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Model of IT graduate in the conditions of digitalization of the Republic of Kazakhstan

The article analyzes the model of a graduate of the Faculty of Information Technology on the example of the specialty "Information Systems". It contains special requirements for the content of training information systems specialists, especially for training new types of IT specialists who are able to contribute and analyze various situations, predict the results of decisions, be creative in finding solutions, and be aware of their personal responsibility. In the graduate model, there are distinguished groups of competencies, such as socio-personal, general professional, and special competencies. The components of the content of the educational program for students of the specialty "Information Systems" are described, which have been finalized and changed under the requirements of modern development of society, the degree of digitalization, legislative and regulatory documents of the Republic of Kazakhstan. The main issues and difficulties of training IT specialists arising from changes in the needs of society, the demand for specialists in this field, as well as the recognition by employers of the quality of graduate training, are identified. The article also emphasizes the importance of such an element of training as professional practice, during which the student will be able to apply his knowledge, skills and abilities acquired during training, as well as personal qualities in accordance with the goals of professional activity.

Keywords: information technologies, informational systems, professional competencies, professional skills, IT-specialist, training specialist in information systems, specialist training modules, model of an IT-graduate, digitalization, training.

Introduction

Improving the quality of specialist training and providing new areas of training are the main trends in the development of higher education. Currently, an important trend is the digitalization of our Republic, which is being implemented under the State Program "Digital Kazakhstan".

A significant problem is the training of students who have the necessary competencies and are able to solve the tasks set.

The relevance of the problem of the quality of training of specialists is constantly growing and is determined by a number of objective reasons:

- increasing the dependence of the pace of social development on the level and scale of higher education development;

- the formation of an information society due to the sharp acceleration of scientific and technological progress;

- the formation of a quality management system of higher education based on monitoring of processes related to the training of specialists, modeling of didactic support to improve the quality of training of technical specialists.

The quality of education depends on a significant number of interacting competencies and includes many components. Moreover, the main aspect of the quality of education is the adequacy of the educational result to the existing needs of participants in the educational environment.

To date, the issues of training IT graduates are considered from different points of view, often narrowly focused. Volkov I.V., Ermakova A.Yu. consider the training of specialists in IT areas in order to minimize the academic difference within one area of training to ensure the mobility of students. To identify professionally significant competences of IT-professionals, Volkov I.V., Ermakova A.Yu. note that for most of the IT-profession require the same basic set of competencies, which are aimed at the formation of General cultural and professional competencies [1].

Kubricky J., Castkova P. approach the issue of ICT competencies as a necessary part of the professional qualities of a teacher of technical education [2]. Gastelu C., Kiss G., Dominguez A. consider in detail the levels of mastering ICT competencies at the university [3].

Makhrova L.V. methodical system of formation of information and technological competence of future specialists, based on the implementation of the principle of continuity in the target, substantial, operational-activity, control, estimating and effective components [4].

Naseikina L.F., Zubkova T.M., Tagirova L.F., Tagirov V.K. point out personal qualities that are necessary for an IT specialist to be in demand in the IT services market. Thus, researchers agree that besides hard (technical) skills, soft (also called personal) skills are necessary [5, 6].

Based on the conclusions made during the analysis of psychological and pedagogical literature on these issues, the purpose of the study is identified: to determine the key and professional competencies of hard-skills and soft-skills of an IT-graduate required in the conditions of digitalization of the Republic of Kazakhstan. The object of the study is a graduate of an IT specialty with a set of relevant competencies that will be formed in the learning process.

Experimental

The list of IT competencies is changing dynamically. The university is obliged to train specialists with not one but several competencies.

The following groups of competencies are distinguished in the graduate model:

- socio-personal competencies, including knowledge about the person, features of activity, interpersonal interactions of a person, etc.;

- general professional, including informational, managerial, organizational, design and engineering competencies;

- special competencies, including professional knowledge and skills related to a specific type of activity.

The various components of modern IT are closely intertwined with each other. First, it is difficult to imagine a highly qualified specialist who has no idea about related fields. For example, a highly qualified system administrator who has no idea about the basics of programming and database administration. As well as a programmer who does not understand the principles of computer operation and does not know anything about system administration. Especially if he is busy developing real-time systems, and that is what highly skilled programmers usually do. This list can be continued for long.

