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CONTENTS

THE THEORETICAL FOUNDATIONS OF APPLYING TAX INCENTIVES FOR INVESTMENTS DIRECTED TOWARD HUMAN CAPITAL	14
Quliyev Begimqul Melikovich	
ECONOMETRIC MODELS OF CASHLESS SETTLEMENTS AMONG ECONOMIC ENTITIES.....	21
Ruzimuradov Shukhrat Khusanovich	
PROSPECTS FOR THE DEVELOPMENT OF TOURISM BRAND MARKETING IN MODERN CONDITIONS (UAE: DUBAI ON THE EXAMPLE OF A CITY).....	26
Ibodova Dilsora Ibodovna	
CREDIT DEFAULT SWAPS AS A WAY TO HEDGE AGAINST FORTHCOMING FUTURE UNCERTAINTIES IN THE DEBT MARKET OF UZBEKISTAN	31
Abduganiev Abdulaziz Alisher o'g'li	
SHOULD THE REGULATION OF THE E-COMMERCE MARKET IN THE REPUBLIC OF UZBEKISTAN BE CARRIED OUT BY THE NATIONAL AGENCY FOR PERSPECTIVE PROJECTS OR THE CENTRAL BANK?	39
Sadikov Aziz Mirsharapovich	
MECHANISM FOR IMPLEMENTING ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN THE OPERATIONS OF COMMERCIAL BANKS IN UZBEKISTAN.....	46
Bakhriddin Berdiyarov	
INNOVATIVE APPROACHES OF SMALL BUSINESSES IN THE INDUSTRY AND CONSTRUCTION SECTORS AND THEIR IMPACT ON EMPLOYMENT.....	53
Ergasheva Nigora Abdigapparovna	
AI-BASED NORMALIZATION METHODOLOGY FOR COLLECTING AND PROCESSING KPI INDICATORS.....	56
Shuhratov Mamurjon Shuhrat o'g'li	
REFORMS AND PROSPECTS FOR THE DEVELOPMENT OF THE PARTICIPATORY BUDGETING INITIATIVE IN UZBEKISTAN	63
Khamidov Khabibullo Hikmatulla ugli	
PROBLEMS OF THE INWARD PROCESSING CUSTOMS REGIME AND WAYS TO ELIMINATE THEM.....	70
Abdullaev Shakhzodbek	
FINANCIAL ANALYSIS OF SMALL BUSINESS AND PRIVATE ENTREPRENEURSHIP IN CONSTRUCTION	74
Musayeva Shoirazimovna	
MEASURES TO ENHANCE THE ROLE AND EFFECTIVENESS OF SMALL BUSINESS IN REGIONAL ECONOMIC DEVELOPMENT.....	80
Ergashev Jamshid Jamoliddinovich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS FOR IMPLEMENTING INNOVATIVE TECHNOLOGIES IN EDUCATION.....	84
Alijonova Marjonabonu Jaxongir qizi	
INDIA'S EXPERIENCE IN ENHANCING PUBLIC WELFARE THROUGH THE DEVELOPMENT OF ENTREPRENEURIAL ACTIVITY	88
Aripov Oybek Abdullayevich	
GREEN STRUCTURAL TRANSFORMATION IN UZBEKISTAN: GREEN FINANCE AND ECO-INNOVATION FOR SUSTAINABLE INDUSTRIAL AND AGRICULTURAL DEVELOPMENT.....	93
Egamberdiev Khumoyun	
AGRICULTURAL MANAGEMENT BASED ON INNOVATIVE TECHNOLOGIES AT THE INTERNATIONAL LEVEL: THE EXAMPLE OF UZBEKISTAN.....	101
Bustonov Komiljon Kumakovich	
ANALYSIS OF THE FINANCIAL CONDITION OF ENTERPRISES: ASSESSMENT OF EQUITY EFFICIENCY	110
Umurkul Shukhratovich Fayziev	

