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THE ELECTRONIC SYSTEM FOR THE MANAGEMENT OF UNIVERSITY EDUCATIONAL PROGRAMS

Abstract. The article presents the research results of the electronic system for managing university educational programs (EP). The analysis of scientific works showed that higher educational institutions need the introduction of integrated information systems. Such systems are the technical basis of the electronic university and have functionality for managing education and providing communications to university management. An analysis of the main processes of EP management was performed, and interested parties, their roles, and participation in the methods were determined. The proposed mathematical model is the basis of management for introducing the EP, its development, and implementation control based on quality parameters. The software module is a part of the university's management process support system and the JetIQ of Vinnytsia National Technical University's (VNTU's) comprehensive information system. For the analysis of the subject area and the formation of optimal management processes, the methodological recommendations of the National Agency for Higher Education Quality Assurance (NAQA), data export and import system for the Unified State Electronic Database on Education Issues, the experience, and recommendations of experts from the department of quality assurance of education of VNTU, experts and guarantors of educational programs were used. Precedent models are formed about such role scenarios – applicant, student, teacher, guarantor, management, expert, stakeholder (employer). Such models made it possible to create not only the software module for the management of educational programs (QEd – **Q**uality **Ed**ucational) but also to determine the conditions for publication on the main website of VNTU of educational programs and documentation of their development, syllabi on the foremost showcase and jet-sites of the department, to create scenarios for automatic quality control of the EP. The result of the creation of the software module for the management of educational programs is a system of structured information regarding the development and implementation of the educational program, which allows the guarantor and specialists of the department to ensure the quality of education by use special containers for documentation and interested parties to use public up-to-date information on the university's websites.

Keywords: digitization; electronic university; management system; educational program; informational electronic educational environment; information electronic management environment; educational program management module; JetIQ.

1. INTRODUCTION

Modern educational institutions actively use various information technologies in academic and management processes. This information is used to optimize learning and management processes and actively introduce blended learning methods and the concept of an electronic university. Implementing educational programs requires special tools to support a high level of education quality assurance. Such tools must comply with the legislative rules

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for developing and implementing educational programs and the peculiarities of implementing educational and management processes at the university. A comprehensive approach to forming requirements for developing the management subsystem of academic programs, which will consider the peculiarities of management and educational processes, should be based on the well-known concepts of quality management, development of the university and its electronic environment. The collaboration of methodological concepts of the implementation of educational programs with the tools for the creation and functioning of the electronic information environment will allow for improvement in the procedures for managing the processes of development and implementation of educational programs, monitoring the indicators of education quality assurance. The research is relevant for improving the management system for ensuring the quality of education for a modern university and creating a practical software module for processing, presenting, and storing information about the results of the implementation of educational programs.

Research in the direction of "Information technologies in education" as a component of the field of knowledge "Information technologies" involves the use of well-known methods of organizing educational and management processes, the formation of a single microservice information ecosystem "Electronic University". The educational program management module is one of the most important modules of the information ecosystem. The functions of monitoring and controlling the results of the implementation of educational programs allow for the assurance of a high level of quality in the provision of educational services. That is why it is advisable to investigate the concepts of quality management and the peculiarities of their adaptation to the management of educational programs in a modern educational institution

A proposed management system called the "method of containers" aims to enhance management functions. It involves storing project files, the current version of educational programs, and links to modules that monitor the indicators of providing educational programs with resources. The management scenarios of key actors such as the quality assurance department and guarantors are also defined. This system uses scientific research to digitize management in higher education and automate specific management processes, particularly in educational program management. There are no existing analogues of this proposed module, and the prototype of the educational program management is based on the principles of the information ecosystem. It considers the peculiarities of educational program management in Ukrainian higher education institutions.

The electronic university is an automated system for managing the educational process and supporting a higher education institution's methodical, scientific, and managerial activities. It includes information and management support, which is presented in the form of a digital microservice ecosystem of the university.

Statement of the problem. The complex system of ensuring the implementation of university activity processes is based on the following subsystems:

- Training management subsystem.
- Subsystem of public information.
- University management subsystem.
- Subsystem of ensuring methodical activities.
- Subsystem of providing scientific activity.

