

Strategic Management of International Cooperation in a Transport Higher Education Institution: From Activity Indicators to Outcome Indicators (The Case of Tashkent State Transport University, 2020–2025)

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ABSTRACT

Objective: This article analyzes the international cooperation indicators of Tashkent State Transport University (TSTU) for 2020–2025 in the context of internationalization theory and Uzbekistan's national higher education reforms. **Method:** Using the university's internal data, a national policy document, and international scholarly sources. **Results:** The study finds a strong quantitative expansion: international agreements grew from 9 to 257, foreign centers and laboratories from none to more than 15, staff trained abroad from 28 to 180 per year, and grants and investments from USD 1.7 million to USD 10.8 million. However, most reported indicators describe inputs and activities; outcome indicators such as graduate employment, employer assessment, and laboratory utilization are not systematically tracked. The study is limited by its reliance on unaudited institutional data and the absence of employer and graduate survey data, which are identified as priorities for further research. **Novelty:** Drawing on the Balanced Scorecard, the Triple Helix model and the PDCA cycle, the paper proposes a four-perspective strategic management model for international cooperation in transport universities, informed by the Luban Workshop experience and Uzbekistan's transnational education policy.

INTRODUCTION

The concept of internationalization of higher education has become one of the central issues in university management over the past three decades. Jane Knight defines it as the process of integrating an international, intercultural, or global dimension into the purpose, functions, and delivery of education at the national, sectoral, and institutional levels [1]. According to Knight, the national and sectoral levels influence internationalization through policies, funding, programs, and regulation, whereas the process itself often takes place primarily at the institutional level. Knight further emphasizes that the definition of internationalization itself shapes policy development [2]. In other words, how a university understands international activities determines how it manages them.

Altbach and Knight distinguish globalization from internationalization. Globalization represents the broader context of economic and academic trends, whereas internationalization refers to the policies and practices adopted by systems and institutions to respond to this context. They identify commercial interests, the acquisition of knowledge and languages, and the enrichment of curricula with international content among the major motivations, while initiatives include branch campuses, cross-border cooperation, international student programs, and English-medium programs [3]. De Wit

and Altbach argue that internationalization has evolved over the past half-century from activities conducted abroad into a central component of higher education reform agendas. At the same time, de Wit notes that there is no single model of internationalization applicable to all institutions and that, in practice, tendencies toward competition and marketization have become prominent. The field of internationalization studies began to take shape in the mid-1990s and subsequently developed into a distinct area of research [4]. Therefore, evaluating a university's international activities solely in terms of their scale—such as the number of agreements, programs, or revenues—is insufficient; it is also necessary to measure how these activities are translated into educational and research outcomes.

In Uzbekistan, this process constitutes part of national higher education policy. The Concept for the Development of the Higher Education System of the Republic of Uzbekistan until 2030, approved by Presidential Decree No. PF-5847 of October 8, 2019, envisages a gradual transition to a credit-module system, a shift from theoretical knowledge toward practice-oriented skills, greater academic autonomy of higher education institutions, the “University 3.0” concept, and the inclusion of at least 10 universities among the top 1,000 institutions in international rankings [5]. As a result, higher education enrollment increased from 9% in 2016 to 42% in 2023 while the number of higher education institutions increased from 77 to 210, of which 97 are private or foreign universities. Beginning in 2017, incentives such as grants, tax benefits, guarantees for compensation of losses, and the provision of buildings and land were offered to foreign universities, and 23 foreign institutions established campuses in the country during 2018–2022. The number of foreign university branch campuses increased from 7 in 2016 to 22 by mid-2020 and to 30 by early 2024. The total number of transnational higher education institutions reached 38, placing Uzbekistan third in the world, after China and the United Arab Emirates, in terms of the number of international branch campuses [6]. Joint educational programs with foreign universities have also become a distinct area of research. The number of international students in the country reached 12,500 at the beginning of the 2024/2025 academic year, representing an almost eighteen-fold increase over the preceding decade.

Against this background of expansion, transport higher education institutions occupy a distinctive position [7]. They train specialists for rapidly evolving fields such as digital and intelligent logistics, green transport, and hydrogen technologies. Consequently, international laboratories, joint programs, and international practical experience constitute direct factors influencing the quality of education in these institutions. However, the reviewed literature has focused primarily on national policy, foreign branch campuses, and general joint programs. The strategic management of international cooperation at the institutional level in a state university specializing in a specific sector has received comparatively less attention. This study seeks to address this research gap [8].

Research objective: To assess the international cooperation indicators of Tashkent State Transport University (TSTU) during 2020–2025 in comparison with the theory of internationalization and the national context, and to develop a strategic management model for international cooperation [9].