Second, if a narrow specialist also finds some application in a system integrator or a software company, then an outsourcer or an IT service company in a non-IT industry will most likely be useless. Because any practical activity, focused on the result, is connected with the aforementioned architecture.

To achieve the purpose of the study, methods of theoretical analysis of scientific and pedagogical literature and educational documents of the Republic of Kazakhstan were used.

Based on the analysis of the professional standard of the direction “Information and Communication Technologies” (Atameken, 2017), the competencies of an IT graduate, as well as the professional and personal qualities of a specialist necessary for successful professional activity are determined.

The change in the requirements for the training of IT specialists is due to the emergence of new types of practical tasks and theoretical problems that differ in systemic and interdisciplinary nature, non-standard and global potential results. Such tasks have complex, multi-valued solutions, which require significant qualitative transformations of the entire professional activity of specialists and the training of new specialists of a

modern type who are able to see the whole situation as a whole, make a personal contribution to the search for a solution, approach it systematically and inventively, and are also able to foresee the result of the chosen solution, realizing their duty and responsibilities [7].

Research and Discussion

In modern society, the quality of training of IT specialists is subject to increased requirements. It is customary to allocate three groups of specialists working with modern information technologies. The first group includes computer maintenance specialists, system engineers, and programmers. The second group consists of project managers; top managers in the field of new information technologies, whose activities are located at the intersection of two areas: subject and program. The third group of specialists includes all those who actively use information technologies in their professional activities.

In accordance with the educational program 6B06103 (5B070300) – "Information Systems", education and training of students are aimed at meeting the needs of the IT specialists' market in the Republic of Kazakhstan with access to the world level.

The scope of directions and orientation of professional activity under the educational program 6B06103 (5B070300) – "Information systems" include computer science and applied mathematics, mobile and Internet technologies, local and global information networks, robotics.

The results of the graduates' mastering of the educational program 6B06103 (5B070300) – "Information systems" are outlined and formed, i.e. the ability to acquire and apply knowledge, skills and abilities, as well as acquired personal qualities, considering in close connection with the goals of professional activity. Graduates of this specialty master key competencies of learning process in such areas as:

- native and foreign language;
- fundamental mathematical, natural science, and technical training;
- computer technology;
- social and cultural activities;
- educational and pedagogical activities;
- entrepreneurial and economic activity.

The new educational standards in all areas of training focus on the formation of a specific set of competencies.

In the field of creating and preparing a qualification system for specialists in the ICT industry, the most successful one is JSC "National Infocommunication Holding "Zerde", together with representatives of leading universities, which have developed professional standards for most professions in the field of information and communication technologies, such as: Software maintenance specialist; Software developer; Software Testing Specialist; Content Manager; Database Administration Specialist; System Administrator; Network Administrator; System analyst; Business analyst. By analyzing these professional standards, one can conclude that most IT professions require almost the same basic set of competencies [8].

For a successful activity, ICT specialist needs two categories of skills – hard and soft skills. When we talking about hard skills, we refer to direct technical knowledge. On the opposite, soft skills refer to communication, team work, creativity, problem solving, and other personal skills. Experts agree that beside hard (technical) skills, soft (also called personal) skills are necessary [9].

To identify the personal qualities of a graduate required for effective professional activity in the field of information technology, as well as corresponding to the requirements of professional standards developed with the assistance of joint associations of employers and representatives of industrial enterprises, expert groups, educational and scientific institutions, we analyzed various sources. As a result, we found out these requirements for personal competencies: organization and discipline, responsibility and initiative, attentiveness, planning and analytical thinking, sense of duty, taking decisions and result orientation, teamwork and the desire to improve professionalism.

Organization involves the performance of an employee's work without flaws, mistakes, manifesting himself in patience, self-organization and endurance in solving professional tasks that usually require long-term sedentary work.

Discipline is characterized by the employee's ability to follow established norms and rules, as well as perform tasks efficiently and in a timely manner.

Responsibility implies the willingness and ability of a specialist to find independent solutions, predict and be responsible for their results and consequences. When making decisions, this means applying a model of behavior that allows one to assess the direct and indirect consequences and implement obligations. If it is

impossible to fulfill the obligations assumed, the employee tries to minimize the damage and notifies interested parties of the changes made.

Initiative is characterized by the desire for independent social initiatives, activity, enterprise, and implementation of their ideas in life.

Attentiveness requires the employee to be precise and meticulous, even in the smallest details.

