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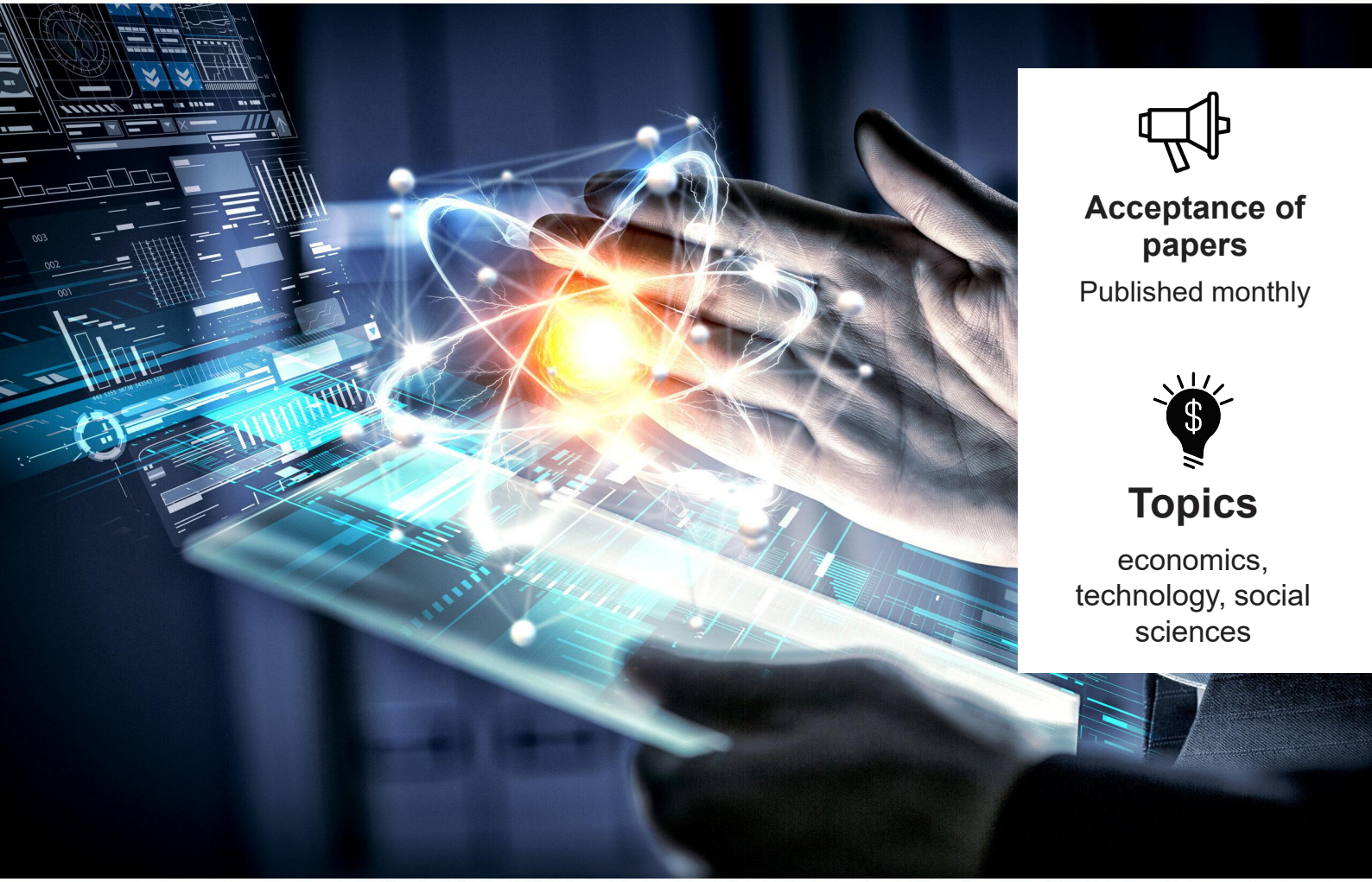