Research questions:

1. What quantitative changes occurred in TSTU's international activities during 2020–2025?
2. At which levels – resources, activities, or outcomes – do the existing indicators operate, and which levels are insufficiently represented?
3. What management mechanisms are required to transform the outcomes of international cooperation into sustainable quality indicators?

Research hypotheses:

H1. The majority of TSTU's international cooperation indicators relate to the resource and activity levels.

H2. International cooperation is not sufficiently linked to outcome indicators within the strategic management system.

The article is structured as follows: Section II presents the methods and data; Section III presents the results; Section IV discusses the findings and proposes a strategic management model; and Section V presents the conclusions [10].

RESEARCH METHOD

Research Design

The study employs an instrumental case study of a single institution, TSTU, and applies dynamic and comparative analysis, growth-rate calculations, indicator classification, and content analysis. The analysis covers the period from 2020 to 2025.

Data Sources

Primary data. Internal TSTU data related to international cooperation, including agreements and memoranda, joint programs, revenues, grants and investments, international centers and laboratories, staff professional development, academic mobility, international faculty members, and international students. The data were provided by the university and were not independently audited.

Secondary data. The analysis draws on national regulatory documents international scholarly publications analytical materials on higher education in Uzbekistan and publicly available sources on China's "Lu Ban Workshops".

Theoretical Framework

The analysis is based on three approaches.

1. **Internationalization as a process.** According to Knight's definition, internationalization is the process of integrating an international dimension into the purpose, functions, and delivery of education. This definition establishes the analytical criterion of the study: the assessment focuses not merely on the activities themselves, but on their integration into the university's core functions.

2. **The Triple Helix.** Etzkowitz and Leydesdorff explain innovation systems through interactions among universities, industry, and government. This approach makes it possible to examine the role of the national industry sector in international cooperation.
3. **Balanced Scorecard (BSC) and PDCA.** Kaplan and Norton proposed the BSC as a tool for translating strategy into a system of operational performance indicators. Studies have also examined its application in higher education institutions. For example, Umashankar and Dutta demonstrated how the BSC can translate a university's mission into a system of interconnected dimensions while Lassoued examined it as an applicable assessment tool in the context of higher education institutions in the United Arab Emirates. For continuous monitoring, the Shewhart–Deming cycle (PDCA: Plan, Do, Check, Act) is applied.

Classification of Indicators

Each indicator was assigned to one of four levels based on a logic model (Table 1):

Table 1. Logic-Model Levels Used to Classify International Cooperation Indicators

Level	Meaning	Examples
Input	Funds and resources mobilized	grants, equipment, international faculty
Activity	Activities implemented	agreements, conferences, professional development
Output	Direct outputs	programs, fields of study, revenue, number of students
Outcome	Impact on the quality of training	employment, employer assessment of education and workforce

The classification is based on the author's own analytical framework. When comparing agreements, programs, and fields of study, differences in units of measurement are taken into account. Joint and double-degree programs have an established body of independent scholarly literature and are therefore analyzed separately. In this study, they are assessed at the **output** level.

Calculation Methods

Growth indicators were calculated as ratios (final value / initial value) and as percentage changes, while the compound annual growth rate (CAGR) was calculated using the formula: $CAGR = (V_1/V_0)^{(1/n)} - 1$. Where the boundaries of the period were not explicitly specified in the data (e.g., "the last five years"), $n = 5$ was assumed, and this assumption is indicated in the relevant tables.

Limitations

(1) The data rely on internal reports and have not been independently verified. (2) Some indicators are reported for different periods and in different formats (academic year versus calendar year, and monetary flows), which limits direct comparability. (3) Survey data from employers, graduates, and students are not available. (4) The study covers a single university; therefore, generalization of the findings to other institutions should be approached with caution.

RESULTS AND DISCUSSION

Results

Institutional Expansion

The data presented in Section III were obtained from TSTU's internal reports. Table 2 presents the dynamics of the main indicators.

Table 2. Dynamics of TSTU International Activity Indicators

Indicator	Initial	Current	Change	CAGR*
International agreements and memoranda	9	257	≈ 28.6-fold	≈ 95%
Staff members receiving professional development abroad (per year)	28	180	≈ 6.4-fold	≈ 45%
International centers and laboratories	0 (until 2021)	More than 15	–	–
International events (per year)	≈ 10	≈ 100	10-fold	≈ 58%
International educational programs (2020–present)	6	58 fields of study**	–	–
English-medium educational programs	–	43	–	–
International partner countries	–	More than 30	–	–

* CAGR = Compound Annual Growth Rate.

