

Assessing the effectiveness of quality management (TQM) education in higher education institutions in the field of technology

Aslitdin B. Nizamov, Doctor of Economics, Professor,

Bukhara Engineering and Technology Institute

Address: Republic of Uzbekistan, 200117, Bukhara, Kayuma Murtazaev street, 15

ORCID ID: 0000-0001-7765-1475

E-mail: buhibkol@mail.ru

Akram O. Ochilov, Academician of the Turan Academy of Sciences, Doctor of Economics, Professor, Head of the Department «Economics», Karshi State University

Address: Republic of Uzbekistan, 180119, Kashkadarya region, Karshi, Kuchabog street, 17

E-mail: akram.oo@mail.ru

ORCID ID: 0009-0004-9254-188X

Shakhlokhon K. Gafurova, Doctoral student,

Bukhara Engineering and Technology Institute

Address: Republic of Uzbekistan, 200117, Bukhara, Kayuma Murtazaev street, 15

ORCID ID: 0000-0002-9391-6960

E-mail: shaxlo_gafurova@mail.ru

Jahongir Obid oglu Shodiev, Master's student, Karshi State University

ORCID ID: 0009-0001-3952-590X

E-mail: jakhongirshodievv@gmail.com

Abstract. The article discusses the effectiveness of implementing the principles of total quality management (TQM) in the educational processes of technical higher education institutions (HEIs). The author emphasizes the key aspects of TQM, such as orientation to the needs of students and employers, employee participation, process approach and continuous improvement. A structural and logical approach to educational quality management is presented, including the assessment of input data, resources and quality indicators. The main attention is paid to the barriers of TQM implementation in educational institutions, including insufficient funding, staff qualification and adaptation of industrial methods to the educational environment. A survey among 504 respondents was conducted to assess the readiness to implement TQM in three technical universities in Uzbekistan. A methodology aimed at improving quality management processes, student satisfaction and competitiveness of educational institutions is proposed.

Key words: Quality management, TQM, higher education, technical universities, quality of education, innovations, educational processes, quality indicators, resource management.

Оценка эффективности обучения качественному менеджменту (TQM) в технических высших учебных заведениях

Низамов Аслиддин Бахреддинович, доктор экономических наук, профессор,

Бухарский инженерно-технологический институт

Адрес: Республика Узбекистан, 200117, Бухара, улица Каюма Муртазаева, 15

ORCID ID: 0000-0001-7765-1475

E-mail: buhibkol@mail.ru

Очиллов Акрам Одилович, академик Академии наук Турана,

доктор экономических наук, профессор, заведующий кафедрой «Экономика»,

Каршинский государственный университет

Адрес: Республика Узбекистан, 180119, Кашкадарьинская область, Карши, улица Кучабог, 17

E-mail: akram.oo@mail.ru

ORCID ID: 0009-0004-9254-188X

Гафурова Шахлохон Каримовна, докторант,

Бухарский инженерно-технологический институт

Адрес: Республика Узбекистан, 200117, Бухара, улица Каюма Муртазаева, 15

ORCID ID: 0000-0002-9391-6960

E-mail: shaxlo_gafurova@mail.ru

Шаропов Темирмалик Рустам оглы, докторант,

Каршинский государственный университет

Адрес: Республика Узбекистан, 180119, Кашкадарьинская область, Карши, улица Кучабог, 17

E-mail: sharopovtemirmalik@gmail.com

ORCID ID: 0009-0007-1436-7531

Аннотация. В статье рассматривается эффективность внедрения принципов всеобщего управления качеством (TQM) в образовательные процессы технических высших учебных заведений (ВУЗов). Автор подчеркивает ключевые аспекты TQM, такие как ориентация на потребности студентов и работодателей, участие сотрудников, процессный подход и непрерывное совершенствование. Представлен структурный и логический подход к управлению качеством образования, включающий оценку входных данных, ресурсов и показателей качества. Основное внимание уделено барьерам внедрения TQM в образовательных учреждениях, включая недостаточное финансирование, квалификацию персонала и адаптацию промышленных методов к образовательной среде. Для оценки готовности к внедрению TQM проведено исследование среди 504 респондентов в трех технических университетах Узбекистана. Предложена методология, направленная на улучшение процессов управления качеством, удовлетворенность студентов и конкурентоспособность образовательных учреждений.