The requirements for a high level of quality in providing the results of educational services at the university are the basis for implementing management modules and the management module of educational programs. This subsystem is the basis for teaching students and moderating their educational trajectories. Compliance with the level of education quality assurance is carried out by conducting internal audits and external procedures for

accreditation of educational programs. That is why the educational program management module is a priority among the software components of the e-university management scheme.

The methodology of its creation is based on the rules for the provision of educational services, the use of electronic services of the university and requirements for the level of quality of the educational program (its implementation). Research and practical implementation of the electronic management system of educational programs require studying the experience of other universities.

In addition, it is expedient to adapt the principles of quality management to the specifics of the management of an educational institution, to emphasize the control of indicators of compliance with licensing conditions, to support the principles of transparency and publicity of higher education institutions' activities, etc.

The implemented electronic system for managing the university's educational programs should work as part of the "Electronic University" information ecosystem and be a powerful tool for program guarantors and education quality assurance department specialists.

Analysis of recent research and publications. The relevance of research on developing electronic management modules of universities based on learning management systems is confirmed by scientific and practical publications of foreign and domestic scientists and practitioners [1-7]. Various sources were analysed to create the educational program management module as an "Electronic University" information system component. Among the various research areas are such as:

- developing integrated information systems to ensure the quality and improvement of IT infrastructure, electronic modules for management and training [1], [2].
- improvement of approaches to e-learning and teachers' work using a virtual environment; integrity detectors; validation modules [3], [4], [5];
- development of interaction between training and quality management systems [6];
- formation of a high-quality university environment of SMART education using modern information technologies [7].

The relevance of research on developing electronic management modules for universities is confirmed by several scientific and practical publications of foreign and domestic scientists and practitioners [8], [9]. However, the development of an integrated university management system and an educational program management system adapted to the peculiarities of the university's management and educational processes and the requirements for educational programs of regulatory documents of education quality assurance agencies have not been considered sufficiently and require further research.

Such systems are built on the implementation of the idea of synchronous and asynchronous interaction and the implementation of educational programs in a mixed-learning environment [6-9].

Such systems are built on implementing the idea of synchronous and asynchronous interaction between the teacher and students with the possibility of performing various tasks, conducting lectures, testing, monitoring knowledge, etc. In addition, such systems, as a rule, include electronic deanery modules or are integrated with them [6], [7]. The public information subsystem consists of sites that contain mandatory and desirable general information materials in public access.

Among the known studies, the most developed are learning management systems, which are the basis of distance and mixed forms of learning.

University management information systems consider the peculiarities of such institutions as educational institutions. The authors of the academic information system research justify the expediency of complex automation and internal development of software modules of such a system [10].

Proposals for ready-made university management software are fragmented and modular, requiring extraordinary efforts to adapt to the educational and management processes of the university and integrate into a single information system [11].

The analysis of publications on the creation of a methodology for managing educational programs and its programmatic implementation as a subsystem of a single information ecosystem indicates that the development of such a methodology and its implementation is a topical topic and should consider the results of research into automated university management systems, individual program modules, and the experience of implementing education quality management, technical aspects of software implementation of microservice systems.

The development of the educational program management module is based on the methodologies of creating a high-quality electronic information environment of mixed learning, the principles of quality management, and the features of educational program management.

The aim of the research. The study aims to develop a methodology for managing the development and implementation of educational programs and their implementation as a subsystem of educational program management in a single information ecosystem of an electronic university.

2. RESULTS OF THE RESEARCH

2.1 Automated generation of information on quality assurance criteria

Implementing the quality management system at enterprises and institutions involves using ISO 9001 standards and defining the leading indicators of the quality of products and services, the quality of which is evaluated [12]. Automating the quality management system involves using special tools to determine business processes and indicators of their execution and the quality of obtaining results – products and services [8]. An ideal automated quality management system involves complete documentation of the definition and description of business processes, their owners, and quality indicators of the performance of the defined processes and the results obtained. In addition, such a system has a directory of standardized indicators with which a comparison is made to determine the level of quality indicators. ISO international standards are used voluntarily within enterprises and organizations and primarily ensure the quality of management. The complex automated quality management system is designed to build an integrated management system for the effective development of the organization according to the defined mission and target direction. ISO 9001 is based on seven principles of quality management. Including the next:

1. Focus on the client.
2. Maintaining leadership and a high level of competitiveness (uniqueness or compliance with the level of service provision and product production)
3. Engage stakeholders and work with internal and external teams.
4. Focus on the quality of business processes and results.
5. Continuous development and improvement.
6. Making management decisions based on evidentiary information.
7. Management of relations between owners of business processes, customers, competitors, experts, etc.