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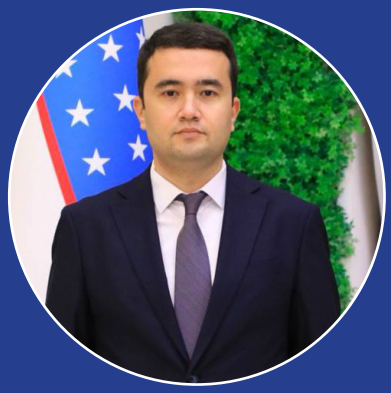

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CONTENTS

STATE SUPPORT IN THE REPUBLIC OF UZBEKISTAN FOR ORGANIZING SHORT-TERM SCIENTIFIC INTERNSHIPS OF YOUNG SCIENTISTS ABROAD

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Abstract: In recent years, the Republic of Uzbekistan has significantly expanded state support mechanisms aimed at developing human capital in science and innovation. One of the most important instruments of this policy is the organization of short-term scientific internships for young scientists in leading foreign research and educational institutions. This article analyzes the scope, institutional structure, and financial dynamics of state-supported short-term scientific internships abroad during 2018–2025, based on official registry data. The findings demonstrate a steady expansion in participation, diversification of host institutions, and increasing public investment, reflecting Uzbekistan's strategic priorities in science, technology, and international academic integration.

Key words: state support; short-term scientific internships; young scientists; human capital development; international scientific mobility; innovation policy; public investment; research capacity building; Uzbekistan.

Annotatsiya: So‘nggi yillarda O‘zbekiston Respublikasi ilm-fan va innovatsiyalar sohasida inson kapitalini rivojlantirishga qaratilgan davlat qo‘llab-quvvatlash mexanizmlarini sezilarli darajada kengaytirdi. Ushbu siyosatning eng muhim vositalaridan biri yosh olimlar uchun yetakchi xorijiy ilmiy va ta’lim muassasalarida qisqa muddatli ilmiy stajirovkalarni tashkil etish hisoblanadi. Mazkur maqolada 2018–2025 yillar davomida davlat tomonidan qo‘llab-quvvatlangan xorijiy qisqa muddatli ilmiy stajirovkalarning ko‘lami, institutsional tuzilmasi va moliyaviy dinamikasi rasmiy reyestr ma’lumotlari asosida tahlil qilinadi. Tadqiqot natijalari ishtirokchilar sonining barqaror o‘sishi, qabul qiluvchi muassasalarning diversifikatsiyasi hamda davlat investitsiyalarining ortib borayotganini ko‘rsatib, O‘zbekistonning ilm-fan, texnologiya va xalqaro akademik integratsiya sohasidagi strategik ustuvor yo‘nalishlarini aks ettiradi.

Kalit so‘zlar: davlat qo‘llab-quvvatlashi; qisqa muddatli ilmiy stajirovkalar; yosh olimlar; inson kapitalini rivojlantirish; xalqaro ilmiy mobillik; innovatsion siyosat; davlat investitsiyalari; ilmiy salohiyatni oshirish; O‘zbekiston.

Аннотация: В последние годы Республика Узбекистан значительно расширила механизмы государственной поддержки, направленные на развитие человеческого капитала в сфере науки и инноваций. Одним из важнейших инструментов данной политики является организация краткосрочных научных стажировок для молодых ученых в ведущих зарубежных научных и образовательных учреждениях. В статье на основе официальных реестровых данных анализируются масштабы, институциональная структура и финансовая динамика государственной поддержки краткосрочных научных стажировок за рубежом в 2018–2025 годах. Полученные результаты свидетельствуют о стабильном росте числа участников, диверсификации принимающих организаций и увеличении объемов государственных инвестиций, что отражает стратегические приоритеты Узбекистана в области науки, технологий и международной академической интеграции.

Ключевые слова: государственная поддержка; краткосрочные научные стажировки; молодые ученые; развитие человеческого капитала; международная научная мобильность; инновационная политика; государственные инвестиции; развитие научного потенциала; Узбекистан.

INTRODUCTION

The development of scientific potential is a key driver of sustainable economic growth and technological modernization. Recognizing this, the Republic of Uzbekistan has placed strong emphasis on supporting young scientists through targeted state programs. Among these measures, short-term scientific internships abroad play a particularly important role by enabling early-career researchers to acquire international experience, gain access to advanced research infrastructure, and establish global academic networks.

