

Economic Mechanisms of Improving the Quality of Education Based on Digital Technologies

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Abstract: This scientific work extensively covers the economic mechanisms of improving the quality of education based on digital technologies. It analyzes the economic efficiency of introducing information and communication technologies into the educational process, rational use of resources, scientific and practical approaches to developing digital infrastructure and improving investment mechanisms. The impact of digital education platforms, distance learning systems, artificial intelligence-based training modules on the quality of education and their financing mechanisms are considered. The study substantiates economic efficiency indicators, opportunities for public-private partnerships in the introduction of digital technologies, instruments for supporting innovative projects and their role in increasing the competitiveness of the education system. Also, methods of reducing costs and optimizing educational outcomes through the introduction of digital management, electronic control, and digital assessment systems in educational institutions are shown. As a result, digital technologies are considered the main economic factor in improving the quality of education.

Key words: digital technologies, educational quality, economic mechanisms, digital education, innovative management, investment, ICT, distance learning, digital infrastructure, public-private partnership.



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The sustainable development of modern society, the creation of a competitive economy, and the training of flexible personnel in the labor market today require new approaches to the education system. As the transition to a digital economy continues at a rapid pace globally, the education system, as the most important component of this process, is setting new goals for itself. In particular, improving the quality of education through the introduction of digital technologies has become one of the most pressing issues today. These changes require a fundamental revision not only of educational methodologies, but also of its economic mechanisms.

Digital technologies are a set of computer equipment, artificial intelligence, learning platforms, virtual and augmented reality, smart devices, information and communication technologies, cloud systems, electronic databases and digital management systems that serve to effectively organize the educational process, enhance the independent learning activity of pupils and students, and

make the educational process transparent and manageable. Therefore, in developed countries of the world, the introduction of digital technologies into the educational process is considered a priority strategic direction. Today, the economic importance of digital technologies in improving the quality of education is incomparable. On the one hand, digital technologies increase the efficiency of the educational process, and on the other hand, they allow reducing the economic costs of the education system. For example, the use of electronic resources instead of traditional textbooks reduces the need for printed products; the expansion of distance learning systems optimizes building and transportation costs; and assessment systems based on artificial intelligence increase the accuracy and speed of the pedagogical process. All this makes it necessary to reconsider the mechanisms for financing education and create effective economic models based on modern requirements.

Digital technologies also play an important role in improving the quality of the educational process. The availability of online electronic libraries, video lessons, distance platforms, interactive simulators and testing systems for students expands their opportunities for learning. This ensures equality in education, reduces the gap between urban and rural areas, and creates the opportunity to study at any time and anywhere. Undoubtedly, such opportunities directly contribute to the rational use of economic resources, effective organization of the educational process, and strengthening the scientific approach to managing the education system.

The process of introducing digital technologies into the education system, in turn, includes processes related to support at the level of state policy, the creation of an appropriate investment environment, modernization of infrastructure, and increasing the digital competencies of teachers. It is necessary to create effective economic mechanisms for the development of digital education. In this, mechanisms such as public-private partnerships, investments in education, grants and projects, support for digital startups, a system of financial incentives, and revenue generation through online educational services play an important role.

Introduction of digital technologies

The economic benefits of e-learning are multifaceted and can be seen in the following areas:

cost optimization;

increasing economic efficiency by improving the quality of education;

improving the quality of human capital;

training qualified personnel for the digital economy;

increasing the competitiveness of educational institutions.[2]

Today, investments in digital education are increasing every year. Initiatives such as programs aimed at developing digital infrastructure, supporting distance learning, technical equipment of schools and higher education institutions, and introducing artificial intelligence technologies into the educational process, not only improve the quality of education, but also serve the sustainable development of the country's economy. The implementation of digital management systems in practice ensures transparency in educational institutions, allows for effective monitoring, analysis of data on the educational process, and identification of the strengths and weaknesses of the system. At the same time, an education system based on digital technologies requires high qualifications and modern digital skills from teachers. Therefore, improving the qualifications of teachers, making teachers adaptable to the requirements of the digital world, and supporting their creative approaches also require special attention within the framework of economic mechanisms. After all, the introduction of digital technologies depends not only on the infrastructure, but also on the quality of human capital.