Features of the quality management of the provision of educational services of higher education, and in particular the management of academic programs, involve:

The use of quality management principles.

The introduction of a process approach to the digitization of management.

The formation of scenarios for all identified sectors in the management system of educational programs.

Management of a higher educational institution has its characteristics [5],[7],[9]. Digitization of every university management process will allow transformation in educational methods and quality control. Defining all management, teaching, and learning roles allows for effective implementation of university digitalization processes. Evaluation of the quality criteria of the provision of educational services involves adapting the quality management principles. Management modules are created based on the process approach and quality management based on the context of the principles of the Industry 4.0 paradigm applied to SMART education.

The university management subsystem consists of the following main modules:

- Document management system,
- System for monitoring the execution of contracts (plans, decisions),
- System for monitoring compliance with license conditions.

Management system of educational programs. Each of the management modules corresponds to the necessary functionality for management and must meet the quality criteria.

Two modules - the system for monitoring compliance with licensing conditions at each teacher and department level, specialities, and the system for managing educational programs- use the criteria for ensuring the quality of higher education by the NAQA documents. That is why creating a management system for academic programs and using a license conditions control system in accreditation processes will improve the management part of the "Electronic Dean's Office" information ecosystem.

2.2 The concept of creating a management system for educational programs

Educational services of higher education are based on the implementation of educational programs. Such programs are created by the needs of the market and the availability of modern resources for their implementation. The Regulation of their accreditation forms the criteria for evaluating educational programs [13]. Considering that one of the principles of quality management is improvement and development, the management system of educational programs should provide for the possibility of monitoring documents of different periods, recording the results of discussions, conducting internal and external audits, making changes based on proposals or by changes in standards and legislation, etc. In addition, the EP management system should focus on the needs of all interested parties. Such a software module is designed to ensure the quality of the educational process, and that is why the authors named this software module QEd. Among the actors of the system are applicants, students, teachers, guarantors, employers, the management of a higher educational institution, and in particular, representatives of the higher education quality assurance department, experts.

Fig. 1 presents the general model of management of EP.

The processes of management of educational programs are implemented according to the following stages:

- Justification of the possibilities of implementation and development of the educational program.
- Development and publication of the educational program project.
- Publication of reviews and feedback on the educational program.
- Approval and publication of the educational program.
- Implementation of the educational program.
- Collect feedback and proposals for making changes to the educational program.
- Formation of the program update project.

– Approval and publication of the educational program.