** The source data refer to 58 fields of study.

* $n = 5$ is assumed for the calculation.

** A ratio was not calculated because programs and fields of study are measured using different units. The initial value for international events is an estimated value recalculated from the reported figure of a “tenfold increase [11].”

On average, there are fewer than 8.6 agreements per partner country (257 / more than 30 countries). Thus, although the geographic scope of cooperation is broad, the depth of cooperation with individual countries is not uniform. Data on how many of the agreements are currently active are not available.

Financial Outcomes

Revenue from joint programs increased from UZS 571.6 million in 2021 to UZS 1,061 million in 2024 (+85.6%, CAGR ≈ 23%, * n = 3). Over the last three academic years,

total revenue amounted to UZS 4,254.4 million, which was identified as an additional source of funding for academic staff beyond their regular monthly salaries [12].

Grants and investments amounted to USD 1.7 million in 2023, USD 2.3 million in 2024 (+35%), and USD 10.8 million in 2025. The 2025 figure was approximately 4.7 times higher than in 2024 and approximately 6.4 times higher than in 2023. However, the 2025 figure should be compared with previous years with caution, as it encompasses both “soft” and “hard” investments, including various financial flows ranging from laboratory investments to tuition payments by international students [13].

Practical Infrastructure

The following facilities have been established or are currently being developed within the framework of international cooperation: **“Lu Ban Workshop”** (“Belt and Road” Initiative): In the first phase, an IT and artificial intelligence laboratory was established with 172 types of equipment valued at USD 373,000. In the second phase, a logistics laboratory with an investment of USD 1.5 million is being constructed. The new facility covers 1,500 m² and is scheduled to be commissioned by the end of 2025. The total project value is USD 1.8 million.

1. **“Linnan Higher Vocational Workshop”**: USD 800,000 was allocated for the first phase, focusing on automotive engineering, technical maintenance, and hydrogen technologies.
2. **Uzbekistan–China Faculty of Transport** (in cooperation with Chang’an University): The Government of Shaanxi Province provided an educational grant of USD 1.8 million, covering 10 PhD, 40 master’s, and 60 bachelor’s places, with 1+1 (master’s) and 2+2 (bachelor’s) study formats. This corresponds to an average grant of approximately USD 16,400 per study place (USD 1.8 million / 110 places, author’s calculation).

Mobility and Human Resource Capacity

Over the five-year period, 481 students participated in academic mobility programs, including 125 students who participated in summer and winter schools and 187 students who undertook paid internships in Germany (approximately 39% of mobile students). For the remaining 169 students (approximately 35%), the type of mobility activity was not specified in the available data. On average, approximately 96 students participated in mobility programs annually [14].

A total of 609 students were sent to foreign higher education institutions. Of these, 187 are currently studying in Belarus, 62 graduates have completed their studies and entered employment, and 37 students were sent to Poland, Slovakia, and Russia. The number of international academic staff employed on a regular basis exceeds 50, while the number of international students is 44. In addition, 439 staff members have undertaken professional development abroad.

Comparison with the National Context

The 44 international students at TSTU account for approximately 0.4% of the 12,500 international students in Uzbekistan (an approximate comparison based on the combined

national figure for universities and colleges). A substantial proportion of international students in Uzbekistan come from countries such as India and are enrolled in medical programs. Therefore, attracting international students to engineering and transport-related fields requires a distinct strategic approach.

At the same time, the geographic distribution of TSTU's programs and partnerships—including China, South Korea, Poland, the Czech Republic, Türkiye, Belarus, and Russia—is consistent with the principle of avoiding excessive dependence on a single country in Uzbekistan's transnational education landscape. Of the 30 international branch campuses operating in the country, 14 belong to Russian universities, while the remainder are affiliated with institutions from other countries [15].

Classification of Indicators (Testing H1 and H2)

The 13 key indicators reported in the available data are classified in Table 3.

Table 3. Classification of TSTU International Activity Indicators by Level
(Author's Classification)

No.	Indicator	Level
1	Volume of grants and investments	Resource
2	Number of international centers and laboratories	Resource
3	International academic staff employed on a regular basis	Resource
4	International agreements and memoranda	Activity
5	Number of international events	Activity
6	Staff professional development abroad	Activity
7	Academic mobility and students sent abroad	Activity
8	International educational programs and fields of study	Output
9	English-medium educational programs	Output
10	Revenue from joint programs	Output
11	Number of international students	Output
12	Graduates who completed their studies in Belarus and entered employment (62 graduates)	Outcome
13	Employer assessment; level of laboratory utilization	Data not available

Seven indicators (approximately 54%) correspond to the resource and activity levels, four indicators (approximately 31%) correspond to the output level, and only one indicator (approximately 8%) corresponds to the outcome level. A number of other outcome indicators are not monitored at all [16].