IMPROVING THE QUALITY OF ECONOMIC GROWTH THROUGH THE TRANSITION TO THE DIGITAL ECONOMY.....	118
Mamadaliyev Akmaljon	
МЕТОДЫ И МЕХАНИЗМЫ ИССЛЕДОВАНИЯ ПОТРЕБИТЕЛЬСКОГО ПОВЕДЕНИЯ НА ТУРИСТСКОМ РЫНКЕ.....	124
Нурматова Ситора Шавкатовна	
ANALYSIS OF INNOVATION ACTIVITIES.....	133
Alieva Elnara Ametovna	
METHODS AND MECHANISMS FOR STUDYING CONSUMER BEHAVIOR IN THE TOURISM MARKET.....	139
Nurmatova Sitora Shavkatovna	
ALGORITHMS AND METHODS FOR CALCULATING THE AREA OF A GASTRIC ULCER DEFECT USING MODERN MATHEMATICAL TECHNIQUES.....	145
Yusupov Ibrohimbek XXX, Abdusamatova Munira Sultonbek qizi	
UTILIZATION OF ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN ENTERPRISE MARKETING ACTIVITIES.....	151
Sadikov Shohrux Shukhratovich	
ENSURING THE FINANCIAL SUSTAINABILITY OF HIGHER EDUCATION INSTITUTIONS: STRATEGIC DIRECTIONS, GLOBAL TRENDS, AND POLICY IMPLICATIONS.....	156
Inomiddin Imomov	
THEORETICAL FOUNDATIONS OF THE STRUCTURE OF THE NATIONAL ECONOMY.....	161
Bustonov Mansurjon Mardonakulovich	
IMPORTANT CHARACTERISTICS OF THE DEVELOPMENT OF E-COMMERCE SERVICES.....	169
Jurakulov Shohruh Bahtiyorovich	
AGRICULTURE PROMOTION AND DEVELOPMENT IN MOUNTAIN AND MOUNTAIN REGIONS.....	173
Abdulxayeva Gulshan Maxmudovna	
IMPROVING MECHANISMS FOR ENHANCING ECONOMIC EFFICIENCY IN SERVICE ENTERPRISES.....	178
Seytimbetov Kabul Serimbetovich	
INTEGRATION OF INTELLIGENT CONTROL IN DRYING SYSTEMS: PROCESS OPTIMIZATION THROUGH SENSORS, ARTIFICIAL INTELLIGENCE, AND MODULAR DRYING.....	184
Yangiboyeva Raxbaroy Mashrabboy qizi	
THEORETICAL MODELS AND CONCEPTS OF ECONOMIC DEVELOPMENT IN THE ENERGY SECTOR.....	190
Nigmatullaeva Gulchekhra Nurullaevna	
STATISTICAL ANALYSIS OF REGIONAL ECONOMIC POTENTIAL (A CASE STUDY OF NAMANGAN REGION).....	196
Tursinbayev Azizbek Nabijon o'g'li, Sirojiddinov Kamoliddin Ikromiddinovich	
DIRECTIONS FOR DEVELOPING INVESTMENT AND EXPORT IN REMOTE SERVICE ENTERPRISES.....	203
Uzakov Ortik Shaymardanovich	
SPECIFIC FEATURES OF ENTREPRENEURSHIP IN INCREASING THE INCOME OF THE POPULATION IN THE REGION.....	207
Kuldasheva Maftuna Musurmon kizi	
KEY FACTORS OF ATTRACTING INVESTMENT THROUGH SUBSIDIES AND INVESTMENTS TO INCREASE AGRICULTURAL CROP PRODUCTION IN UZBEKISTAN.....	211
Mamatkulova Nadira Makkamovna	
RAQAMLI MARKETING VA INNOVATSION TEXNOLOGIYALAR ASOSIDA EKOTIZIM SAMARADORLIGINI OSHIRISH USULLARI.....	216
Sobirov Azizbek Avazbekovich	
WAYS TO IMPROVE THE STATISTICAL ASSESSMENT OF FRUIT AND VEGETABLE PRODUCTION PROCESSES AND EXPORT POTENTIAL IN THE REPUBLIC OF UZBEKISTAN.....	223
Anorboeva Bakhtijamol Daniyar kizi	