Since 2018–2025, the Government of Uzbekistan has systematically financed and coordinated short-term scientific internships through higher-level government bodies, line ministries, and state-owned enterprises. These initiatives are fully aligned with broader national reforms aimed at strengthening the innovation ecosystem and increasing the contribution of science to socio-economic development.

In this context, the Agency for Innovative Development under the Ministry of Higher Education, Science and Innovation has played a central coordinating role in organizing internship programs. During 2018–2025, approximately 63.74 billion soums were allocated from public funds, enabling more than 1,160 young scientists to undertake short-term scientific internships abroad (Annex 1). This sustained support demonstrates the government's long-term commitment to fostering human capital and international scientific integration.

Institutional Framework of State Support

State support for short-term scientific internships is implemented through a multi-level institutional framework that involves:

•Higher-level government organizations and sectoral agencies

•State-owned enterprises and large industrial holdings

•Research institutes and higher education institutions

Registry data for 2018–2025 indicate that internships were organized under the supervision of a wide range of higher-level institutions, highlighting the cross-sectoral nature of scientific and technological development in Uzbekistan. This institutional diversity enables young scientists from various fields—engineering, natural sciences, applied research, and industrial innovation—to participate in international mobility programs (Annex 2).

Such an inclusive framework ensures that internships are not limited solely to academic research but also support applied scientific activities, technology transfer, and innovation processes that are directly relevant to national industrial and economic priorities.

LITERATURE REVIEW

The role of state support in the development of scientific human capital has been widely examined in the international academic literature. Numerous studies emphasize that targeted public investment in scientific mobility and training is a critical determinant of national innovation capacity and long-term economic growth. In this context, short-term scientific internships abroad are increasingly viewed as an effective policy instrument for enhancing research quality, fostering knowledge transfer, and integrating national scientific systems into global research networks.

Classical human capital theory, as developed by Becker and later expanded by endogenous growth theorists, provides a theoretical foundation for understanding the economic rationale behind state-funded scientific training programs. According to this framework, investments in education, research skills, and international exposure generate positive externalities that extend beyond individual beneficiaries, contributing to productivity growth and technological advancement at the national level. Empirical studies confirm that countries with active support for international research mobility tend to demonstrate higher innovation performance and stronger research output.

A substantial body of empirical research focuses on international academic mobility as a mechanism for knowledge diffusion. Scholars such as Ackers and Teichler argue that short-term research stays enable young scientists to access advanced infrastructure, learn cutting-edge methodologies, and internalize international research standards without the risk of permanent brain drain. Unlike long-term migration, short-term internships are often associated with "brain circulation," whereby researchers return to their home countries equipped with new competencies and professional networks that enhance domestic research ecosystems.

Recent policy-oriented studies highlight the growing role of governments in institutionalizing scientific mobility through structured programs and dedicated funding schemes. In both developed and emerging economies, state-supported internships are commonly embedded within broader innovation and science policies aimed at strengthening national research systems. The literature indicates that such programs are most effective when they are aligned with national strategic priorities, supported by transparent selection mechanisms, and complemented by post-internship evaluation frameworks.

Research on science policy in transition and developing economies underscores the importance of international internships for overcoming structural constraints in domestic research environments. Limited access to modern laboratories, insufficient funding, and restricted international collaboration opportunities are frequently cited challenges. Short-term internships abroad are shown to mitigate these limitations by providing young scientists with temporary access to high-quality research environments, thereby accelerating capacity building and institutional learning upon their return.

Studies focusing on the financial dimension of scientific mobility emphasize that sustained public investment is a key prerequisite for program effectiveness. The literature suggests a positive correlation between the scale of state funding for research mobility and measurable outcomes such as publication activity, patenting, and participation in international research projects. Moreover, diversification of host institutions and destination countries is identified as a factor that enhances the breadth of knowledge transfer and reduces dependency on a limited set of academic partners.

Despite the generally positive assessment of short-term scientific internships, several scholars note persistent challenges highlighted in the literature. These include unequal access across regions and institutions, limited internship duration, and insufficient monitoring of long-term impacts. Consequently, recent studies advocate for more comprehensive evaluation models that combine quantitative indicators with qualitative assessments of career development and institutional spillover effects.