Planning is activities related to setting goals and actions in the future.

Analytical thinking is characterized by the ability to understand a situation or a task by breaking it into parts and comparing them. It incorporates systematization, innovation and creativity in decision-making. This personal quality implies the employee's search for non-standard solutions to problematic problems in the professional sphere.

Sense of duty implies the need for practical implementation, fulfillment of tasks and obligations in professional activity.

Taking decisions is manifested in the ability to distinguish individual elements of reality, their classification. Having this personal quality allows the employee to evaluate atypical professional situations and make the optimal decision.

Result orientation is the ability to clearly represent the result and the desire to keep it in the process of work.

Teamwork is characterized by the ability to interact with people, communicate politely, respectfully, cooperate with colleagues in the process of achieving work results, is realized in the ability to understand other people, accept their position and argue one's own. Employees with this personal quality actively discuss all work issues, problems and tasks in a team, work to achieve success as a whole, make all decisions together.

Desire to improve professionalism is characterized by the presence of personal motivation to acquire new knowledge and skills, the desire for self-education and the development of professional competencies throughout life.

It should be emphasized that the above-mentioned personal qualities are the basis for the formation and development of the general cultural competence of the graduate of the information profile [10].

In the educational program 6B06103 (5B070300) – "Information systems", the following hard-skills and soft-skills are defined, which should be formed in the educational process for high-quality specialist training:

- hard-skills: high professionalism in the field of IT technologies;
- soft-skills: emotional intelligence, adaptability to global challenges, leadership, entrepreneurial thinking, global citizenship, understanding of the principles and culture of academic integrity.

The implementation of the educational program 6B06103 (5B070300) – "Information systems" is determined by the mission of the university, which is to maintain regional leadership in the field of multidisciplinary classical education through the implementation of modern quality standards, a multi-level model of continuous learning, research, training of competitive specialists of new formation with fundamental knowledge, innovative approaches, research skills for scientific, pedagogical, professional, and practical activities. This is largely due to the information format of the program, which is aimed at preparing a bachelor of engineering and technology in the educational program 6B06103 (5B070300) – "Information systems", can perform research, scientific and technological, organizational and managerial and educational activities in areas that use information systems and computer technologies.

The content of the educational program 5B070300 – "Information Systems" is constantly changing, supplemented and improved in accordance with the pace of development of pedagogical science, updates of legislative and regulatory documents of the Republic of Kazakhstan in the field of higher and professional education. For this purpose, the transforming needs of society in the field of information technology, the demand for graduates in the information sphere, contentment of employers with the level of training of graduates are considered.

To realize the goals of the educational program and manage the educational activities of students effectively, the teacher performs the educational process, acts as the main resource of the educational process. Teachers must match the qualification criteria for licensing pedagogical activities, have extensive and thorough knowledge, possess modern technologies and methods of teaching and training, extensive experience and other necessary skills for effective and productive transfer of knowledge to students.

The educational program realized and introduced in practice with the help of credit and distance learning technologies, which allows students to choose teachers and training mode; timely receive the necessary

advice from teachers during students' independent work under the guidance of a teacher (SRSP); independently study training courses using educational and methodological complexes of disciplines, course cases and electronic library resources; monitor their own progress, etc., i.e. effectively personalize training according to individual abilities and needs.

The requirements for the educational process of training an information systems specialist vary and are supplemented by the university depending on the field of practical application of his knowledge and skills, by changing and replenishing the composition and content of the cycle of special disciplines, in this case, the substance of the syllabus is adapted accordingly.

The content of the educational process studied by the student is determined by the standard of education, which contains the following cycles of disciplines: general education, basic and profile. For their compilation and integration into educational training programs for IT specialists, various disciplines are included, which can be conditionally grouped into modules (Tables 1–9). The names of disciplines may vary depending on the educational institution, but their essence, purpose and content form a basic set of general cultural and professional competencies. The socio-political module (Table 1) is focused on an active civic position, the ability to navigate social interaction. Within the framework of this module, graduates will get an idea of the principles of behaviour, interpersonal relationships and forms of regulation, learn about sociological approaches to personality, spiritual, ethical and cultural values of society, get acquainted with the traditions and culture of the people of Kazakhstan, trends in the development of society and tolerance for the traditions and culture of other peoples of the world, develop creative thinking and non-standard approaches to solving problems.