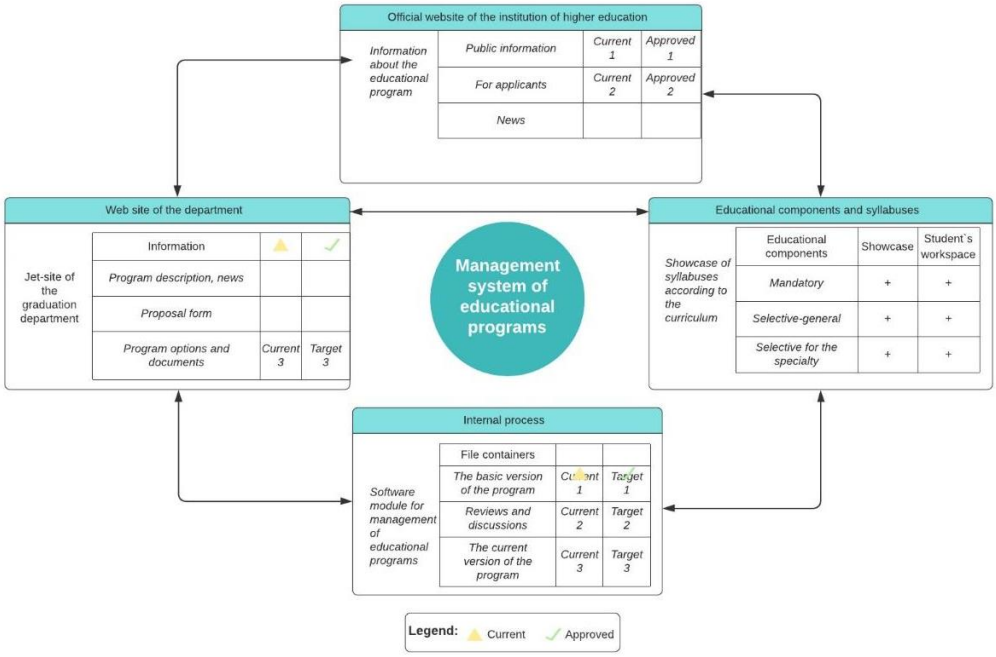

Fig. 1. General structure of the QEd EP management software module

Between these stages, there is an internal verification of compliance with the requirements for implementing educational and management processes, indicators of the professional activity of teachers implementing the academic program, surveys of applicants, stakeholders, scientists, etc.

Specialists of the Centre for Quality Assurance of Education and guarantors of the educational program are the coordinators of the implementation of all defined stages. The information sets of educational program management processes include criteria for evaluating the quality of the educational program, provision of personnel and other resources, the content of the educational program and all regulatory documents for its implementation by the recommendation of the National Agency for Quality Assurance of Education.

Each of the criteria is evaluated according to the recommendations. For example, the provision of personnel resources is characterized by the presence of teachers in the relevant field, speciality, and professional activity. Such information is formed based on the data entered by the teacher regarding his professional activity and is controlled by specialists of the Department of Quality Assurance of Education. The declared indicators can be accepted or rejected according to the rules of their formation. For example, the publication date, documents confirming a specific type of activity, etc., may be considered. These indicators are the basis for determining the rating by the number of completed points of professional activity, which is automatically published based on the results of approved types of activity by the centre for ensuring the quality of education.

According to the defined stages, information tuples can be formed. They are formed in the system in the form of information files of the content and components of educational programs Kq, licensing requirements for the level of professional activity of teachers, and requirements for other resources for the implementation of educational programs Khr. Licensing requirements and recommendations of NAQA define these criteria. They are implemented in the form of projects of educational programs that are discussed and corrected,

with further approval of the current educational program Zpn and its components OK (S), its implementation and formation of a self-assessment report Zvs, conducting internal and external audit Av, Az. The results obtained from the implementation of educational programs and their PI quality indicators are presented in the "Public Information" section on the official website of the educational institution.

Information flows of EP management are formed according to the following information sets:

$$\langle Kq;\ Khr\rangle \rightarrow \langle Zp_1;\ Zvs,\ Zp_{\ldots n},\ OK\ (S);\ Av;\ Az,\rangle \rightarrow \langle PI\rangle,$$

where Kq – criteria for evaluating the quality of the educational program,

Khr – criteria for providing educational components by human and other resources,

Zp_1 – the content of the EP (basic),

Zp_n – the content of the EP (variable, with changes - from 2 to n),

Zvs – self-assessment report,

OK (S) – educational components, syllabi,

Av - results of internal audit,

Az - external audit results,

PI – public information.

By the criteria for evaluating and ensuring the quality of educational programs, the content of the program and documentation of its implementation are formed. The results of proposals, audits, and reports are the basis for starting a new version of the EP and making changes. The content of the educational components and the specified general information is public and should be displayed on open resources.

Fig. 2 presents the panel for creating a record, entering metadata, controlling the main processes of the corresponding educational program, and filling file containers.