On this basis, hypotheses H1 and H2 are supported within the scope of the available data. This conclusion should nevertheless be interpreted cautiously, as the data may be selective, and outcome indicators may exist in the university's internal reporting systems even though they are not included in the available dataset [17].

Discussion

Alignment of the Findings with National Policy

The direction pursued by TSTU—joint programs, international laboratories, English-medium programs, and the recruitment of international staff—is consistent with the objectives of the PF-5847 Concept, particularly its emphasis on practice-oriented education, entry into international rankings, and the integration of universities. The university's quantitative growth does not differ markedly from the overall national trend: the transnational education sector expanded rapidly during 2018–2022 while the number of joint programs also increased. Thus, the situation observed at TSTU should not be regarded as an isolated phenomenon, but rather as an institutional response within a broader national trend [18].

From Quantity to Quality: From the Perspective of Internationalization Theory

Knight's definition requires the integration of an international dimension into the purposes, functions, and delivery of education. Table 3 demonstrates that the current basis for measuring the impact of internationalization at TSTU on educational and research outcomes remains insufficient. This situation is related to the risk highlighted by de Wit: an excessive orientation of internationalization toward mobility and economic motives may bring it closer to competition, marketization, and revenue generation]. Altbach and Knight also identify commercial interests as one of the motivations for internationalization [19].

At TSTU, revenue generated from joint programs provides an additional incentive for academic staff, which can be viewed positively; however, revenue itself is not a quality indicator. Without linking revenue to quality indicators—such as graduate assessment, program accreditation, and employer satisfaction—international activity may gradually become primarily oriented toward financial objectives.

Lessons from the “Lu Ban” Experience

The “Lu Ban Workshop” at TSTU is part of an international project initiated by Tianjin. As of November 2024, there were 33 such workshops in 29 countries across Asia, Africa, and Europe. They had provided educational qualifications to 20,000 people, technical training to 35,000 people, and training for more than 2,200 local teachers. The workshops are based on the EPIP (Engineering, Practice, Innovation, Project) teaching model, which received China's highest national award for teaching achievements in 2022. In a 2022 survey, more than 99% of participants reported that what they had learned was aligned with societal needs; approximately 80% expressed an intention to work at local branches of Chinese enterprises, while more than 80% wished to continue their studies in China [20].

Two conclusions can be drawn from these data. First, a successful international laboratory model involves not only the provision of equipment, but also a specific teaching methodology (EPIP) and links with employers. Second, the outcomes of the workshops are assessed through participants' career plans and employer demand. For TSTU, this implies that the effectiveness of the Lu Ban laboratory should not be measured by the value or quantity of equipment, but by the employment of graduates trained there in national transport enterprises and by employer assessments. This conclusion follows

logically from the international evidence presented above; however, it requires empirical verification in the context of TSTU.

From the Perspective of the Triple Helix

According to the Triple Helix model, innovation and knowledge-based development depend on interactions among universities, industry, and government. In the data presented for TSTU, interactions between the university and foreign governments or international partners are clearly visible—for example, the grant from the Government of Shaanxi Province and the agreement with the Guangzhou government [21]. However, the share of agreements concluded with the national transport industry is not reflected in the available data. This may indicate that one dimension of the Triple Helix is insufficiently represented. To verify this, it is recommended that TSTU's 257 agreements be classified according to partner type: foreign university, foreign enterprise, national enterprise, or government agency.

Risks

Wilkins and Muratov identify several challenges associated with transnational education in Uzbekistan: the absence of clear and separate regulation for transnational education institutions, different requirements being applied to institutions under the supervision of different ministries, and the need for a preparatory year or additional language support because students' English proficiency does not fully correspond to international standards. The existence of 43 English-medium programs at TSTU makes these risks directly relevant: as the number of programs increases, mechanisms for language preparation and quality assurance should also be strengthened.

Another risk is that resources reflected in the available data—for example, the USD 10.8 million investment—may represent one-time financial inflows, while mechanisms for their long-term sustainability, such as equipment maintenance and the training of local personnel, may not yet be sufficiently established.

Proposed Model: A Four-Dimensional System for the Strategic Management of International Cooperation

Based on the analysis above, a model for managing international cooperation is proposed following the logic of the Balanced Scorecard. The existing TSTU indicators are used as baseline values, while the target values are to be determined by the university itself.