Table 1

Socio-political module

Block	Disciplines
Social-political	Modern history of Kazakhstan (GE) Philosophy Fundamentals of political science and sociology Rukhani Zhangyru (National Identity)

The natural sciences module (Table 2) must ensure that the skills of economic justification of made design decisions, development of business plan of project and assess the indicators of economic efficiency and risks of their realization, gaining knowledge about legal issues in the information sphere – dissemination and use of various types of information, copyright compliance, processing and storage of personal data. In addition, this module of disciplines should develop skills and abilities in the application of information and communication technologies (ICT) in professional activities, possess network, cloud and multimedia technologies for planning and organizing project activities of future computer science teachers, for organizing online forums and seminars, virtual learning environment; the use of ICT, interactive whiteboards and multimedia projectors for technical support of active types of training; possess the skills of processing information of various types, including: receiving, extracting, modifying, grouping and classifying digital, textual, graphic and visual, hypermedia information.

Table 2

Natural sciences module

Block	Disciplines
Natural sciences	Basics of law and anti-corruption culture Ecology and basics of life safety Basis of economy Applied business The Economics of the business and its legal provision Information and communication technologies (in English)

The professional language module (Table 3) ensures the realization of the potential for the development of professional speech in the native language, advanced mastering a foreign language, activates the mastery of scientific language style, expands knowledge in the field of communication technologies and strategies, develops constructive dialogue skills, is focused on communication in a multiethnic, intercultural and polyconfessional tolerance society.

Table 3

Professional language module

Block	Disciplines
Professional language	Foreign language Kazakh language Professional Kazakh language Professionally-oriented foreign language

The natural-mathematical module in the training of IT specialists (Table 4) should be aimed at obtaining basic knowledge of fundamental sciences represented by mathematical, natural science and technical disciplines. The knowledge acquired from these areas of specialist training is used in the generation of methodological, research and applied basis and foundations of information and communication technologies that contribute to the emergence of a highly educated professional with a broad outlook, developed thinking and communication culture.

Table 4

Natural-mathematical module

Block	Disciplines
Natural-mathematical	Physics-I Math-I Mathematics-II Mathematics-III Numerical method Discrete Mathematics and Probability Theory Mathematical logic and mathematical statistics Visualization of physical processes The circuitry of the computer

The module "Algorithmization and programming" (Table 5) should be aimed at mastering the fundamentals of theoretical computer science, mastering the most common programming languages, modern tools, as well as acquiring software development skills.

Table 5

Module "Algorithmization and programming"

Block	Disciplines
Algorithmization and programming	Algorithms, data structures, and programming Programming technology Theoretical foundations of computer science Programming in high- level languages Functional programming Programming in C ++ Object-oriented programming Programming in C # Development Net-applications Java programming Advanced technologies and application development languages Programming in PHP Net programming

The information technology module (Table 6) should be aimed at studying hardware and software, mastering the principles of building and functioning of computer systems in general and peripheral devices and software in particular, considering methods for configuring hardware, studying computer and network equipment of various configurations, as well as work with big amounts of data. This module also includes information security – any IT-specialist must master the skills of analyzing potential threats to information security of the designed systems and choose, apply, develop methods and means of protection against them.

Table 6

Information technology module

Block	Disciplines
Information technology module	IT-infrastructure Architecture and programming in Assembler Basics of building and functioning of computer systems Network operating system Data management (Big Data) Computer networks Networking for home and small businesses Telecommunications systems and networks Development and support of computer networks Information security and information protection Cryptology

The professional module (Table 7) should provide an in-depth study of the principles of creating and maintaining information systems and databases, mastering the methodology of developing technologies for their design and creation. Graduates get acquainted with the intellectualization of information systems and know the technologies of intelligent systems development; learn how to research, select and process data from digital and Internet sources; be able to operate models and perform object modeling, as well as be able to create multimedia presentations; possess programming skills using modern tools and languages. This module forms students' understanding of the importance and place of information processes and technologies in social environment, their technical capabilities and prospects for use in various sectors of human activity.

Table 7

Professional module

Block	Disciplines
Professional module	Basics of information systems Databases in IP Design of information systems Applied intelligent systems Information systems interface The development of mobile application Designing Internet applications Web-technology Development of Web - applications Computer graphics Computer technology of three-dimensional graphics and animation Multimedia technologies Computer modeling Technologies of development the modern information systems on the .NET platform Design and development of database applications

The “Robotics” module (table 8) is aimed at studying the technology of developing robotic systems, designing robotic systems, the principle of operation of radio elements, modules, sensors and actuators, creating applications for controlling robots and automated mechanisms on different platforms from mobile devices.