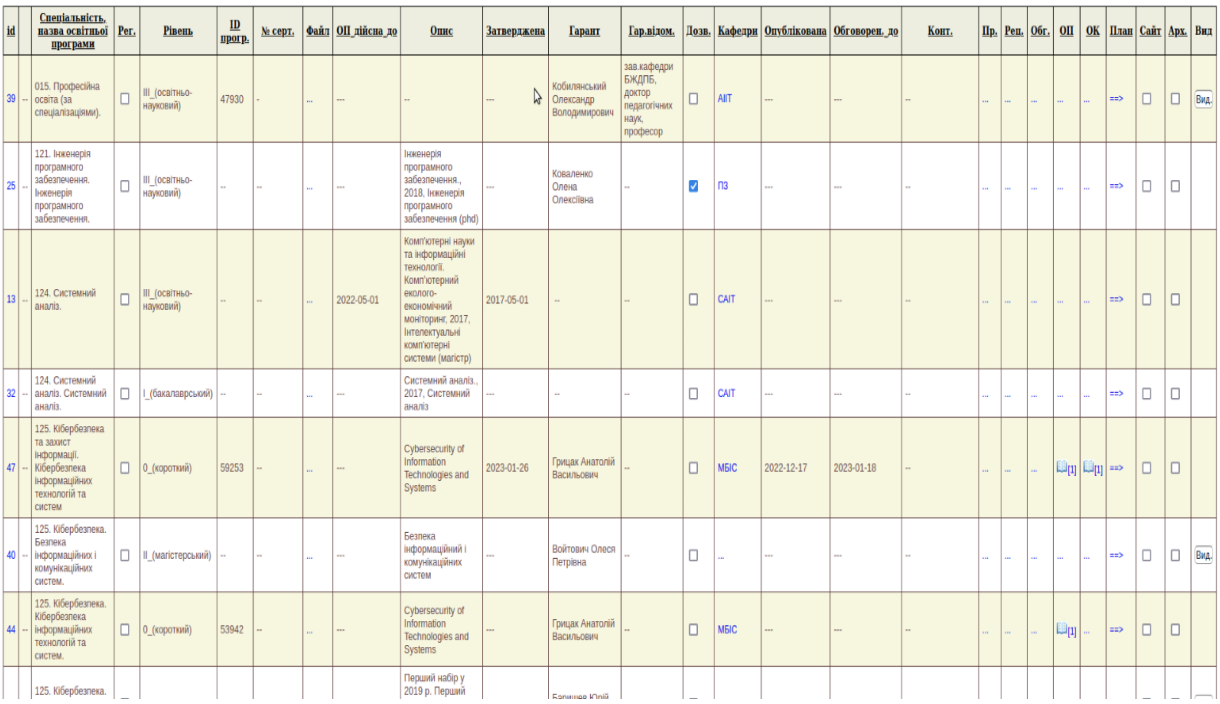

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Fig. 2. Panel for creating records and managing the main processes

Table 1 contains a list of quality management principles and their detailing by the evaluation criteria of educational programs before and during accreditation, in the post-

accreditation period to determine the main processes of automating the management of educational programs.

Table 1

The relationship between the quality management system of higher education provision and the tools of the EP management software module

Principles of quality management	**Principles of Management of Educational Programs**	**Evaluation criteria (by numbers [11])**	**Information on the quality management system**	**Users**
1. Focus on the client.	Student-centred approach	2,5,7	Public information, results of discussion of proposals, electronic forms for proposals	Applicant, student
2. Support of leadership and a high level of competitiveness (uniqueness or compliance with a sufficient level of quality in the provision of services and production of products)	High level of quality educational services, high level of research	1,5,7,9	The uniqueness of the program, its educational components, teaching methods, ratings, and performance results	The Guarantor, specialist of the Education Quality Assurance Department
3. Engagement of stakeholders, and work with internal and external teams.	Cooperation with employers. Student-centred approach. The motivation of teachers for development and professional development Internal and external audit.	3,4,6,8	Results of evaluation of the EP by stakeholders and auditors.	All users
4. Focus on the quality of business processes and results.	Structured educational process, methodical. scientific and managerial activities.	1,2,6	The results of the implementation of the educational program.	The Guarantor, specialists of Center for Quality Assurance of Education, teachers, employees of service departments
5. Continuous development and improvement.	Regular audit and improvement of educational programs.	9	Structured information on the results of audits.	The Guarantor, teachers, heads of departments, specialists of Center for Quality Assurance of Education
6. Making managerial decisions based on evidentiary information.	Evidential reports of self-assessment, internal and external audit, and control of compliance with license conditions.	6,9	Reports, and summary information as required.	Guarantors, teachers, heads of departments, specialists of Center for Quality Assurance of Education
7. Management of relations between owners of business processes, customers, competitors, experts, etc.	Implementing the best practices of creating educational programs and managing their development according to the proposals of all	1,8,9	Defined role functions of EP management and the documents they create edit, approve, and	All users

	stakeholders is a rational approach to the performance of role functions in the management of educational programs.		publish.	

The technical implementation of the EP management module is based on a microservice approach. QEd is created as a separate module in the JetIQ electronic educational process management system of VNTU and is implemented based on LAMP architecture.

It uses its relational database (based on MySQL), which includes seven tables with EP metadata. Metadata describes the purpose, structure, dates, guarantors, responsible departments, etc. Each EP is associated with a file database designed to store its pdf documents. The file database uses six file containers with the following purpose:

- Files of projects of educational programs.
- Files of reviews and feedback.
- Discussion files.
- Files of approved versions of educational programs.
- Component files.
- Files of approved educational programs by the Industry Expert Council and NAQA.

