives in space research, IT, and digital development - Focus on digital economy development - Common platforms for data sharing and research collaboration	Indicates a strong commitment to technological advancement and integration

Aspect	Details	Implications
Scientific Collaborations	- Emphasis on research projects in AI, biotechnology, and advanced materials - Collaboration on molecular mechanisms of oxygen transport	Shows focus on cutting-edge scientific fields
Industrial Cooperation	- Support for creating joint ventures and technology parks - Implementation of inter-governmental investment projects worth 105 billion roubles - 16 investment projects underway in Belarus	Demonstrates efforts to boost innovation and industrial synergy
Digital Integration	- Development of unified digital standards system - Growth in IT services (132.7% increase in software development in Russia, Jan-Aug 2024)	Suggests prioritization of digital infrastructure and services
Education and Research	- Over 1,300 cooperation agreements between universities - Joint conferences, staff, and student exchange programs - Launch of double degree programs - Association of Schools of Russia and Belarus (200 schools)	Indicates strong focus on knowledge exchange and human capital development
Economic Integration	- Part of Eurasian Economic Union, including customs union - 92% of transactions in national currencies - Russia's share in Belarus's foreign trade: 49.0% (2021)	Shows deep economic ties supporting technological cooperation
Patent Activity	- Russia: 25,188 patent applications (2022), rank 14th globally - Belarus: 980 patent applications (2022), rank 49th globally - Joint PCT publications in renewable energy	Reflects innovation output, with potential for growth in joint patents
Challenges	- Disparities in economic growth and industrial production - Differences in business landscapes and wage structures - Data availability and standardization issues	Highlights areas needing attention for smoother integration

Note: compiled by authors based on the official and reputable sources

The industrial cooperation efforts, including joint ventures and investment projects, suggest a strategic approach to boosting innovation and industrial synergy [8]. The development of unified digital standards and growth in IT services indicates a prioritization of digital infrastructure, which is crucial for a modern, integrated economy [5, 20].

The extensive educational collaboration, with over 1,300 cooperation agreements between universities and joint programs, underscores a strong focus on knowledge exchange and human capital development [22]. This aligns with the goal of creating a unified scientific and technological space [5].

However, challenges such as disparities in economic growth and industrial development [15], differences in business landscapes, and data standardization issues [5] highlight areas needing attention for smoother integration [4]. The patent activity data, while showing innovation output, also suggests potential for growth in joint patents, which could be a key area for future development.

The statistical analysis reveals significant disparities in innovation output between Russia and Belarus, with Russia showing a substantially higher number of patent applications and innovation density [6]. This

suggests potential for knowledge transfer within the Union State framework. The stark difference in the share of women inventors indicates a need for addressing gender diversity in innovation [13]. Despite these disparities, the similar GDP growth rates point to balanced economic cooperation potential [8]. The rapid growth in Russia's IT services and R&D sectors, as shown in Table 2, could serve as a driver for joint initiatives, aligning with the Union State's focus on digital development and scientific collaboration [5, 20]. However, the lack of comparable data for Belarus in some metrics highlights the need for improved data standardization and sharing between the two countries.

Table 2 – Statistical Analysis of Scientific and Technological Cooperation between Russia and Belarus

Metric	Russia	Belarus	Percent Difference	Inference
Patent Applications (2022)	25,188	980	2,471% higher in Russia	Significant disparity in innovation output, potential for knowledge transfer
Patent Applications per Million Inhabitants	135 (rank)	38.4	251.6% higher in Russia	Russia has higher innovation density, possible mentor role
Share of Women Inventors	16.1%	3.6%	347.2% higher in Russia	Significant difference in gender diversity in innovation
GDP Growth Rate (2023)	3.6%	3.9%	8.3% higher in Belarus	Similar economic growth rates, facilitating balanced cooperation
Growth in IT Services (2024)	132.7%	N/A	N/A	Rapid growth in Russian IT sector, potential driver for joint initiatives
R&D Growth (2024)	107.3%	N/A	N/A	Positive growth in Russian R&D, may benefit joint projects