THE IMPACT OF DEGRADATION ON THE OPERATIONAL CHARACTERISTICS OF PHOTOVOLTAIC MODULES UNDER SHARPLY CONTINENTAL CLIMATIC CONDITIONS	229
Qurbanov Yunus Murtaza o'g'li	
INTEGRATED NEW MEDIA OPERATION MODEL FOR INTELLIGENT TALENT ASSESSMENT PLATFORMS: THE PATH OF QR CODE ACTIVATION AND CONTENT-DRIVEN ENGAGEMENT.....	235
Wang Biao	
METHODOLOGICAL FOUNDATIONS FOR SHAPING THE CREATIVE ACTIVITY OF YOUNGER PUPILS IN SOLVING MATHEMATICAL PROBLEMS	239
Dzhurakulova Adolat Khalmuratovna	
SOLIDWORKS-BASED MODELING OF AN AIR-BLOWING SYSTEM TO ENSURE HIGH-QUALITY FIBER REMOVAL FROM SAW TEETH	247
Mirzakarimov Mirsharoffiddin Mirzaabdurahimovich	
THEORETICAL STUDY OF TEMPERATURE AND THERMAL PHENOMENA IN MECHANICAL CUTTING OF WHITE CAST IRON.....	256
Allanazarov Akmal Abdulxaqovich	
THEORETICAL AND METHODOLOGICAL FOUNDATIONS OF SUSTAINABLE DEVELOPMENT OF THE REGIONAL ECONOMY	262
Turdiyev Ulug'bek Qayumovich	
THE INTERRELATIONSHIP BETWEEN MIGRATION AND THE INDUSTRIAL ECONOMY	266
Khusanbek Begmatov	
THE IMPACT OF ESG PRINCIPLES ON THE HOTEL INDUSTRY	271
Khusenova Mekhrangiz	
CURRENT STATUS OF INDUSTRIAL PRODUCTION AND SERVICES MARKET IN KASHKADARYA REGION.....	276
Norov Murodjon Makhmudovich	
DEVELOPMENT OF AN ARTIFICIAL INTELLIGENCE-BASED CYBERSECURITY SYSTEM FOR THE AUTOMATIC DETECTION OF FAKE FINANCIAL RECEIPTS, PHISHING URLS, AND MALICIOUS APK FILES	284
Shermatov Axlidin Sharobiddin o'g'li	
WAYS TO INCREASE REVENUES IN COMMERCIAL BANK OPERATIONS	287
Ostonaqulova Gulchehraxon Muhammadyoqub qizi	
РОЛЬ СВОБОДНЫХ ЭКОНОМИЧЕСКИХ ЗОН В РЕГИОНАЛЬНОМ РАЗВИТИИ И ЗАРУБЕЖНЫЙ ОПЫТ.....	301
Файзиева Ширин Шодмоновна	
RAQAMLI IQTISODIYOTGA O'TISH SHAROITIDA IQTISODIY O'SISH OMILLARINING TA'SIRINI BAHOLASH METODOLOGIYASI.....	307
Bustonov Mansurjon Mardonakulovich	
FINTECH TRENDS: NEW TOOLS FOR ATTRACTING FINANCING IN THE CONTEXT OF DIGITAL TRANSFORMATION	313
Madjitova Lolakhon Lazizovna	
CHALLENGES AND PROSPECTS FOR THE DEVELOPMENT OF E-COMMERCE IN UZBEKISTAN.....	317
Toshpulatov Akhror Tukhtamurod ugli	
STRATEGIC DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN UZBEKISTAN	326
Rustamov Foziljon	
TYPES AND MEANS OF ADVERTISING IN THE FIELD OF TOURISM	335
Bahriyeva Zarina Nasimovna	
INTELLECTUALIZATION OF TECHNICAL MEANS FOR CONTROLLING TECHNOLOGICAL REFINING PROCESSES.....	340
Ruziyev Umidjon Abdimajitovich	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS	349
Sherkulov Dilshod Jurakulovich	
YASHIL IQTISODIYOT VA MOLIYAVIY INKLYUZIYANING O'ZARO BOG'LIQLIK NAZARIYALARI.....	354
Adashaliyev Baxtiyorjon Valisher o'g'li	