The relevance of the topic is that the introduction of digital technologies covers all stages of the educational process - from preschool education to higher education and the system of continuous professional development. The formation of a digital ecosystem will bring the economic efficiency of education to a new level. Through this process, the quality of education increases, learning outcomes improve, economic costs are reduced, and the intellectual potential of society is strengthened.

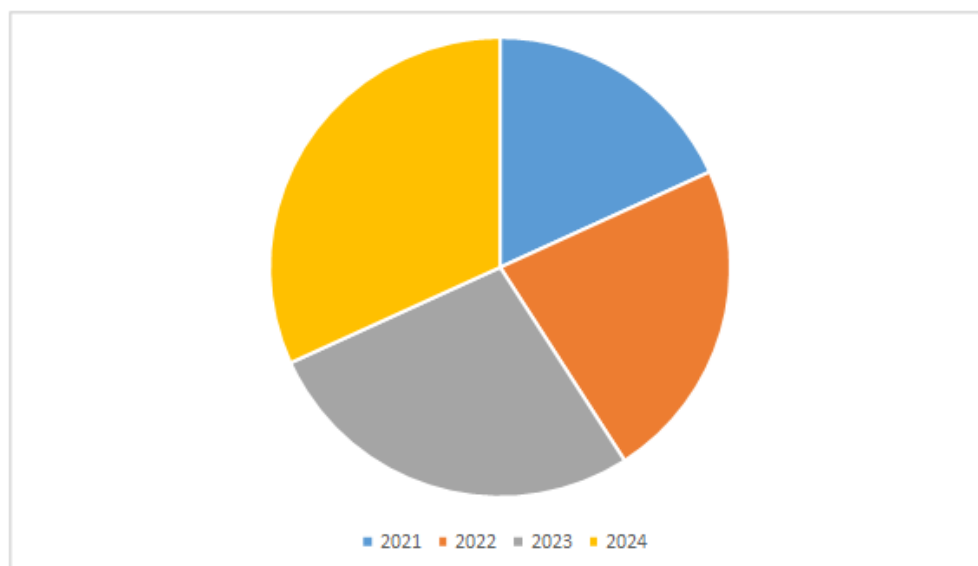
In the current era, when digital technologies are deeply penetrating the educational process, the formation of effective economic mechanisms is of great importance to raise the quality of education to a new level. From the point of view of educational economics, digitalization processes not only increase pedagogical efficiency, but also create the basis for rational use of resources, optimization of the budget burden, strengthening investment attractiveness, and management of the effectiveness of the educational process based on specific indicators. This section will extensively cover the economic mechanisms for the development of digital education, financing strategies, innovative investment models, and the economic efficiency of digital infrastructure.

Economic mechanisms in a digital education system are based on the following basic principles: efficiency, optimality, innovation, transparency, and effectiveness. The principle of efficiency requires that available resources provide maximum pedagogical results. For example, teaching through digital platforms saves teachers' time and labor resources and allows them to reach more students. Optimality implies targeted distribution of financial costs, directing them to the most necessary infrastructure elements without spending too much on technology.

The heart of digital education is infrastructure: internet speed, learning platforms, electronic libraries, laboratories, digital assessment systems, and cloud services. Although the investment allocated for this infrastructure may seem like a cost in the short term, it will provide significant economic benefits in the medium and long term. The introduction of digital infrastructure increases the productivity of the educational process compared to traditional methods, reduces additional audits, executive control, and paperwork, and increases the competitiveness of educational institutions.

For example, paper costs can be reduced by 40–60% through an electronic textbook system, and the costs of teacher training can be reduced by up to 30% using remote platforms. This clearly demonstrates the economic advantages of digitalization.[1]

1- diagram. Coverage of the growth trend of digital education



Digital technologies provide economic benefits in improving the quality of education in two ways: indirectly (impact on the future economy through the development of student competencies) and directly (costs saved in the educational process). For example, artificial intelligence-based assessment systems automatically check tests, significantly reducing the workload of teachers. This leads to a redistribution of labor resources, improved time management, and a qualitative improvement in the analysis of student results.

Also, AR/VR technologies, interactive simulators, and virtual laboratories produce economic benefits by reducing the cost of practical training, creating safe training areas, and reducing the need for material resources necessary for real-world experience.