Ключевые слова: управление качеством, TQM, высшее образование, технические университеты, качество образования, инновации, образовательные процессы, показатели качества, управление ресурсами.

Аннотация: В статье рассматривается эффективность внедрения принципов всеобщего управления качеством (TQM) в образовательные процессы технических высших учебных заведений (ВУЗов). Автор выделяет ключевые аспекты TQM, такие как ориентация на потребности студентов и работодателей, участие сотрудников, процессный подход и постоянное совершенствование. Представлен структурно-логический подход к управлению качеством образования, включающий оценку входных данных, ресурсов и показателей качества. Основное внимание уделено барьерам внедрения TQM в учебных заведениях, среди которых недостаточное финансирование, квалификация персонала и адаптация промышленных методов к образовательной среде. Проведен опрос среди 504 респондентов для оценки готовности к внедрению TQM в трех технических вузах Узбекистана. Предложена методология, направленная на улучшение процессов управления качеством, удовлетворенности студентов и конкурентоспособности учебных заведений.

Ключевые слова: управление качеством, TQM, высшее образование, технические вузы, качество образования, инновации, образовательные процессы, показатели качества, управление ресурсами.

Introduction

The role of Interdisciplinary technical higher educational institutions (HEI) is paramount in the production of trained manpower needed for socio-economic development and the advancement

of technology in modern society. Such specialists are trained not only in the transfer of fundamental knowledge, but in the development of professional abilities, creative thinking, and vigor to dynamically respond to the changing events in the job market. However, technical HEIs have also been faced with the increasing complexity of the tasks in understanding global competition, digitalization and stakeholder, including students, employers, government and community in general increasing expectations. Furthermore, the significant challenge at present, for technical HEIs, is how to reach an accepted high standard of education. The question of quality management does arise, and indeed a number of reasons can be cited. To begin with, there is the issue of addressing the demands of the labor market, which requires the constant revision of curricula while incorporating emerging professional requirements. There is also the issue of incorporating new techniques of learning such as e-learning, which cuts across traditional methods of pedagogy. And finally, educational institutions should take into account the expectations of different groups of stakeholders, including students, teachers and employers.

In this regard, traditional methods of education quality management based on formal accreditation procedures and inspections can no longer effectively respond to the challenges of the time. More flexible, dynamic and result-oriented approaches are required. One such approach is Total Quality Management (TQM), which has been successfully applied in industry and other sectors for many years. The TQM concept offers a systematic approach to quality management focused on continuous process improvement, involvement of all participants and customer satisfaction.

A pertinent aspect of research in several countries is the incorporation of TQM (Total Quality Management) principles in education, particularly in technical universities. Investigation proves to be useful that TQM's basic principles – customer focus, employee participation, process approach and continuous enhancement – can be implemented in the educational context (Mehta & Pandit, 2020)¹. Students, employers and society as a whole are the customers/clients in the higher education system; hence, their needs are very important in formulating the quality management systems. Different approaches, including models, are used to measure the performance of the TQM strategy in HEIs. To illustrate, the European Foundation for Quality Management (EFQM) framework is employed to evaluate the organizational maturity stage of a higher education institution and its conformity with the relevant quality requirements (Zairi, 2018)². Furthermore, the BSC (Balanced Scorecard) technique is also frequently employed for tracking critical success indicators (Kaplan & Norton, 1996)³. These models enable addressing problems such as student satisfaction, graduate employability and achievement of academic goals.

Alharbi and Yusoff (2021)⁴ explain that the implementation of TQM is associated with improved satisfaction of the student, the faculty and the academic institution's international ranking and performance. TQM however, is not immune to a number of factors that may hinder its success within the higher education institution. There are however, factors that affect the success of TQM implementation including organizations management support, qualification of the HEI staff and the presence of a stable organizational culture. Regardless of TQM's potential benefits, certain

¹ Mehta, S., & Pandit, G. (2020). "Total Quality Management in Education: Principles and Practices". *Journal of Educational Management and Leadership*, 12(4), 245-260.