Note:
1) N/A- Not Available
2) Compiled by authors based on the official and reputable sources

The distribution of joint initiatives between Russia and Belarus demonstrates a balanced focus across digital/IT and education sectors [3, 5] as well as medical/health, each accounting for 28.6% of the total initiatives [13]. This aligns with the Union State's priorities in technological advancement and human capital development [5, 20]. The equal emphasis on these sectors suggests a comprehensive approach to integration, addressing both technological [15] and social aspects [3, 5]. However, the lower representation of cultural initiatives (14.2%) may indicate an area for potential expansion [11]. As shown in Table 3, the diversity of sectors involved reflects the multifaceted nature of Russia-Belarus cooperation, though the relatively small total number of initiatives (7) suggests room for growth in collaborative efforts [4].

Table 3 – Distribution of Joint Initiatives

Sector	Number of Initiatives	Percentage
Digital/IT	2	28.6%
Medical/Health	2	28.6%
Education	2	28.6%
Culture	1	14.2%
Total	7	100%

Note: compiled by authors based on the official and reputable sources

The chi-square test results presented in Table 4 suggest that the distribution of joint initiatives across sectors is not significantly different from a uniform distribution ($p = 0.9344$). This indicates a balanced approach to cooperation between Russia and Belarus, aligning with the Union State's goal of comprehensive integration [13]. The equal representation in digital/IT, medical/health, and education sectors reflects the prioritization of technological advancement and human capital development [5, 20]. As noted by Klimuk and Zelepukin [11], while the current distribution appears balanced, there may be opportunities for expanding initiatives, particularly in underrepresented areas like culture. This balanced yet limited scope of initiatives underscores both the progress and potential for growth in Russia-Belarus scientific and technological cooperation [4].

Table 4 – Chi-square Test for Distribution of Joint Initiatives

Statistic	Value
Null Hypothesis	The distribution is uniform across sectors
Observed Frequencies	Digital/IT: 2, Medical/Health: 2, Education: 2, Culture: 1
Expected Frequencies	1.75 for each sector (assuming uniform distribution)
Degrees of Freedom	3
Chi-square Statistic	0.429
p-value	0.9344
Conclusion	Fail to reject the null hypothesis

Note: compiled by authors based on the official and reputable sources

Table 5 reveals a very strong positive correlation ($r = 0.97$) between Russia's share in Belarus's foreign trade and foreign investments, indicating a deeply intertwined economic relationship (Dadalko, 2023). The high coefficient of determination ($r^2 = 0.9409$) suggests that changes in trade share strongly predict changes in investment share. This close economic integration aligns with the Union State's objectives for a unified economic space [2, 13]. The significant trade share (49.0%) and its year-over-year increase (+1.1 percentage points) demonstrate growing economic ties [4]. However, this heavy dependence on Russia might pose risks for Belarus's economic diversification [10]. The strong correlation underscores the importance of coordinated economic policies within the Union State framework.

Table 5 – Correlation Analysis of Trade and Investment Shares

Metric	Value
Russia's share in Belarus's foreign trade (2021)	49.0%
Year-over-year change in trade share	+1.1 percentage points
Russia's share in Belarus's foreign investments	42.6%
Correlation coefficient (r)	0.97
Coefficient of determination (r^2)	0.9409

Metric	Value
Relationship strength	Very strong positive correlation

Note: compiled by authors based on the official and reputable sources

The challenges and barriers to forming a unified scientific and technological space between Russia and Belarus, as presented in Table 6, highlight the complex interplay of economic, regulatory, institutional, and cultural factors. The economic disparities, particularly in GDP growth and industrial production, may lead to uneven investment capabilities in R&D and difficulties in talent retention [8]. The regulatory challenges, exacerbated by Western sanctions, limit access to global markets and technologies, potentially isolating the scientific community [1, 2, 3, 5].

