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INTERNATIONAL STANDARDS AND THEIR APPLICATION IN DEVELOPING AN INFORMATION AND EDUCATIONAL ENVIRONMENT

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Abstract. The article examines international standards applied in the development of the information and educational environment of modern educational institutions. It analyzes the main areas of standardization related to educational processes, digital learning resources, information security and interoperability of information systems. The features of implementing ISO and ISO/IEC standards in the design, organization and improvement of the information and educational environment are explored. A structural model for integrating international standards into educational activities is proposed. The study substantiates that standardization contributes to improving educational service quality, management efficiency, accessibility of learning materials and the resilience of digital infrastructure.

Keywords: information and educational environment, international standards, digital education, standardization, learning resources, information security, quality management, e-learning, system interoperability, digital infrastructure, educational technologies, learning efficiency.

Аннотация. В статье рассматриваются международные стандарты, применяемые при формировании информационно-образовательной среды современного образовательного учреждения. Анализируются основные направления стандартизации образовательных процессов, цифровых образовательных ресурсов, информационной безопасности и совместимости информационных систем. Раскрываются особенности применения стандартов ISO и ISO/IEC при проектировании, организации и совершенствовании информационно-образовательной среды. Предлагается структурная модель внедрения международных стандартов в образовательную деятельность. Обосновывается, что стандартизация способствует повышению качества образовательных услуг, эффективности управления, доступности учебных материалов и устойчивости цифровой инфраструктуры.

Ключевые слова: информационно-образовательная среда, международные стандарты, цифровое образование, стандартизация, образовательные ресурсы, информационная безопасность, управление качеством, электронное обучение, интеграция систем, цифровая инфраструктура, образовательные технологии, эффективность обучения.

Annotatsiya. Maqolada zamonaviy ta'lim muassasasining axborot-ta'lim muhitini şakllantirişda qöllaniladigan xalqaro standartlar körib çiqiladi. Ta'lim jarayonlari, raqamli ta'lim resurslari, axborot xavfsizligi va axborot tizimlarining özaro muvofiqligini standartlaştirişning asosiy yönalishlari tahlil qilinadi. Axborot-ta'lim muhitini loyihalaş, taşkil etiş va takomillaştirişda ISO hamda ISO/IEC standartlarini qöllash xususiyatlari yoritiladi. Xalqaro standartlarni ta'lim faoliyatiga joriy etişşning tarkibiy modeli taklif etiladi. Standartlaştiriş ta'lim xizmatlari sifatini, boşqaruv samaradorligini, öquv

HSR (LONDON),
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materiallaridan foydalaniş imkoniyatlarini hamda raqamli infratuzilmaning barqarorligini oşirişga xizmat qilişi asoslanadi.

Kalit sözlar: axborot-ta'lim muhiti, xalqaro standartlar, raqamli ta'lim, standartlaştiriş, ta'lim resurslari, axborot xavfsizligi, sifat menejmenti, elektron ta'lim, tizimlar integratsiyasi, raqamli infratuzilma, ta'lim texnologiyalari, ta'lim samaradorligi.

Introduction. In the context of the digital transformation of society, the development of educational institutions is directly linked to the introduction of information technologies, the improvement of electronic educational resources, and the formation of a comprehensive information and educational environment. Modern educational activity involves not only the use of digital learning tools but also the creation of an interconnected system that provides management of the learning process, information exchange, storage and processing of educational data, monitoring of learning outcomes, and organization of students' independent work.

The information and educational environment is a set of information resources, hardware and software, educational technologies, organizational mechanisms, and communication tools that ensure the delivery of the educational process in digital and traditional formats. Its effective functioning requires coordinated interaction of technical, pedagogical, organizational, and informational components.

One of the significant problems in creating an information and educational environment is the lack of a unified approach to integrating various software solutions, electronic educational resources, learning management systems, and information protection mechanisms. Fragmentation of information systems may lead to data duplication, reduced accessibility of educational materials, more complex administration, and limited opportunities for developing the digital infrastructure.

Under these conditions, the application of international standards becomes particularly important, as they make it possible to establish unified requirements for the management of educational processes, the quality of educational services, information security, digital resources, and interoperability of information systems.

For military educational institutions, the problem under consideration is of additional significance, since the information and educational environment is used in training specialists, conducting classes, organizing independent work, simulating professional situations, and improving practical skills. At the same time, the introduction of digital technologies must take into account requirements for information protection, access differentiation, and the specific nature of educational activity.