Table 8

Robotics module

Block	Disciplines
Robotics	Introduction to robotics Technology for developing robotic systems Design of robotic systems Development of robotic systems Mechatronics and robotics Robot-oriented programming

The additional module (Table 9) should be focused at mastering oral and written speech, logically correct, reasoned and clearly structured; at developing a culture of thinking of a specialist capable of perceiving information, summarizing it, analyzing it, setting goals, objectives and tasks, choosing ways to achieve and solve them; conducting a thorough conversation in English on a professional topic; preparing business documents in the state language.

Table 9

Additional module

Block	Disciplines
Additional	Office work in the state language Documentation Basic English language course (level A2-B1) Basic English course (level B1) Basic English course (level B2) Language for specific purposes 1 Language for specific purposes 2

The catalog of elective disciplines is the next component of the educational program, developed on the basis of the provisions of the annually updated curriculum of the specialty, while taking into account a set of basic, specialized disciplines. The disciplines located in the catalog are regularly analyzed and transformed to meet the development and demands of production and the surrounding world. Thus, it remains relevant, connected with practical activities and applied significance [11].

Trends in the use of specialized software by organizations in the education, science and management of the region required the formation of new curricula and the addition of new elective courses to the plans [9]. For this purpose, new elective courses, such as Technologies for solving professionally oriented tasks, System Programming, PHP Programming, Java programming, Internet of things (IoT), Development of virtual and augmented reality applications and others were prepared and introduced.

Elective courses are included in the catalog of elective subjects. The catalogue of elective disciplines is periodically analyzed and corrected in close connection with the current requests of employers, which are bilaterally approved and reflected in the list of coordination of disciplines. For example, employers such as EPAM Kazakhstan LLP, Creatida Internet Company LLP, WTO Information Systems Center LLP, Orleu Center for Innovative Technologies LLP at various times offered the above elective courses, which were promptly added to the catalogue of the specialty “Information Systems”.

Graduates are trained under the educational program with constant control of national and regional needs and interests both in science and education, and in the applied activities of enterprises, which is confirmed by the protocols for the approval of elective disciplines.

The results of mastering educational program are determined by the competencies acquired by the graduate, i.e., his ability to use developed personal qualities in accordance with the goals and objectives of professional activity, to apply the acquired knowledge and skills in practice. This is facilitated by the adaptability and adaptability of individual programs chosen by students taking into account personal abilities and interests, the specifics of the university and the dynamic labor market conditions in the field of information technology and the required professional competencies.

To ensure the connection and complementarity of all stages of the project, it is proposed that course projects and works on the studied disciplines carried out during the study period should be related to the direction of the final thesis or project. This also applies to the choice of disciplines for which course projects and works will be prepared, and to the selection of the content of the work performed. Depending on the preferred field of study, course projects and works may be related to analysis, development and design:

- databases of the organization (enterprise);
- subject-oriented IP;
- applied expert IS;
- websites of an organization (enterprise), an online store;
- electronic document management systems of the organization (enterprise);
- local (corporate) network of the organization (enterprise);
- mobile applications;

- threats to the information security of the IP (computer network) and the choice of methods and means of protection against them.

The subject of term papers (projects) should be focused on the step-by-step preparation of the thesis or project. Ideally, each course of project (work) should become an integral part of the thesis or project, or at least a full-fledged example (analogue) of the component part of this work. As a result, the entire set of course projects (works) should make up the majority of the thesis.

The defense of term papers and projects should be conducted openly and publicly, with a presentation of stages and results. This approach helps students learn how to prepare reports and make presentations, get used to public speaking, discussions, and develop argumentation skills. The creation and functioning of such a system for supply a thesis or project requires coordinated, focused and purposeful work of the entire teaching staff of the graduating and auxiliary departments.

Practice is also an important part of the education and specialists training. The educational standard assumes the following types of practice:

- Educational practice. The main content is the implementation of practical training, educational research, creative tasks corresponding to the nature of the future professional activity of students;

- Production and pre-graduate practice is an effective form of training directly related to work in the specialty in organizations (enterprises), necessary to demonstrate and consolidate knowledge and skills in the workplace, as well as intended for collecting and preparing materials for a thesis or project.