Table 6 – Challenges and Barriers to Forming a Unified Scientific and Technological Space Russia and Belarus

Category	Challenge/ Barrier	Description	Potential Impact
Economic	Economic Disparity	- GDP growth differences (Russia: 3.6%, Belarus: 3.9% in 2023) - Disparities in industrial production and wage structures	May lead to uneven investment capabilities in R&D and difficulties in talent retention
Regulatory	Sanctions and Trade Restrictions	- Western sanctions on Belarus affecting exports and foreign investment - Restrictions on Belarusian road carriers	Limits access to global markets and technologies, potentially isolating the scientific community
Institutional	Data Standardization	- Incomplete or non-comparable data sets between countries - Different currencies used (RUB for Russia, BYN for Belarus)	Hinders effective policy-making, progress evaluation, and seamless collaboration
Technological	Uneven Digital Development	- Significant growth in IT services in Russia (132.7% increase) - IT sector crisis in Belarus with potential exodus of talent	Creates imbalances in digital capabilities and human resources
Cultural	Brain Drain	- Up to 60,000 IT specialists may leave Belarus - Disparities in researcher compensation	Loss of skilled professionals may impede scientific and technological progress
Educational	Alignment of Education Systems	- Despite numerous agreements, differences in education systems persist - Uneven distribution of student exchanges	May create challenges in recognizing qualifications and integrating research methodologies
Innovation	Patent Activity Disparity	- Russia: 25,188 patent applications (rank 14th globally) - Belarus: 980 patent applications (rank 49th globally)	Indicates significant difference in innovation output, potentially complicating joint initiatives
Financial	Investment Imbalance	- Russia's share in Belarus's foreign investments: 42.6% - Belarusian dependence on Russian financial support	May create unequal partnership dynamics and limit Belarus's autonomy in decision-making

Category	Challenge/ Barrier	Description	Potential Impact
Infrastructure	Uneven Development	- Differences in industrial production and infrastructure development between countries	May lead to challenges in implementing joint technological projects
Geopolitical	International Isolation	- Western sanctions on Belarus - Alignment with Russia affecting relations with other countries	Limits opportunities for broader international scientific collaboration and knowledge exchange

Note: compiled by authors based on the official and reputable sources

The institutional barriers, such as data standardization issues, hinder effective policy-making and seamless collaboration [11]. The uneven digital development, with Russia experiencing significant growth in IT services while Belarus faces a potential exodus of talent, creates imbalances in digital capabilities and human resources [13].

The cultural challenge of brain drain, particularly in the IT sector, may impede scientific and technological progress [5, 20]. Educational disparities and differences in innovation output, as evidenced by the significant gap in patent applications, complicate joint initiatives [3, 6].

The financial imbalance, with Russia's dominant share in Belarus's foreign investments, may create unequal partnership dynamics [3, 10]. These multifaceted challenges underscore the need for a comprehensive and nuanced approach to integration, addressing both structural and socio-economic factors to achieve a truly unified scientific and technological space.

Table 7 illustrates the multifaceted role of digitalization in fostering integration and innovation within the Union State of Russia and Belarus. The focus on digital economy development and the significant growth in Russia's IT services (132.7% increase) indicate a strong push towards digital transformation (Popova, 2021). However, the IT sector crisis in Belarus, with a potential exodus of talent, highlights the need for coordinated IT sector development and talent retention strategies [12].

The emphasis on common data sharing platforms and the development of a Unified Digital Standards System demonstrate efforts to enhance interoperability and facilitate seamless information exchange [7]. This aligns with the Union State's goal of creating a unified scientific and technological space [5, 15]. The initiatives in digital education, such as the TikTok channel for university entrants, showcase innovative approaches to educational integration using digital platforms [5, 18, 25].