THE IMPORTANCE OF THE AUDIT OF LEASING OPERATIONS ON FARMS OF THE REPUBLIC OF UZBEKISTAN	359
Tursunov Ulugbek Sativoldievich	
METHODOLOGY DEVELOPMENT RETAIL MARKETING AND TRADING SYSTEM.....	365
Makhmatkulov Golibjon Kholmuminovich	
NECESSITY OF ENSURING AND INCREASING THE COMPETITIVENESS OF PLACEMENT MEANS	369
Sherkulov Dilshod Jurakulovich	
ENVIRONMENTAL FISCAL POLICY AS A DRIVER OF GREEN GROWTH AND EMPLOYMENT IN CENTRAL ASIA: EMPIRICAL EVIDENCE	374
Rakhmatova Zilola Yurevna	
ON THE ISSUE OF CALCULATING THE POWER REQUIRED TO HEAT THE EDGES OF THE PIPE BILLET TO THE WELDING TEMPERATURE.....	379
Zairkulov Elyor Yoqubjon o'g'li	
STATISTICAL ASSESSMENT OF REGIONAL ELECTRICITY GENERATION VOLUMES.....	385
Doliev Shokhabbos Kulmurat ugli	
ANALYSIS OF ICT APPLICATION IN UZBEKISTAN'S TOURISM BASED ON EMPIRICAL RESEARCH.....	389
Nazarov Khusanbek Avazbek ogli	
METHODOLOGY FOR FORECASTING AND ANALYZING MANAGEMENT ACCOUNTING INDICATORS AT AN ENTERPRISE.....	395
Minutdinova Liliya Tagirovna	
WELLNESS TOURISM AS AN ESSENTIAL COMPONENT OF HEALTH TOURISM.....	402
Tashtayeva Saida Kahharovna	
THE EXPERIENCE OF GERMANY IN DEVELOPING SMALL AND MEDIUM ENTERPRISES.....	409
Annaklichev Saxi Saparmuxamedovich	
ANALYSIS OF THE APPLICATION OF THE INTERNATIONAL STANDARD ON AUDITING "ANALYTICAL PROCEDURES" IN NATIONAL AUDIT ACTIVITIES	416
Tajekeev Ziyatdin Kobeyzinovich	
ORGANIZATIONAL AND ECONOMIC FOUNDATIONS OF GREEN ENTERPRISE DEVELOPMENT IN ENSURING REGIONAL ENVIRONMENTAL SAFETY	421
Khamidillo Odilov	
A REALIST-POSITIVIST FRAMEWORK FOR ANALYSING MERGERS AND ACQUISITIONS UNDER ECONOMIC POLICY UNCERTAINTY	429
Zakhidov Azizbek Rustamovich	
DEVELOPING MATHEMATICAL MODELS TO SIMULATE THE DYNAMIC BEHAVIOR OF SEPARATION PROCESSES, CONSIDERING THE IMPACT OF EXTERNAL FACTORS	436
Abdulleva Kamola Rustamovna	
THEORETICAL FOUNDATIONS OF IMPLEMENTING DIGITAL TECHNOLOGIES IN THE TRANSFORMATION OF BANKS.....	445
Umarova Malika Baxtiyarovna	
ON THE ISSUE OF RESEARCH AND DEVELOPMENT OF A SLAG-FORMING BASE FOR ELECTRODE COATINGS FOR WEAR-RESISTANT SURFACING.....	451
Sadikov Jaxongir Nasidjanovich	
MODELING OF HEAT FLOWS IN GAS-FIRED CHAMBER FURNACES.....	456
Rajabov Azamat Toirovich	
DEVELOPMENT OF A MIMO MODEL OF AZEOTROPIC DISTILLATION	462
Shamsutdinova Vinera Khafizovna	
THEORETICAL FOUNDATIONS OF THE INTERACTION OF A COTTON TUFT WITH A SCREW CONVEYOR AND A MESH SURFACE.....	468
Matyaqubova Jumagul Bakhtiyarovna	
FORECASTING LIQUIDITY AND SOLVENCY INDICATORS BASED ON ARTIFICIAL INTELLIGENCE	473
Zaynutdinov Ismoil Samariddin o'g'li	
MODELS FOR PREDICTING THE MANAGEMENT OF COMPLEX TECHNOLOGICAL PROCESSES AND PRODUCTIONS	477
Gulyamov Shukhrat Mannapovich	