In the context of Uzbekistan, the existing literature remains relatively limited and is primarily focused on broader science and innovation reforms rather than detailed analysis of international scientific internships. Available studies acknowledge the government's increasing attention to human capital development and international cooperation in science, yet they often lack systematic empirical evaluation of internship programs. This gap underscores the relevance of the present study, which contributes to the literature by providing an evidence-based assessment of state-supported short-term scientific internships abroad during 2018–2025, with particular attention to institutional structures, participation dynamics, and financial mechanisms.

RESEARCH METHODOLOGY

This study examines state support for organizing short-term scientific internships of young scientists abroad in the Republic of Uzbekistan during 2018–2025. The research is based on official registry data provided by the Agency for Innovative Development under the Ministry of Higher Education, Science and Innovation.

A quantitative approach is applied to analyze participation dynamics, funding volumes, and institutional involvement using descriptive statistics and trend analysis. In addition, qualitative content analysis of regulatory and policy documents is conducted to assess the institutional framework and coordination mechanisms of state-supported internship programs.

The analytical framework is grounded in human capital theory and the concept of international scientific mobility, which views short-term internships as a mechanism for knowledge transfer and research capacity building. The study relies on aggregated and publicly available data, ensuring objectivity and compliance with ethical research standards.

ANALYSIS AND RESULTS

Dynamics of Participation (2018–2025)

An in-depth analysis of the available registry data reveals a clear and sustained upward trend in the participation of young scientists in short-term scientific internships abroad during the 2018–2025 period. This trend reflects the gradual institutionalization of international scientific mobility within Uzbekistan's national science and innovation policy framework.

In the initial years following 2018, participation levels increased steadily, indicating the expansion of state-funded mobility programs and the growing awareness among young researchers of international internship opportunities. This phase can be interpreted as a period of policy formation and capacity building, during which administrative mechanisms, selection procedures, and institutional coordination were progressively refined.

The observed temporary fluctuations in participation during certain years are largely associated with external and systemic factors rather than structural weaknesses of the program itself. Global mobility restrictions, disruptions in international travel, and internal organizational adjustments influenced the annual dynamics of participation. However, the subsequent recovery and renewed growth in later years demonstrate the resilience of the policy framework and confirm the continuity of government commitment to supporting scientific mobility.

Overall, the participation dynamics indicate that short-term scientific internships have transitioned from a pilot or ad hoc initiative into a stable and predictable instrument of Uzbekistan's science and innovation policy, contributing to the long-term development of national research capacity.

Financial Support and Public Investment

Financial support represents a foundational pillar of state-organized short-term scientific internships. According to official registry data, budgetary allocations for these programs increased significantly throughout 2018–2025, both in absolute monetary terms and in proportion to the number of participating young scientists. This growth in funding underscores the strategic prioritization of international scientific mobility within public expenditure on science and innovation.

Public financing for internships typically encompasses a comprehensive set of cost components, including international travel and accommodation, internship participation and training fees, as well as subsistence and living expenses during the internship period. Such comprehensive coverage reduces financial barriers for participants and ensures equal access to international research opportunities regardless of individual economic background.

The sustained expansion of funding reflects the government's recognition of short-term scientific internships as a long-term investment in national intellectual capital rather than a short-term budgetary expense. Furthermore, higher levels of financial support are frequently associated with internships conducted in technologically advanced countries and specialized research centers, where access to cutting-edge laboratories, equipment, and expertise entails higher costs. This funding pattern indicates a deliberate focus on maximizing the qualitative impact of internships by prioritizing high-value research environments (Annex 3).

Role of Short-Term Internships in Scientific Development

Short-term scientific internships abroad generate multifaceted benefits that extend beyond individual skill acquisition and contribute to the broader development of the national research system. One of the most significant outcomes is the strengthening of human capital, as young scientists acquire advanced research skills, modern methodologies, and hands-on experience in leading international laboratories and research institutions.

In addition, internships facilitate effective knowledge transfer by exposing participants to international best practices, research cultures, and standards of scientific excellence. Upon returning to their home institutions, young scientists are able to apply this knowledge to improve the quality, productivity, and international orientation of domestic research activities.