The final stage of specialist training is writing and defending a thesis or project. At this stage, students carry out complex projects, during which they systematize, increase and supplement their theoretical knowledge, deepen and consolidate practical skills in accordance with the chosen direction and the qualifications obtained, and proving their ability to work independently in their specialty.

Conclusions

Graduates of the specialty “6B06103 (5B070300) – Information systems” are in demand as a system administrator, software engineer, programmer, IS developer, leading information systems specialist, system engineer in various organizations.

For the successful professional activity of IT graduates, the necessary competencies and skills (hard-skills, soft-skills) are formed during training, professional practice, and according to the results of training when writing and presenting the final work or project, covering such modules as: socio-political, natural sciences, professional language, natural mathematics, algorithmization and programming, information technology, professional, robotics and additional. Thus, the competencies and skills acquired by the graduate of the educational program “6B06103 (5B070300) – Information Systems” will provide high-quality training of IT specialists.

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Қазақстан Республикасының цифрландыру жағдайындағы IT-түлегінің моделі

Мақалада «Ақпараттық жүйелер» мамандығы мысалында IT-түлегінің моделі қарастырылған. Онда ақпараттық жүйелер мен технологиялар бойынша мамандар даярлау мазмұнына, әсіресе әртүрлі жағдайларға ықпал ете алатын және талдай алатын, шешім нәтижелерін болжай алатын, яғни шешім іздеуде шығармашылық және жеке жауапкершілікті сезінетін IT-мамандардың жаңа түрлерін дайындауға қойылатын ерекше талаптар қамтылған. Түлек моделінде әлеуметтік-жеке, жалпы кәсіптік, арнайы құзыреттер сияқты құзыреттілік топтары ерекшеленген. «Ақпараттық жүйелер» білім беру бағдарламасының студенттерін оқыту мазмұнының компоненттері сипатталған, олар қоғамды цифрландыру талаптарына, Қазақстан Республикасының Жоғары білім беру саласындағы заңнамалық және нормативтік құжаттарына сәйкес пысықталған және өзгертілген. Қоғам қажеттіліктерінің өзгеруі, түлектерге деген сұраныс, сонымен қатар, жұмыс берушілердің оқу сапасын мойындауы, яғни, IT-мамандар дайындаудағы мәселелер айқындалған. Сонымен қатар, мақалада студент кәсіби қызметтің мақсаттарына сәйкес білімін, дағдылары мен жеке қасиеттерін қолдана алатын өндірістік тәжірибе сияқты оқыту элементінің маңыздылығы баса айтылған.

Кілт сөздер: ақпараттық технологиялар, ақпараттық жүйелер, кәсіби құзыреттілектер, кәсіби дағдылар, IT-маман, ақпараттық жүйелер бойынша маман даярлау, мамандарды даярлау модульдері, IT-түлек моделі, цифрландыру, оқыту.

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Модель ИТ-выпускника в условиях цифровизации Республики Казахстан

В статье рассмотрена модель ИТ-выпускника высшего учебного заведения на примере специальности «Информационные системы». Она содержит особые требования к содержанию подготовки специалистов по информационным системам, особенно для подготовки новых типов ИТ-специалистов, способных вносить свой вклад и анализировать различные ситуации, прогнозировать результаты решений, проявлять творческий подход в поиске решений и осознавать свою личную ответственность. В модели выпускника выделены группы компетенций, такие как социально-личностные, общепрофессиональные, специальные компетенции. Описаны компоненты содержания обучения студентов образовательной программы «Информационные системы», которые были доработаны и изменены в соответствии с требованиями цифровизации общества, законодательных и нормативных документов Республики Казахстан в сфере высшего образования. Выявлены проблемы подготовки ИТ-специалистов, возникающие при изменении потребностей общества, востребованности выпускников, а также признания работодателями качества обучения. В статье также подчеркнута важность такого элемента обучения, как производственная практика, в ходе которой студент сможет применить знания, навыки и личностные качества в соответствии с целями профессиональной деятельности.

Ключевые слова: информационные технологии, информационные системы, профессиональные компетенции, профессиональные навыки, ИТ-специалист, подготовка специалиста по информационным системам, модули подготовки специалистов, модель ИТ-выпускника, цифровизация, обучение.

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