Table 4. Proposed Model for the Strategic Management of International Cooperation

Dimension	Strategic Objective	Illustrative Indicators	Baseline
1. Partners and Industry (Triple Helix)	Involving the national transport industry in international projects	Share of active agreements; number of tripartite agreements with national enterprises; program	257 agreements; share of active agreements unknown

Dimension	Strategic Objective	Illustrative Indicators	Baseline
2. Internal Processes	Integrating international programs and laboratories into the educational process	committees involving employers Laboratory utilization hours; share of courses delivered using international laboratories; proportion of students enrolled in English-medium programs	15+ laboratories; 43 English-medium programs; utilization data unavailable
3. Learning and Development	Building the capacity of academic staff and students	Share of staff who have completed professional development abroad and applied the acquired knowledge in the educational process; graduation outcomes of mobile students; language certificates	180 staff members/year; 481 mobile students
4. Finance	Ensuring sustainable financing	Share of revenue allocated to laboratory services and incentives; grant refinancing ratio	UZS 1,061 million; USD 10.8 million
Outcome Block (Impact)	Demonstrating the quality of human capital development	Graduate employment within six months; employer satisfaction; program assessments by international partners	Data available only for 62 graduates (Belarus)

Source: Author's proposed model based on TSTU data and the Balanced Scorecard and Triple Helix approaches.

The proposed model is recommended to be managed based on the PDCA cycle:

1. **Plan:** Three-year objectives and indicators for each dimension are approved by a decision of the Vice-Rector.
2. **Do:** The departments responsible for each indicator (international relations, academic affairs, and finance) are identified.
3. **Check:** Reports are prepared twice a year, while surveys of employers and graduates are conducted once a year.
4. **Act:** Based on the results, agreements are renewed or terminated, and resources are reallocated.

Implementation Stages (Roadmap)

1. *Diagnosis (Months 1–6):* Classify agreements by partner type and level of activity and establish a database for collecting outcome data.

2. *Pilot (Months 7–18)*: Test the full set of BSC indicators using the Lu Ban and Linnan laboratories as pilot cases.
3. *Scaling Up (Months 19–36)*: Extend the model to all international centers and joint programs and introduce performance-based incentives.

Limitations and Directions for Future Research

Because the study relies on internal data from a single university, the identified gaps—particularly the absence of outcome indicators—may also result from incomplete data availability. In the next stage, surveys and semi-structured interviews with employers, graduates, international partners, and students are planned, along with pilot testing of the proposed model over one academic year [22]. Further research could also compare TSTU with other higher education institutions in the transport sector and examine separately the relationship between international cooperation and practice-oriented forms of human capital development, such as dual education.

CONCLUSION

Fundamental Finding: The analysis demonstrates that Tashkent State Transport University significantly expanded its international cooperation during 2020–2025. The number of international agreements and memoranda increased approximately 28.6-fold, the number of staff members undertaking professional development abroad increased approximately 6.4-fold, international laboratories were established after 2021, and grants and investments increased approximately 6.4-fold during 2023–2025. These developments are consistent with the broader internationalization trend observed in Uzbekistan. At the same time, the analysis shows that the majority of the available indicators remain concentrated at the resource and activity levels, while outcome indicators are only weakly represented. As a result, the current system provides limited evidence of how international cooperation contributes to educational quality, graduate employment, employer satisfaction, and the effective use of international infrastructure. This finding is consistent with Knight's understanding of internationalization as the integration of an international dimension into the core functions of higher education and with de Wit's observation concerning the risk of internationalization becoming overly oriented toward competition, marketization, and revenue generation. **Implication:** The experience of China's Lu Ban Workshops further demonstrates that the effectiveness of international laboratories depends not only on the provision of equipment and financial resources, but also on teaching methodology, practical training, and links with employers. For TSTU, this highlights the importance of strengthening cooperation with the national transport industry and of assessing international projects through their contribution to human capital development and educational outcomes. In this context, the proposed four-dimensional strategic management model, based on the Balanced Scorecard, Triple Helix, and PDCA approaches, provides a framework for connecting international cooperation with strategic objectives, measurable indicators, and

continuous monitoring. The model incorporates dimensions related to partners and industry, internal processes, learning and development, and finance, while placing particular emphasis on outcome indicators such as graduate employment, employer satisfaction, and program assessment by international partners. **Limitation:** However, the proposed model should be regarded as an analytical and managerial framework rather than as a validated causal model. **Future Research:** Its practical effectiveness requires further empirical verification through employer and graduate surveys, systematic monitoring of laboratory utilization and educational outcomes, and pilot implementation at TSTU. Such evidence would make it possible to determine whether the quantitative expansion of international cooperation is accompanied by sustainable improvements in the quality and relevance of transport higher education.

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