The purpose of the article is to analyze the international standards applied in creating an information and educational environment and to develop a generalized model for their practical implementation in the activities of an educational institution.

To achieve this purpose, the following tasks are to be addressed:

to study the main international standards related to the information and educational environment;

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HOUGHTON STREET REVIEW JOURNAL
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to determine the functional role of standards in ensuring the quality of educational processes;

to consider the areas of application of international standards in the digital educational infrastructure;

to propose a structural model for introducing international standards into the information and educational environment.

Main Areas of International Standardization of the Information and Educational Environment. International standardization in education and information technology aims to establish unified approaches to managing educational processes, developing and exchanging digital resources, ensuring information accessibility, and protecting information systems.

At present, when forming an information and educational environment, it is advisable to consider standards in several interrelated areas: management of educational organizations, information security, structuring of educational resources, accessibility of digital materials, and interoperability of information systems.

One of the key documents in this area is ISO 21001:2025 "Educational organizations – Management systems for educational organizations – Requirements with guidance for use". This standard establishes requirements and guidance for building the management system of an educational organization (Educational Organization Management System – EOMS). Its application is aimed at aligning educational activity with the organization's objectives, learners' needs, the requirements of stakeholders, and mechanisms of continual improvement.

ISO 21001:2025 provides a systematic approach to managing educational activity, including planning, resource provision, organization of educational processes, evaluation of results, and improvement of the management system. The standard can be applied in various educational institutions regardless of organizational structure, scale of activity, and forms of instruction used [1].

Standardization of information security is an important area. The functioning of an information and educational environment involves processing personal data of students and teachers, information on academic activity, electronic documents, assessment results, and other information materials. Therefore, applying ISO/IEC 27001, which sets requirements for an information security management system, makes it possible to organize a systematic approach to risk identification, management of information assets, access control, and information protection.

The practical significance of this standard lies in creating organizational and technical mechanisms of information protection that ensure its confidentiality, integrity, and availability. When implementing an information and educational environment, information security requirements should be taken into account at the design stage, and not only during the operation of information systems [2].

Standardization of educational resources is no less important. ISO/IEC 19788-1:2024 addresses the metadata framework for educational resources, which ensures the description, identification, systematization, and retrieval of learning materials. The use of such approaches makes it possible to build structured electronic libraries, catalogs of learning materials, and information databases that enable more effective use of digital educational resources [3].

HSR (LONDON),
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Standardization also provides for ensuring the accessibility of educational resources for different categories of learners. In this area, the provisions of the ISO/IEC 24751 series are applied, relating to the adaptability and accessibility of e-learning, educational, and training information materials. The use of such approaches helps create a digital environment in which educational materials can be delivered with regard to users' individual needs, interface characteristics, and different ways of interacting with information [4].

Thus, international standards ensure not only the unification of technical requirements but also form the methodological basis for the comprehensive development of the information and educational environment.

Features of Applying International Standards in Forming the Information and Educational Environment. The practical application of international standards involves considering the information and educational environment as an interconnected system consisting of several functional levels.

The first level comprises the organizational and managerial component, intended for planning educational activity, defining goals, allocating responsibility, managing resources, and evaluating the effectiveness of educational processes. When forming this component, it is advisable to take into account the provisions of ISO 21001:2025, which make it possible to organize the activity of an educational institution on the basis of systematic management and continual improvement.

The second level is the information and resource component, which includes electronic textbooks, teaching and learning materials, digital libraries, multimedia resources, databases, and electronic educational courses. The use of unified approaches to describing educational resources ensures their systematization, retrieval, reuse, and integration into various educational platforms.

The third level is formed by the hardware and software infrastructure. It includes server and computing resources, local and wireless networks, software, learning management systems, videoconferencing tools, and other digital instruments. To ensure the stable functioning of this component, it is necessary to take into account the compatibility of software solutions and requirements for performance, reliability, and technical support.

The fourth level includes the information security component. It provides for the use of user authentication mechanisms, access control, backup, protection of information channels, management of information risks, and control over data processing. The implementation of this component must comply with established organizational and regulatory requirements.

The fifth level is the pedagogical and methodological component, which ensures the use of information technologies in the educational process. It includes the development of electronic courses, organization of distance and blended learning, conducting interactive classes, using multimedia materials, and assessing learning outcomes.