WAYS TO ADJUST LAND RESOURCE USE MECHANISMS FOR FARMERS BASED ON THE EXPERIENCE OF FOREIGN COUNTRIES.....	482
Akhmatov Abutolibkhon Ochilkhon oglu	
STATE SUPPORT MECHANISMS FOR THE DEVELOPMENT OF THE MACHINE-BUILDING INDUSTRY	487
Xursandov Komiljon Makhmatkulovich	
EMPIRICAL ANALYSIS OF TOURISM FLOW FORECASTING IN CENTRAL ASIA BASED REGRESSION MODELS	491
Suratova Mokhirakhon Shavkat Kizi	
THE ROLE OF LOANS IN THE DEVELOPMENT OF THE REGIONAL ECONOMY.....	498
Meylikov Fazliddin Abduhalim o'g'li, Valiev Oybek Shukhrat ugli	
PROPAGATION OF SMALL MOTIONS IN A TWO-LAYER DISPERSE MEDIA FLOW.....	503
D. S. Yakhshibaev	
FURTHER IMPROVEMENT OF THE AUTOMATION SYSTEM OF ELECTRONIC SERVICES AND TOURIST PERMITS.....	511
Najmiddinov Sultan Nurali ugli	
THE NECESSITY OF DISCLOSING INFORMATION ON SELLING EXPENSES IN ACCOUNTING REPORTS OF PHARMACEUTICAL ENTERPRISES.....	516
Xudaynazarova Dilnoza Gafurovna	
INVESTMENT FINANCIAL MECHANISMS AND THEIR ROLE IN THE NATIONAL ECONOMY	521
Karjavova Khurshida Abdumalikovna	
WESTERN COUNTRIES' EXPERIENCES IN ENSURING THE FINANCIAL PERFORMANCE OF BANKING ACTIVITIES.....	526
Alimjanova Dilrabo Sobirjanovna	
MAIN FEATURES OF DIVIDEND POLICY IN COMMERCIAL BANKS.....	530
Aliyev G'ulomnozir Maxamatjonovich	
OPTIMIZATION OF THE DESIGN OF AN ENERGY- AND RESOURCE-EFFICIENT PRESSING DEVICE FOR CONVERTING DRIED LEAVES, FALLEN FOLIAGE, AND PLANT RESIDUES INTO LOCALLY PRODUCED ORGANIC FERTILIZERS.....	536
Toirova Nuriya Abdiyevna, Toirov Murtoza Shavkidinovich, Urinova Xulkar Shokirovna	
FUNDAMENTALS OF FORMING ACCOUNTING POLICIES FOR LEASING COMPANIES BASED ON INTERNATIONAL FINANCIAL REPORTING STANDARDS	540
Baxadirov Alisher Komilovich	
THE USE OF DUE DILIGENCE PROCEDURES TO ENSURE TRANSPARENCY OF FINANCIAL REPORTING IN JOINT-STOCK COMPANIES	545
Prokudina Kristina Aleksandrovna	
INTERNATIONAL EXPERIENCE: EXAMPLES OF HISTORICAL CITIES (FLORENCE, LVIV, GRANADA, AND OTHERS)	550
Radjabova Mavluda Ergash qizi	
APPLYING LINEAR PROGRAMMING TO ANALYZE THE STATE OF COMMODITY AND RAW MATERIAL RESOURCES IN INDUSTRIAL ENTERPRISES	554
Beknazarov Farxod Abduvaxidovich, Usmanov Shakhzod Shokhrukhovich	
INTEGRATED EDUCATION MODEL IN TEACHING WATER-SAVING IRRIGATION TECHNOLOGIES.....	561
Shokhimardanova Niginabonu Shavkatovna	
IMPACT OF INFLATIONARY PROCESSES ON PROBLEM LOANS.....	566
Tojiyev Sardor Dilmurod ugli	
DIRECTIONS FOR ORGANIZING EFFECTIVE MANAGEMENT IN GRAIN PRODUCT ENTERPRISES.....	572
Kurbanova Dildora Abduraxmanovna	
THE OIL AND GAS INDUSTRY AS A BACKBONE SECTOR OF UZBEKISTAN'S ECONOMY	576
Salomova Sarvinoz Salimovna	
BEHIND THE BENCH: THE CURRENT SITUATION OF PURCHASING LABORATORY EQUIPMENT IN UZBEKISTAN	581
Kabashev Tairjon	

BEHIND THE BENCH: THE CURRENT SITUATION OF PURCHASING LABORATORY EQUIPMENT IN UZBEKISTAN



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Abstract: This article analyzes the current state of laboratory equipment procurement in Uzbekistan during the period 2018–2025. The study examines procurement volumes across research institutions and higher education organizations, institutional distribution patterns, funding mechanisms, and key challenges affecting procurement efficiency. Particular attention is given to the relationship between laboratory infrastructure development and national research and development (R&D) expenditure, as well as its positive impact on students and early-career researchers. The findings highlight the growing role of laboratory modernization in strengthening research capacity, improving educational quality, and supporting innovation-driven development in Uzbekistan.

Key words: laboratory equipment; scientific research; public procurement; innovation; Uzbekistan; R&D; research infrastructure.