² Zairi, M. (2018). "Excellence in Higher Education: Application of EFQM Model". *International Journal of Quality Assurance in Higher Education*, 15(2), 78-94.

³ Kaplan, R. S., & Norton, D. P. (1996). "The Balanced Scorecard: Translating Strategy into Action". Harvard Business Review Press.

⁴ Alharbi, A., & Yusoff, R. (2021). "Impact of Total Quality Management Practices on Educational Outcomes in Higher Education Institutions". *Asian Journal of Educational Management*, 7(3), 321-335.

challenges hamper its effective application, say the researchers. Such barriers include inadequate funds, inadequate organizational commitment, and inability to transfer industrial practice to education (Becket & Brooks, 2018)⁵. Insufficient qualification of the teaching personnel for the TQM approaches was also revealed in technical universities.

Methods

In the development of Educational Quality Management, the basis of the research methodology by the authors is a systematic analysis, materials on the analysis of selective literature. Scientific research methods such as generalization, grouping, comparison, analysis and synthesis, were also used in the research process. Also, during our research, a survey among 504 respondents was carried out in order to study the level of Educational Quality Management and their readiness to organize management on the basis of the principles of TQM at the 3 technical fields of Uzbekistan, including the Bukhara Engineering and Technology Institute, Tashkent State Technical University and Karshi Engineering and Economics institutes.

Results

Our research shows that the Ministry of Education, Science and innovation, all educational institutions, all professors, the majority of students, employers and the whole society in general are in favor of improving the quality of Education. But for each category there is its own concept of educational quality. On the basis of this, it can be concluded that our HEIs have two problems in coordinating their activities in the field of quality assurance with international standards:

- The absence of a single system of quality factors and methods in the activities of osms, which direct all the elements of education to the main goal;
- the fact that today's quality management system of higher education is not adapted to the implementation of the principles of achieving the effectiveness of activities and improving quality on an ongoing basis.

As a solution to the above main problems, a methodology for managing the quality of education at universities, separated into three interconnected blocks, was proposed (figure 1). The first block consists of "input data" as a description of the "raw material" adopted at the beginning of each educational process, and "output data" as the results of educational processes and general activities, as well as an assessment of activities (transformation) in all processes in continuous connection from "input" to "output".

The second block deals with assessing the quality of resources used and supported in educational processes.

The third block includes assessment indicators by Quality Management categories.

The proposed methodology for managing the quality of education at universities should be carried out in all areas of the university activity according to the sample of the survey conducted by us. This is due to the large resources and time spent. Therefore, according to the scheme in Figure 2, it is advisable to carry out quality management processes in stages in a 5-year cycle between two attestations of the universities.

⁵ Becket, N., & Brooks, M. (2018). "Barriers to Total Quality Management Implementation in Higher Education: A Systematic Review". *Quality in Higher Education*, 24(1), 5-20.