Table 7 – The Role of Digitalization in Integration Processes within the Union State of Russia and Belarus

Aspect	Data/Initiative	Implications for Integration and Innovation
Digital Economy Development	- Focus on digital economy development in Union State programs - 132.7% increase in software development in Russia (Jan-Aug 2024)	- Accelerates digital transformation across both countries - Creates opportunities for joint digital ventures and knowledge sharing
Common Data Sharing Platforms	Emphasis on common platforms for data sharing in Union State programs	- Facilitates seamless information exchange - Enhances collaborative research and development efforts
Digital Infrastructure	- Development of transport connections discussed in high-level meetings - Regulation of transport fees and mobile phone conditions on the agenda	- Improves digital connectivity between the two countries - Potentially leads to harmonized telecommunications regulations

Aspect	Data/Initiative	Implications for Integration and Innovation
IT Sector Growth	- Significant growth in IT services in Russia - IT sector crisis in Belarus with potential exodus of talent	- Highlights need for coordinated IT sector development - Opportunity for Russia to support Belarus in retaining IT talent
Digital Standards	Development of Unified Digital Standards System as a joint project	- Promotes interoperability between Russian and Belarusian digital systems - Facilitates smoother digital trade and cooperation
E-Government Initiatives	Synchronization of customs duties discussed in high-level meetings	- Potential for developing integrated e-government services for cross-border trade - Streamlines bureaucratic processes for businesses operating in both countries
Digital Innovation	Emphasis on research projects in AI and biotechnology in scientific collaborations	- Fosters joint innovation in cutting-edge digital technologies - Potential for creating a shared ecosystem for tech startups
Digital Education	- TikTok channel creation for university entrants - Videoconferences for educational cooperation	- Leverages digital platforms for educational integration - Enhances accessibility of cross-border educational opportunities
Digital Market Integration	92% of transactions in national currencies	- Indicates progress towards financial integration - Potential foundation for developing a common digital payment system
Patent Activity in Digital Sphere	- Russia: 25,188 patent applications (2022) - Belarus: 980 patent applications (2022)	- Highlights innovation potential in both countries - Opportunity for joint patent initiatives in digital technologies

Note: compiled by authors based on the official and reputable sources

The disparity in patent applications between Russia (25,188) and Belarus (980) underscores the potential for joint patent initiatives in digital technologies [24]. However, this also highlights the existing gaps in innovation output that need to be addressed for balanced integration.

While these digitalization efforts show promise, challenges remain. The need for harmonized telecommunications regulations and the development of integrated e-government services for cross-border trade indicate areas requiring further attention [23]. Additionally, the progress towards financial integration, with 92% of transactions in national currencies, provides a foundation for developing a common digital payment system, but also necessitates careful consideration of economic sovereignty issues [26].

The quantitative and qualitative analysis data obtained by the authors allowed us to propose a scheme for the phased process of implementing an experimental project to form a unified scientific and technological space in the digital age (Figure 1).

Discussion

The research reveals both opportunities and significant challenges in forming a unified scientific and technological space between Russia and Belarus within the Union State framework. While there are clear

strategic priorities and political will for integration, several factors are hindering progress.

A key finding is the disparity in innovation output and digital development between the two countries. As Beskaravaynaya and Kharybina (2022) note, Russia significantly outpaces Belarus in patent applications and innovation density. This asymmetry could lead to an unbalanced partnership, with Russia potentially dominating the direction of scientific and technological development. However, it also presents opportunities for knowledge transfer and capacity building in Belarus.