Annotatsiya: Mazkur maqolada 2018–2025-yillar davomida O‘zbekistonda laboratoriya jihozlari xarid qilish holati tahlil qilinadi. Tadqiqotda ilmiy-tadqiqot muassasalari va oliy ta’lim tashkilotlarida amalga oshirilgan xaridlar hajmi, institutsional taqsimot xususiyatlari, moliyalashtirish mexanizmlari hamda xarid jarayonida yuzaga keladigan asosiy muammolar o‘rganilgan. Shuningdek, laboratoriya infratuzilmasini rivojlantirish, ilmiy-tadqiqot va tajriba-konstruktorlik ishlari (R&D) xarajatlari hamda ularning talabalar va yosh tadqiqotchilar faoliyatiga ijobiy ta’siri tahlil qilinadi. Tadqiqot natijalari ilmiy infratuzilmani modernizatsiya qilish mamlakatda ilm-fan salohiyatini oshirishda muhim omil ekanini ko‘rsatadi.

Kalit so‘zlar: laboratoriya jihozlari; ilmiy tadqiqotlar; davlat xaridlari; innovatsiyalar; O‘zbekiston; R&D; ilmiy infratuzilma.

Аннотация: В статье анализируется текущее состояние закупок лабораторного оборудования в Узбекистане за период 2018–2025-гг. Исследование охватывает объемы закупок в научно-исследовательских организациях и учреждениях высшего образования, особенности институционального распределения, механизмы финансирования, а также ключевые факторы, влияющие на эффективность закупочных процессов. Особое внимание уделяется взаимосвязи развития лабораторной инфраструктуры с национальными расходами на научно-исследовательские и опытно-конструкторские работы (R&D), а также их положительному влиянию на студентов и молодых ученых. Полученные результаты подтверждают значимость модернизации лабораторной базы для укрепления научного потенциала и инновационного развития страны.

Ключевые слова: лабораторное оборудование; научные исследования; государственные закупки; инновации; Узбекистан; R&D; научная инфраструктура.

INTRODUCTION

Over the past decade, Uzbekistan has pursued a consistent and ambitious strategy aimed at strengthening its scientific and innovation capacity. Recognizing science and technology as key drivers of sustainable

economic growth, the government has implemented comprehensive reforms focused on modernizing research institutions, expanding the higher education system, and fostering an innovation-oriented environment. Within this transformation, the procurement of modern laboratory equipment has emerged as a strategically important component supporting the development of scientific infrastructure.

Laboratory equipment plays a vital role in ensuring high-quality research, enhancing practical training for students, and facilitating the integration of national science into global knowledge networks. This article examines the current state of laboratory equipment procurement in Uzbekistan, with particular emphasis on trends observed during the 2018–2025 period, institutional distribution patterns, and the broader context of science development in relation to gross domestic product (GDP).

LITERATURE REVIEW

Previous studies consistently emphasize that a well-developed research infrastructure—particularly the availability of modern laboratory equipment—constitutes a fundamental foundation for scientific productivity and innovation. According to UNESCO (2021), limited investment in research infrastructure can constrain the capacity of developing countries to achieve high-quality scientific output and fully integrate into global knowledge systems. Similarly, OECD (2020) underscores that effective procurement, operation, and maintenance of research equipment are essential components of national innovation systems, as they directly enhance research efficiency, interdisciplinary collaboration, and technology transfer. Collectively, these findings demonstrate a strong and positive relationship between laboratory infrastructure development, research quality, and long-term economic competitiveness.

Within the context of higher education and research capacity building, World Bank analyses (Salmi, 2019; World Bank, 2022) highlight that access to modern laboratory facilities is a key determinant in the establishment of internationally competitive research universities and in the professional development of young researchers. Furthermore, Mazzucato (2018) argues that strategic public investment in scientific infrastructure enables mission-oriented innovation and supports sustainable economic development. National reports from Uzbekistan's Ministry of Higher Education, Science and Innovations (2024) likewise identify laboratory modernization as a strategic priority, emphasizing its role in strengthening research capacity while promoting more efficient and inclusive utilization of financial, regional, and human capital resources.

RESEARCH METHODOLOGY

This study adopts a descriptive and analytical research approach to examine the current state of laboratory equipment procurement in Uzbekistan during the 2018–2025 period. The analysis is based on secondary data obtained from official national procurement records, reports published by the Agency of Innovative Development, and publicly available statistics on research and development (R&D) financing. Quantitative methods are employed to evaluate procurement volumes, financial values, and the institutional distribution of laboratory equipment across research organizations and higher education institutions.