The interconnection of these components makes it possible to regard the information and educational environment not as a collection of separate programs and equipment but as an integral system that ensures the achievement of educational goals.

HSR (LONDON),
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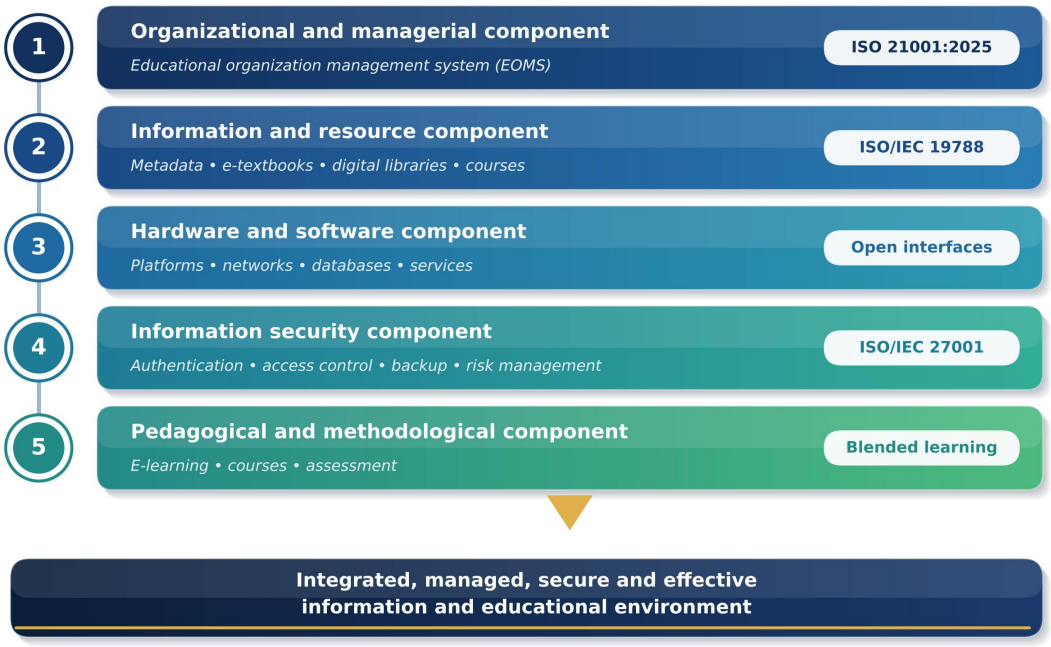


Figure-1. Structure of the information and educational environment based on international standards

The presented structure reflects the functional interrelation of the main components of the information and educational environment. The organizational and managerial component defines the goals and directions of its development, the information and resource component provides the content of the educational process, the hardware and software component creates conditions for the functioning of digital services, and the information security component ensures the protection of information assets. The pedagogical and methodological component is aimed at the direct use of the environment's capabilities to improve learning effectiveness.

Ensuring interoperability of information systems is of particular importance. Educational institutions may simultaneously use various platforms, software products, and digital services with different technical characteristics and data formats. In the absence of agreed interaction mechanisms, difficulties arise in exchanging information, transferring learning materials, integrating electronic courses, and centrally managing educational resources.

In this regard, when creating an information and educational environment, it is necessary to provide for open interfaces, unified data formats, structured metadata, and mechanisms for integrating software solutions. Such an approach reduces an educational institution's dependence on individual software products and makes it possible to expand the system's functionality gradually.

HSR (LONDON),
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For military educational institutions, special attention should be paid to differentiating educational information resources by access level, protecting information channels, ensuring the resilience of the digital infrastructure, and complying with regulatory documents governing work with information. The integration of the information and educational environment must be carried out exclusively within authorized information systems and the established access regime.

Methodological Approach to Introducing International Standards into the Information and Educational Environment. The introduction of international standards into educational activity is advisable to carry out in stages, taking into account the existing level of digitalization of the educational institution, its organizational capacity, technical infrastructure, and learners' needs.

At the first stage, an analysis of the existing information and educational environment is carried out. At this stage, the information systems in use, educational resources, technical means, organizational processes, the level of staff training, and existing problems in the functioning of the digital infrastructure are identified.