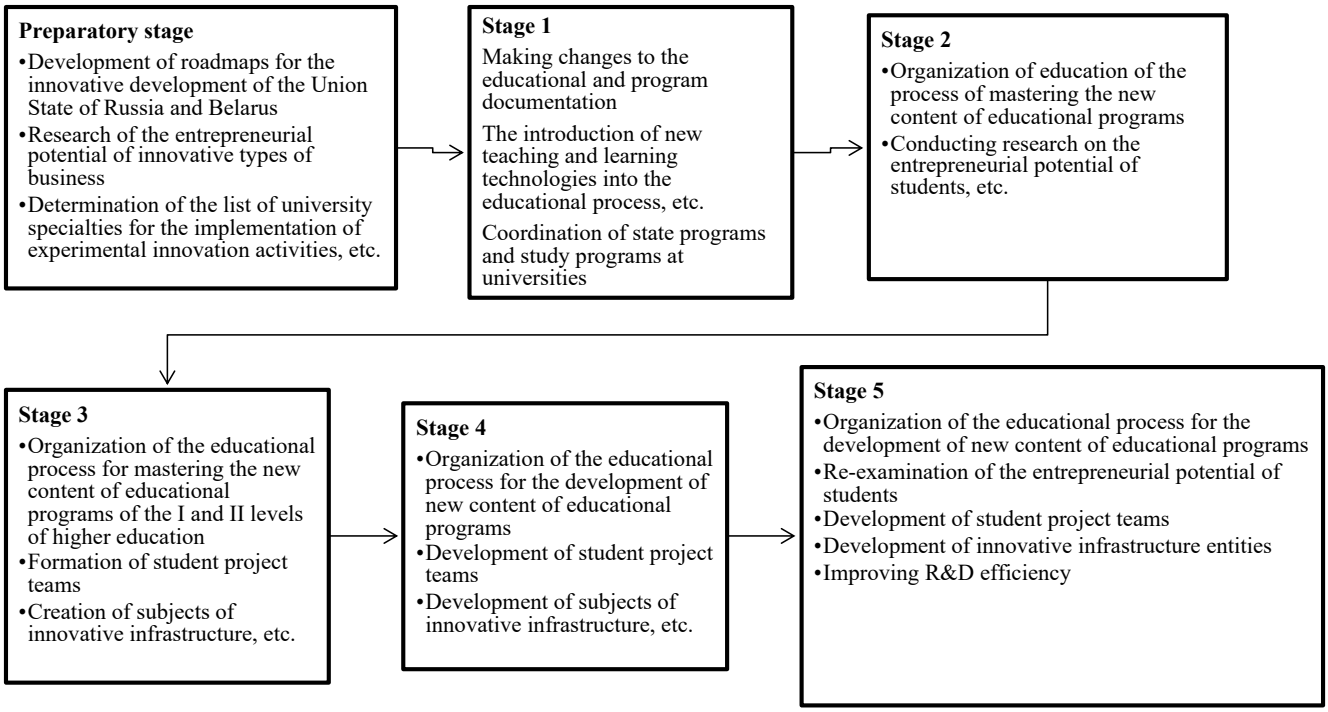

Figure 1 – Scheme for the phased process of implementing an experimental project to form a unified scientific and technological space in the digital age

Note: compiled by authors based on the source [3]

The digital divide between the two countries is another critical issue. Popova [17] highlights the challenges in implementing a unified digital agenda, including diverging levels of digitalization and regulatory frameworks. This disparity could impede the creation of a truly integrated digital market and hinder collaborative research efforts that rely on advanced digital infrastructure.

Political factors also play a crucial role. As Astratova [2] and Bakhlova et al. [4] argue, external pressures and sanctions have catalyzed integration efforts but also introduced instability to the motivations of internal actors. This volatility could complicate long-term planning and commitment to joint scientific and technological initiatives.

Furthermore, the research suggests that the integration process is hampered by institutional inertia and bureaucratic obstacles. Klimuk and Zelepukin [11] point out that the regulatory and legal support for scientific and educational cooperation lacks systemic expression and sufficient institutionalization. This inadequate institutional framework could slow down the implementation of joint projects and policies.

Economic and technological disparities between Russia and Belarus also pose challenges [5, 15]. As Dadalko [8] notes, while integration offers opportunities for optimizing human and material resources, the significant economic differences between the countries could lead to uneven development and potential tensions in resource allocation for scientific and technological projects.