In addition, qualitative analysis is applied to identify structural and systemic factors influencing procurement effectiveness, including budget planning frameworks, administrative procedures, and human capital capacity. Comparative indicators—such as R&D expenditure as a share of gross domestic product (GDP)—are used to contextualize laboratory equipment investment within broader national science and innovation policy trends. The integration of quantitative and qualitative methods provides a comprehensive and robust assessment of procurement practices and their significance for the sustainable development of the national research system.

ANALYS AND RESULTS

The Role of Laboratory Equipment in Scientific Development

Modern laboratories provide essential conditions for experimentation, data collection, and technological innovation across a wide range of disciplines, including medicine, chemistry, physics, environmental science, and engineering. Access to contemporary scientific instruments enhances the relevance, accuracy, and applicability of research outcomes, thereby supporting both academic advancement and practical implementation. Well-equipped laboratories contribute to maintaining research quality and ensuring alignment with international scientific standards.

For students, access to laboratory facilities is equally important. Hands-on experimentation reinforces theoretical knowledge, develops practical skills, and prepares graduates for professional and research-oriented careers. Consequently, sustained investment in laboratory equipment plays a direct role in improving human capital quality and strengthening long-term economic competitiveness.

Why Laboratory Equipment Matters

Laboratory equipment extends far beyond basic experimental tools. Advanced scientific instruments—such as high-precision spectrometers, polymerase chain reaction (PCR) systems, electron microscopes, and chemical analyzers—enable researchers to conduct in-depth analysis, generate new knowledge, and drive innovation. These technologies are indispensable for progress in health sciences, environmental monitoring, industrial development, agriculture, and advanced materials research.

In an increasingly innovation-driven global economy, the capacity of a country's scientific infrastructure significantly influences its competitive position. Modern laboratory facilities support not only fundamental research but also applied studies, product development, and effective participation in international scientific networks.

Overview of Laboratory Equipment Procurement (2018–2025)

During the 2018–2025 period, Uzbekistan substantially expanded the procurement of laboratory equipment across universities, research centers, and innovation-oriented institutions. According to consolidated national procurement data, more than 556 types of scientific laboratory equipment were acquired by the Agency of Innovative Development under the Ministry of Higher Education, Science and Innovations, utilizing resources from the Fund for Financing Science and Innovation Support. This expansion reflects a systematic effort to strengthen research infrastructure and enhance the overall capacity of the national scientific system (Table 1).

Table 1. Summary of Laboratory Equipment Procurement in Uzbekistan (2018–2025)

Indicator	Value
Total number of institutions involved	47
Total laboratory equipment units purchased	785
Total value of equipment (million soums)	357,979.0
Total value of equipment (thousand USD)	33,396.3

Interpretation

The data indicate a substantial level of investment in laboratory infrastructure. When considered across multiple years and institutions, these investments reflect a steady and systematic process of modernization, contributing to the gradual strengthening of research capacity. High-cost scientific instruments are primarily concentrated in research-intensive organizations, where they support advanced studies and act as shared resources for broader scientific communities.

Institutional Distribution of Procurement

The procurement of laboratory equipment in Uzbekistan demonstrates a differentiated institutional distribution. Major universities and specialized research centers account for a significant share of both the volume and value of acquired equipment, reflecting their central role in national research and innovation activities. At the same time, regional institutions are increasingly being integrated into the national research infrastructure through targeted investments, which contributes to more balanced development and expanded access to modern laboratory facilities (Table 2 and Table 3).

Table 2. Selected Institutions with High Laboratory Equipment Procurement

Institution	Equipment Types	Quantity	Value (million soums)
Center for Genomics and Bioinformatics	18	20	15,237.8
Center for Advanced Technologies	3	3	15,020.0
Tashkent Institute of Chemical Technologies	1	1	13,265.2
Uzbek-Japanese Innovation Youth Center	10	10	5,140.4

Table 3. Selected Superior organizations with High Laboratory Equipment Procurement

Superior organization	Equipment Types	Quantity	Value (million soums)
Academy of Sciences	305	493	242,680.33
Ministry of Higher Education, Science and Innovation	95	136	63,963.04
Committee on Ecology and Climate Change	31	31	13,675.96

Interpretation

These institutions primarily specialize in biotechnology, applied chemistry, and innovation-oriented research fields that require high-cost, high-precision laboratory equipment. The observed procurement levels reflect a deliberate and strategic prioritization of resource allocation, aimed at supporting advanced research areas with the greatest potential for scientific and technological impact, rather than indicating systemic imbalance.