At the second stage, the requirements for the information and educational environment are defined. On the basis of the analysis of identified shortcomings, requirements are formed for the management of educational processes, information resources, information security, accessibility of digital materials, and compatibility of software solutions.

At the third stage, a concept for integrating international standards is developed. The functional components of the environment, their interrelation, the main directions of improvement, the necessary resources, and the sequence of activities are determined.

At the fourth stage, the relevant requirements and recommendations are put into practice. This stage provides for organizing digital educational resources, improving the learning management system, introducing information protection mechanisms, training staff, and adapting educational processes to new conditions.

At the fifth stage, the effectiveness of implementation is evaluated. The results of using the information and educational environment, the accessibility of educational resources, the stability of information systems, user satisfaction, the quality of educational processes, and identified shortcomings are analyzed.

At the sixth stage, the information and educational environment is improved on the basis of monitoring results. At this stage, organizational processes are adjusted, educational resources are updated, technical solutions are improved, and requirements for the further development of the environment are refined.

HSR (LONDON),
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Figure-2. Stages of introducing international standards in creating the information and educational environment

The proposed methodological approach makes it possible to regard the introduction of international standards as a sequential process that includes assessment of the initial state, definition of requirements, planning, implementation, monitoring, and improvement of the information and educational environment.

To evaluate the effectiveness of introducing international standards, it is advisable to use a system of indicators reflecting the organizational, technical, informational, and educational aspects of the environment's functioning.

The main evaluation indicators include:

the degree of accessibility of digital educational resources;

the level of integration of information systems;

the stability of the hardware and software infrastructure;

the degree of conformity of organizational processes with established requirements;

the level of information security;

HSR (LONDON),
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the effectiveness of using electronic educational materials;

the satisfaction of teachers and learners;

the dynamics of the quality of educational outcomes.

In this case, effectiveness should be evaluated not only on the basis of technical indicators but also with regard to pedagogical and organizational results. For example, high accessibility of digital resources does not in itself indicate an improvement in the quality of learning if the learning materials do not correspond to educational goals, do not ensure the required level of training, or are insufficiently integrated into the educational process.

An important condition for introducing international standards is the training of teaching and administrative staff. The use of digital educational technologies requires appropriate competencies, skills in working with information systems, an understanding of information security requirements, and the ability to use digital resources in pedagogical activity.

In addition, the introduction of international standards must take economic feasibility into account. Creating an information and educational environment entails costs for technical equipment, software, maintenance of information systems, staff training, and updating of educational resources. Therefore, planning of activities should be based on an analysis of available resources, determination of priorities, and assessment of expected results.

A systematic approach to introducing international standards makes it possible to ensure the gradual development of the information and educational environment without the need to change the entire digital infrastructure of the educational institution at once.

Conclusion. International standards are an important instrument for forming a modern information and educational environment that ensures the interconnection of educational processes, digital resources, hardware and software infrastructure, management mechanisms, and information security.

The analysis showed that the application of ISO and ISO/IEC standards makes it possible to form a systematic approach to organizing educational activity, structuring electronic resources, ensuring the accessibility of educational materials, managing information risks, and improving the digital infrastructure.

In particular, ISO 21001:2025 creates an organizational and managerial basis for improving the activity of an educational institution, ISO/IEC 27001 contributes to building an information security management system, ISO/IEC 19788 provides the methodological basis for describing educational resources, and the ISO/IEC 24751 series is aimed at increasing the accessibility and adaptability of digital educational materials.

The article proposes a structural model of the information and educational environment that combines organizational and managerial, information and resource, hardware and software, information security, and pedagogical and methodological components. A methodological approach to introducing international standards has been developed, providing for the sequential implementation of the stages

HSR (LONDON),
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of analysis, requirements definition, concept development, practical implementation, effectiveness evaluation, and improvement.

The practical application of the proposed approach can contribute to greater efficiency in managing educational processes, better accessibility of learning materials, reduced organizational fragmentation of information systems, an improved digital infrastructure, and higher quality of educational activity.

For military educational institutions, the application of international standards offers an additional opportunity to improve teaching and methodological support, increase the effectiveness of specialist training, and develop the digital educational infrastructure while complying with information security requirements and applicable regulatory restrictions.

Thus, the application of international standards in creating an information and educational environment should be regarded as a systematic direction of an educational institution's development, ensuring the organizational, technical, informational, and pedagogical coherence of its digital infrastructure and educational activity.

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