International networking constitutes another critical dimension of scientific internships. Through collaboration with foreign scientists, research centers, and higher education institutions, participants establish professional networks that often evolve into long-term partnerships, joint research projects, and co-authored publications. These networks enhance the global visibility and integration of Uzbekistan's scientific community.

Finally, the application of acquired knowledge supports innovation and commercialization processes. Skills and competencies gained during internships contribute to industrial modernization, technology adoption, and the practical application of research results within priority sectors of the national economy. Collectively, these effects reinforce national objectives related to innovation-driven growth, scientific competitiveness, and deeper integration into the global research ecosystem.

Challenges and Areas for Improvement

Despite the overall positive dynamics observed during 2018–2025, the analysis identifies several areas where further improvements could enhance the effectiveness and long-term impact of short-term scientific internship programs. One challenge concerns variations in participation levels across institutions and regions, suggesting the need for more balanced and inclusive access to international mobility opportunities.

Another limitation relates to the relatively short duration of internships, which may constrain opportunities for deeper research engagement, long-term experimental work, or full integration into host research teams. While short-term formats offer flexibility and cost efficiency, extending internship duration in selected priority fields could increase scientific returns.

Additionally, the current system would benefit from stronger post-internship monitoring and evaluation mechanisms. The absence of standardized indicators for tracking long-term outcomes—such as research outputs, career advancement, and institutional spillover effects—limits the ability to fully assess program effectiveness.

Addressing these challenges through targeted policy adjustments, enhanced evaluation frameworks, and closer alignment with national development priorities would further improve the efficiency of state support and ensure that short-term scientific internships generate measurable, sustainable, and high-impact research, innovation, and economic outcomes.

CONCLUSIONS AND RECOMMENDATIONS

The experience accumulated during 2018–2025 clearly demonstrates that state support for short-term scientific internships abroad has evolved into a stable, institutionalized, and progressively expanding

component of Uzbekistan's national science and innovation policy framework. The steady growth in the number of participating young scientists, the widening range of supervising institutions, and the consistent increase in public funding collectively underline the strategic role of international scientific mobility in strengthening national research capacity and human capital development.

Empirical evidence presented in the article indicates that short-term scientific internships contribute not only to individual professional development but also to broader systemic outcomes. These include the diffusion of advanced research methodologies, the enhancement of institutional research quality, and the formation of sustainable international academic partnerships. As a result, such internships serve as an effective mechanism for integrating Uzbekistan's scientific community into the global research environment while simultaneously supporting domestic innovation and technological modernization.

From a policy perspective, the observed trends confirm that public investment in international scientific mobility yields multidimensional returns, extending beyond immediate educational benefits to long-term scientific, technological, and socio-economic impacts. In this regard, short-term internships function as a catalyst for knowledge transfer, innovation-driven growth, and the commercialization of research outcomes aligned with national development priorities.

Looking forward, several recommendations can be formulated to further enhance the effectiveness and sustainability of state-supported internship programs. First, continued refinement of selection procedures based on transparent, merit-based, and field-specific criteria would ensure broader institutional and regional inclusiveness. Second, the introduction of systematic post-internship monitoring and impact evaluation mechanisms would enable policymakers to assess long-term research outputs, career trajectories, and institutional spillover effects more accurately. Third, closer alignment of internship destinations and research themes with national strategic sectors—such as digital technologies, green economy, industrial innovation, and applied sciences—would maximize the developmental impact of international mobility programs.

In addition, strengthening cooperation between government agencies, higher education institutions, research organizations, and industrial partners could further enhance the practical relevance of internships and facilitate the translation of acquired knowledge into tangible scientific and economic outcomes. Expanding co-financing models and international partnerships may also contribute to the diversification and long-term sustainability of funding sources.

In conclusion, short-term scientific internships abroad represent a highly effective policy instrument for advancing Uzbekistan's long-term scientific development and sustainable economic growth. With continued institutional support, strategic coordination, and evidence-based policy refinement, these programs are well positioned to play an increasingly significant role in shaping a competitive, innovation-driven national research system.

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