Procurement Mechanisms and Challenges

1. Dependence on Imported Equipment

The majority of advanced laboratory instruments used in Uzbekistan are sourced from Europe, the United States, China, Japan, and South Korea. This approach ensures access to internationally recognized technologies and high-quality equipment. At the same time, it involves additional costs related to transportation, customs procedures, and specialized maintenance services. After-sales support and calibration frequently require the involvement of foreign experts, underscoring the importance of developing complementary local service capacities.

2. Budgetary and Administrative Frameworks

Laboratory equipment procurement is generally carried out through centralized or public procurement mechanisms. While these procedures enhance transparency and accountability, they may require extended timeframes due to compliance with budget cycles, technical specifications, and regulatory standards. Ongoing efforts to improve procedural efficiency are expected to further align procurement processes with the evolving needs of scientific research.

3. Human Capital and Utilization Capacity

The acquisition of advanced laboratory equipment represents a significant step toward strengthening research infrastructure; however, its effective utilization depends on the availability of adequately trained technical personnel and researchers. Continued investment in capacity-building, professional training, and the provision of necessary consumables is essential to maximize the scientific return on equipment investments (Table 4).

Table 4. Science Development Indicators in Uzbekistan

Indicator	Value
R&D expenditure (% of GDP, 2023)	0.13 %
Total R&D expenditure (2024)	1.57 trillion soums
Estimated share of laboratory equipment in R&D	22–25 %

The analysis indicates that, although laboratory equipment procurement in Uzbekistan has increased, its overall scale remains influenced by the relatively low intensity of national research and development (R&D) investment. In comparison with countries allocating approximately 2–4 % of GDP to scientific research, Uzbekistan's research infrastructure development is at an early stage of structural expansion. Nevertheless, the observed dynamics suggest a foundation for future growth, particularly through gradual increases in targeted investment and institutional capacity.

Access to modern laboratory facilities plays a decisive role in shaping educational and research outcomes for students and early-career researchers. In fields such as natural sciences and engineering, limited availability of advanced equipment can constrain practical training and reduce opportunities for hands-on experimentation. At the same time, ongoing efforts to improve laboratory access and regional distribution are contributing to enhanced learning environments. For young researchers, access to modern instrumentation is increasingly recognized as a prerequisite for international publication and participation in global research projects, reinforcing the importance of continued infrastructure development.

Despite existing constraints, recent years have demonstrated several positive and encouraging trends. Since 2020–2021, the value of laboratory equipment procurement has shown steady growth, accompanied by the expansion of innovation centers and shared laboratory facilities. Increased international cooperation and donor-supported initiatives have further strengthened research capacity, while a strategic focus on biotechnology, materials science, and applied research has enhanced alignment with national development priorities. Collectively, these developments indicate a gradual transition from fragmented procurement practices toward more coordinated and strategic planning of research infrastructure.

CONCLUSION AND RECOMMENDATIONS

Between 2018–2025, Uzbekistan achieved measurable progress in modernizing its laboratory infrastructure, investing nearly 358 billion soums in scientific equipment across a broad range of research

and higher education institutions. This progress reflects an increasing recognition of science as a national development priority and demonstrates a growing commitment to strengthening research capacity. At the same time, the scale of procurement continues to be shaped by broader structural conditions, including the overall level of research and development (R&D) investment relative to gross domestic product (GDP), institutional differentiation, and the availability of skilled human capital.

To further integrate science into the country's long-term economic development strategy, future efforts should prioritize increasing R&D intensity, expanding equitable regional access to modern laboratory facilities, and enhancing the effective utilization of existing equipment. Strengthening laboratory infrastructure should be viewed not merely as a technical undertaking but as a strategic investment in Uzbekistan's intellectual capital and innovation potential.

In order to enhance the effectiveness and sustainability of laboratory equipment procurement, it is recommended to increase national R&D expenditure and allocate a larger share specifically to research infrastructure. The establishment of shared laboratories and regional research centers would improve access for universities and early-career researchers, while greater procedural flexibility in procurement mechanisms would allow for a more responsive alignment with scientific needs. Finally, systematic training programs for technical personnel and researchers are essential to ensure efficient utilization and long-term sustainability of laboratory investments.

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