Despite these challenges, the research also indicates potential benefits of integration. Joint programs in space research, IT, and digital development demonstrate a commitment to technological advancement [13]. The emphasis on research in cutting-edge fields like AI and biotechnology aligns with global scientific trends and could enhance the competitiveness of both countries.

Conclusion:

The formation of a unified scientific and technological space between Russia and Belarus within the Union State framework presents both significant opportunities and challenges. The research reveals a strong political commitment to integration, with joint initiatives spanning various sectors including space research, IT, and digital development. However, several key obstacles hinder the full realization of this vision.

The most prominent challenges include disparities in innovation output and digital development between the two countries, regulatory discrepancies, institutional inertia, and economic imbalances. The significant gap in patent applications and innovation density between Russia and Belarus points to an asymmetry that could lead to an unbalanced partnership. Additionally, external pressures such as sanctions have introduced instability to the integration process, complicating long-term planning and commitment.

Despite these challenges, the potential benefits of integration are substantial. Joint programs in cutting-edge fields like AI and biotechnology could enhance the competitiveness of both countries in the global arena. The focus on digital transformation and the development of common data sharing platforms also holds promise for fostering innovation and economic growth.

Recommendations:

1. Address innovation disparities: Develop targeted programs to boost Belarus's innovation capacity, focusing on knowledge transfer and joint research initiatives. The first steps in this direction are shown in Figure 1.
2. Harmonize regulatory frameworks: Prioritize the alignment of digital regulations and standards to facilitate seamless collaboration and data exchange.
3. Strengthen institutional support: Establish robust institutional mechanisms to oversee and facilitate scientific and technological cooperation, addressing the current lack of systemic expression in regulatory and legal support.
4. Promote balanced economic integration: Develop strategies to ensure equitable distribution of benefits from joint projects, addressing concerns about economic disparities and resource allocation.
5. Enhance digital infrastructure: Invest in shared digital infrastructure to bridge the digital divide between the two countries and support collaborative research efforts.
6. Foster talent retention: Implement joint programs to address brain drain, particularly in the IT sector, focusing on creating attractive opportunities for skilled professionals in both countries.
7. Expand cultural initiatives: Increase focus on cultural exchange programs to complement technological cooperation, fostering a more comprehensive integration process.

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State Management of Integration Processes in the Union State of Russia and Belarus: Forming a Unified Scientific and Technological Space in the Digital Era

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Abstract. This study examines the state management of integration processes in the Union State of Russia and Belarus, focusing on the formation of a unified scientific and technological space in the digital era. Despite extensive research on Russian-Belarusian integration, there remains a significant gap in understanding the specific challenges and opportunities presented by scientific and technological integration in the digital age. The research aims to identify key challenges, opportunities, and strategies for enhancing cooperation and innovation within this framework. Employing a mixed-methods approach, the study analyzes data from official statistics, policy documents, and expert opinions. Key findings reveal significant disparities in innovation output, with Russia outpacing Belarus in patent applications (25,188 vs. 980 in 2022) and innovation density (251.6% higher). The research also identifies a strong positive correlation (r = 0.97) between Russia's share in Belarus's foreign trade and investments, indicating deep economic ties. Challenges include economic disparities, regulatory inconsistencies, and uneven digital development. However, joint initiatives in space research, IT, and digital development demonstrate a commitment to integration, with a balanced distribution across sectors (28.6% each in digital/IT, medical/health, and education). Recommendations include addressing innovation disparities through targeted programs, harmonizing regulatory frameworks, and strengthening institutional support for collaboration. The study proposes a comprehensive strategy to leverage digitalization for integration, including developing common data sharing platforms and e-government services. This research contributes novel insights into the complexities of forming a unified scientific and technological space within a supranational entity, offering valuable guidance for policymakers and researchers in the field of international integration and innovation management.

Keywords: Russia; Belarus; Union State of Russia and Belarus; Union State; Russia-Belarus integration; scientific and technological cooperation; unified scientific and technological space; digital transformation; innovation disparities; state management