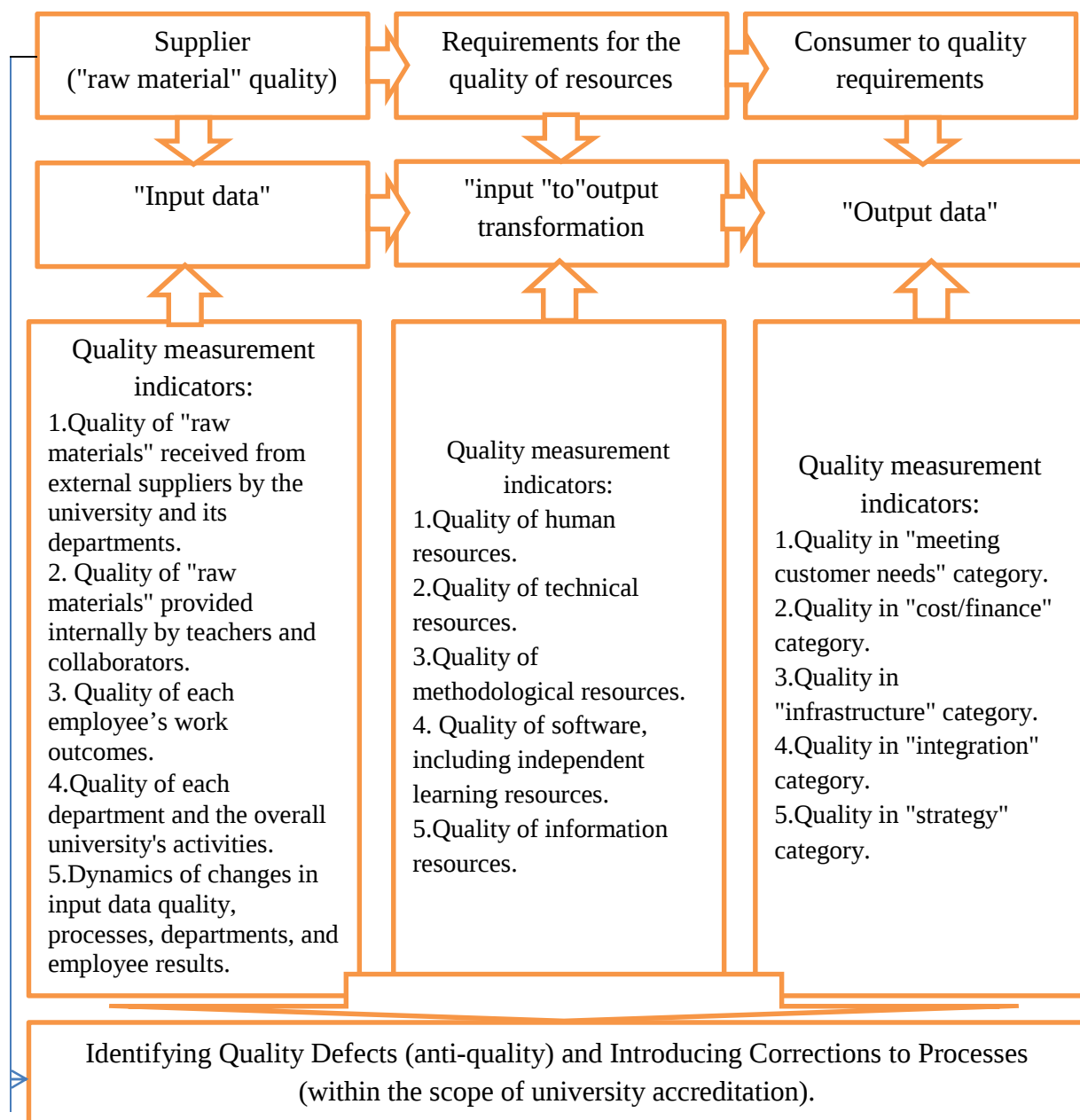


Fig. 1. / Puc. 1. Structural-logical scheme of the methodology for managing the quality of education at the HEIs / Структурно-логическая схема методологии управления качеством образования в вузах

At the same time, taking into account the size of the workload, coordination with the HEMIS system is required in order to automate the processes. The first stage is carried out in the 1st semester after the last accreditation, the last stage in the semester before the next accreditation (Figure 2).

The results of our preliminary study showed that there are many problems in the management of the university. On the other hand, this study covered some superficial issues of the university's activities. In order to have accurate information on the situation and to approach quality problems in all directions, it will be necessary to carry out more in-depth analyzes on all branches of management (rectorate, deaneries, departments and on each employee. In this, in combination with external assessment, self-assessment is carried out and compared.