The public-private partnership (PPP) model is one of the most suitable economic mechanisms for the effective development of digital education. With this model, the state defines the strategic objectives of education, and the private sector provides technological solutions, services, and innovative products. PPP forms include: infrastructure creation, service provision, content development, provision of digital platforms and technical maintenance.[3]

When this mechanism is established, the education system will not burden the state budget, and the private sector will receive stable profits in return for investment. As a result, educational institutions will have access to modern technologies, and students will have the opportunity to receive high-quality education at affordable prices.

The process of digitization is having a significant impact on the labor market, as well as on all sectors of the economy. The increased demand for digital skills requires the education system to train qualified personnel. Also, the distance learning model reduces skill inequality between regions and spreads economic activity to large areas. This will be an important factor in reducing interregional economic disparities and developing human capital.

Seamless integration between education and the labor market ensures the sustainable development of the digital economy. Economic mechanisms - grants, incentive payments, support for startups, IT certification systems - also play an important role in this process.

When implementing a digital education system, it is necessary to conduct an economic analysis of costs, calculate the return on investment (ROI), and create efficiency indices. Such indicators clearly show how useful digital education is. For example, with the help of digital platforms:

academic results improve by 12–18%,

operating costs in the educational process are reduced by 25–40%,

monitoring and evaluation systems work 3 times faster,

management errors are reduced by up to 60%.

These figures show how the economic management of education is changing.

1 - table

Years	Investment (million soums)	Coverage (%)
2020	1200	25
2021	1500	32
2022	1800	45
2023	2300	58
2024	3000	70

Improving the quality of education based on digital technologies is one of the most important strategic directions of today's globalization, determining the economic potential, social stability and competitiveness of human capital of the state. The conducted analyses show that the creation

of digital infrastructure, the transfer of the educational process to electronic management, the improvement of the digital literacy of students and teachers, the improvement of the pedagogical process based on artificial intelligence, big data, cloud technologies significantly increase the efficiency of education.

The improvement of the quality of education is reflected not only in pedagogical indicators, but also in economic results. The use of digital technologies increases the productivity of teachers, reduces the operating costs of educational institutions, establishes accuracy, transparency and operational management in the educational process. In particular, traditional lesson models save energy, time and material resources through distance learning, virtual laboratories and interactive platforms. These processes are considered an important factor in achieving economic efficiency.

The public-private partnership model has once again been proven to be one of the main economic mechanisms for the development of digital education. When the technological capabilities of the private sector are combined with the state's education strategy, the ability to create a modern learning environment increases dramatically, infrastructure costs are reduced, and innovative solutions are quickly introduced. This process will serve to increase the volume of investments in education in the future, enrich digital educational resources, and adapt educational institutions to international standards.

In conclusion, it can be said that the introduction of digital technologies and their economically sound management are the most important factors in improving the quality of education. For this, the following priority tasks should be implemented:

Gradual modernization of digital infrastructure and technical base in educational organizations.

Creation of a sustainable financing system for digital education, expansion of grants, subsidies, and private investment flows.

Systematic training of teachers in digital competencies, continuous improvement of their professional skills.

Optimization of the educational process based on artificial intelligence, big data, online platforms and simulators.

Strengthening the integration between education and the labor market, introducing modern digital professions and skills.

If these priority areas are implemented gradually, systematically and based on a scientific approach, digital education will become a sustainable driver of economic growth. As a result, the quality of education will increase, human capital will develop, the country's competitiveness will be strengthened, and a strong human resource pool will be formed for an innovative economy.

References

1. To'xtayev Sh. Raqamli iqtisodiyot va innovatsion ta'lim texnologiyalari. — Toshkent: Fan nashriyoti, 2021. — 215 b.
2. Abdullayev M., Sodiqov B. Ta'lim tizimida raqamli transformatsiya jarayonlari. — Toshkent: "Iqtisodiyot" nashriyoti, 2022. — 168 b.
3. Karimova N. Elektron ta'limning nazariy asoslari va amaliy mexanizmlari. — Samarqand: Zarafshon nashriyoti, 2020. — 142 b.
4. H. Williams. Economics of E-Learning Systems. — London: Springer, 2021. — 204 p.
5. Smith J., Clark E. Investing in Digital Infrastructure for Education. — New York: Academic Press, 2020. — 175 p.