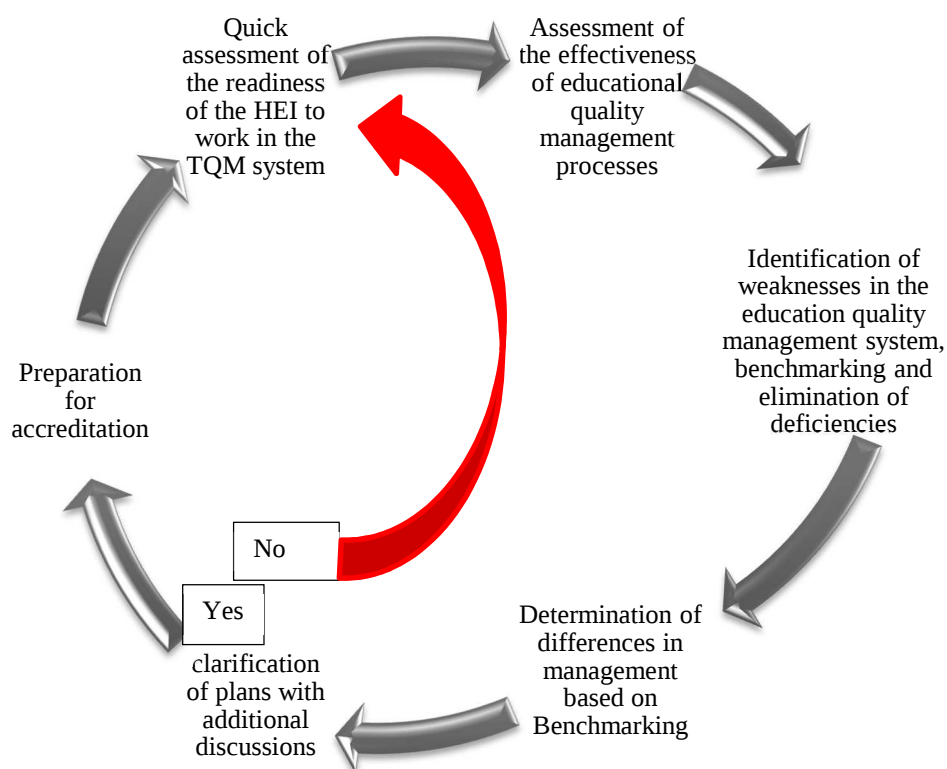


Рис. 2. / Fig. 2. Scheme for monitoring the effectiveness of educational quality management processes during a five-year cycle / Схема мониторинга эффективности процессов управления качеством образования в течение пятилетнего цикла /

The activities of the rectorate are evaluated by the Deans, Heads of departments, staff. The activities of the deans are evaluated by the heads of the relevant department, professors, employees of the Departments of the Institute. The activities of the heads of the department are evaluated by the staff of the dean's office, members of the department, employees of the Departments of the institute, as well as the heads of the partner Department. The activities of the employee are evaluated by the dean's office, the head of the department and the professor-teachers, the head and staff of the Departments of the Institute.

Based on the basic idea of strategic Quality Management (TQM), quality management should be focused on the processes of the HEI's administration to instill new views in the minds of each team member, to involve all employees in quality improvement. A new HEI structure is required to appear to serve the same purpose.

We offer a methodology for assessing the readiness of a higher educational institution (TQM) to transform quality management taking into account defects in terms of quality. There should be studied, at least eight categories of issues through questionnaire surveys to do this:

1. Efficiency of university management processes.
2. Efficiency in managing educational processes.
3. Efficiency of interaction with consumer and educational services markets.
4. Formation of information about the quality of education and effective analysis of information.
5. Personal management.
6. Defect-free teaching and customer orientation.
7. The degree of influence of the intellectual product of the University and its quality of Education.

8. Resource formation, financial stability.

Discussions

Thus, the integral indicators of the effectiveness of quality management and the level of defects in each category are determined. The cost of defects is measured by the expenses required to correct errors. Based on the experience of others, these costs typically account for 20–40% of operational expenses. A portion of these costs is associated with preventing defects, while another portion relates to the expenses incurred in eliminating them, as well as the losses caused by internal and external failures. Measuring these costs is not easy because they are multifaceted, distributed across multiple departments, and are not typically accounted for in traditional accounting practices. Nevertheless, it is possible to estimate these costs at an initial stage. This can be done, first, by calculating the expenses incurred on students who were expelled (such as salaries, the cost of ineffective services, inefficient utility payments, and so on), and second, by considering the costs of re-educating and re-examining students who failed to achieve satisfactory outcomes. In this case, the average cost per student is used as an indicator. If the assessment method remains consistent, it can later be improved further and used as a useful tool for evaluation.

In accordance with TQM principles, the effectiveness of quality management processes in higher education institutions (HEIs) is evaluated by considering the level of defects, resulting in a comprehensive indicator termed “TQM Effectiveness” This indicator reflects the current readiness of the HEI to operate within a TQM system and is determined using the following formulas:

$$E_{HEI} = (E_m + E_e + E_{int} + E_{inf} + E_p + E_{df} + E_{ip} + E_r)/8 \quad (3.1)$$

$$L_D = 1 - \frac{T_{EX} - D_{EX}}{T_{EX}} \quad (3.2)$$

$$TQM_E = E_{HEI} * (1 - L_D) \quad (3.3)$$

In this context:

TQM_E – the TQM effectiveness, indicating the readiness level of the higher education institution (HEI) to transform into a quality management system, considering quality management defects.

E_{HEI} – the effectiveness of quality management processes within the HEI;

L_D – the level of defects in quality management processes;

T_{EX} – the total expenditures of the HEI.;

D_{EX} – Indicates the expenditures incurred due to defects in education quality.

This indicator reflects how effectively the higher education institution (HEI) implements quality management processes and ensures that all departments and activities align with the core principles of Total Quality Management (TQM). Additionally, the TQM effectiveness indicator demonstrates the institution's performance in achieving its strategic objectives. It assists HEI leadership in identifying areas that require more attention to enhance quality. A low indicator value suggests deficiencies in plans and processes structured according to TQM principles, necessitating improvements. By addressing these areas, HEIs can strengthen their TQM effectiveness, improve education quality, increase student satisfaction, enhance competitiveness, and adopt innovative approaches.

In the subsequent stages of our research, we aim to determine the TQM effectiveness indicator for technical higher education institutions (HEIs) under study. Additionally, we will

develop optimal strategies to transform these institutions in line with TQM principles, addressing the primary challenges in quality management.

References

1. Mehta S., Pandit G. *Total Quality Management in Education: Principles and Practices*. *Journal of Educational Management and Leadership*. 2020;12(4):245-260.
2. Zairi M. *Excellence in Higher Education: Application of EFQM Model*. *International Journal of Quality Assurance in Higher Education*. 2018;15(2):78-94.
3. Kaplan R.S., Norton D.P. *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business Review Press. 1996.
4. Alharbi A., Yusoff R. *Impact of Total Quality Management Practices on Educational Outcomes in Higher Education Institutions*. *Asian Journal of Educational Management*, 2021;7(3):321-335.
5. Becket N., Brooks M. *Barriers to Total Quality Management Implementation in Higher Education: A Systematic Review*. *Quality in Higher Education*. 2018;24(1):5-20.
6. Nizamov A.B., Gafurova S.K. *Assessment of Factors Influencing the Quality of Education in Higher Educational Institutions*. *Academicia: An International Multidisciplinary Research Journal*. 2020;10(6):1784-1796.
7. Nizamov A.B., Gafurova Sh.K. Features of the development of the higher education system of Uzbekistan. 2024;1(1):151-154.
8. Karimovna, G.S. Quality management in higher education and its features. gwalior management academy, 40.

Литература

1. Mehta S., Pandit G. *Total Quality Management in Education: Principles and Practices*. *Journal of Educational Management and Leadership*. 2020;12(4):245-260.
2. Zairi M. *Excellence in Higher Education: Application of EFQM Model*. *International Journal of Quality Assurance in Higher Education*. 2018;15(2):78-94.
3. Kaplan R.S., Norton D.P. *The Balanced Scorecard: Translating Strategy into Action*. Harvard Business Review Press. 1996.
4. Alharbi A., Yusoff R. *Impact of Total Quality Management Practices on Educational Outcomes in Higher Education Institutions*. *Asian Journal of Educational Management*, 2021;7(3):321-335.
5. Becket N., Brooks M. *Barriers to Total Quality Management Implementation in Higher Education: A Systematic Review*. *Quality in Higher Education*. 2018;24(1):5-20.
6. Nizamov A.B., Gafurova S.K. *Assessment of Factors Influencing the Quality of Education in Higher Educational Institutions*. *Academicia: An International Multidisciplinary Research Journal*. 2020;10(6):1784-1796.
7. Низамов А.Б., Гафурова Ш.К. Особенности развития системы высшего образования Узбекистана. 2024;1(1):151-154.
8. Karimovna, G.S. Quality management in higher education and its features. gwalior management academy, 40.