The presented ratios can be used to test the activity of users in the management system of educational programs by the defined procedures of accreditation and monitoring of the quality level of the educational process. Table 1 also contains recommendations for information on the level of education quality assurance and the roles of each user. In its work, QEd also uses several tables from the VNTU JetIQ system database, for example, tables of specialities, educational programs, teachers, faculties, and departments. This ensures its integration into VNTU's JetIQ infrastructure.

2.3. Scenarios of using the software module for the management of educational programs

Fig. 3 presents the role model of the software module for managing educational programs by the execution of business processes by such actors as an applicant, student, teacher, Center for Quality Assurance of Education (CQAE) specialist, guarantor, and expert of the NAQA.

Applicants should familiarise themselves with the educational program, syllabi, information about teachers, and teaching methods.

The student should have a more detailed opportunity to familiarize himself with the educational materials of the educational components. All interested parties should be able to make proposals and participate in the discussion of the EP, etc. The guarantor must be able to form information about EP parameters and publish proposals, protocols, discussion results, self-analysis reports, etc. A specialist in the education quality assurance department must be able to verify and control information, approve documents for public access, and conduct internal audits. The expert must be able to work with general information, with documents approved and published in public access.

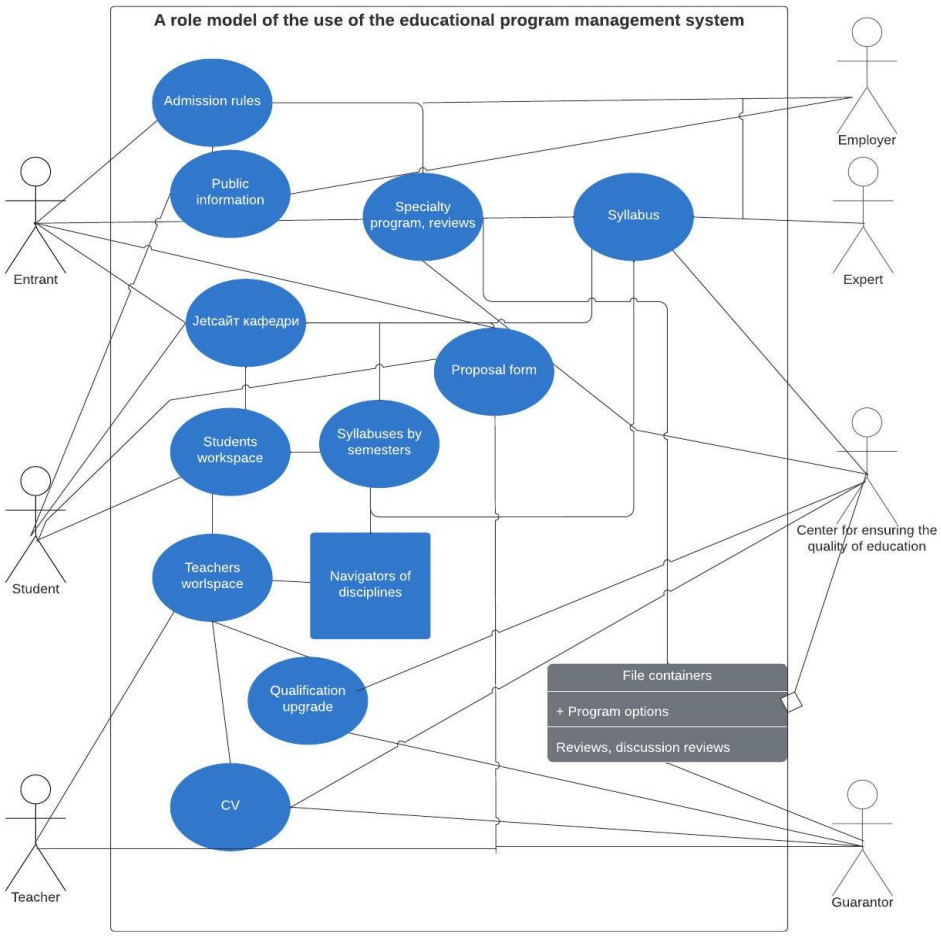
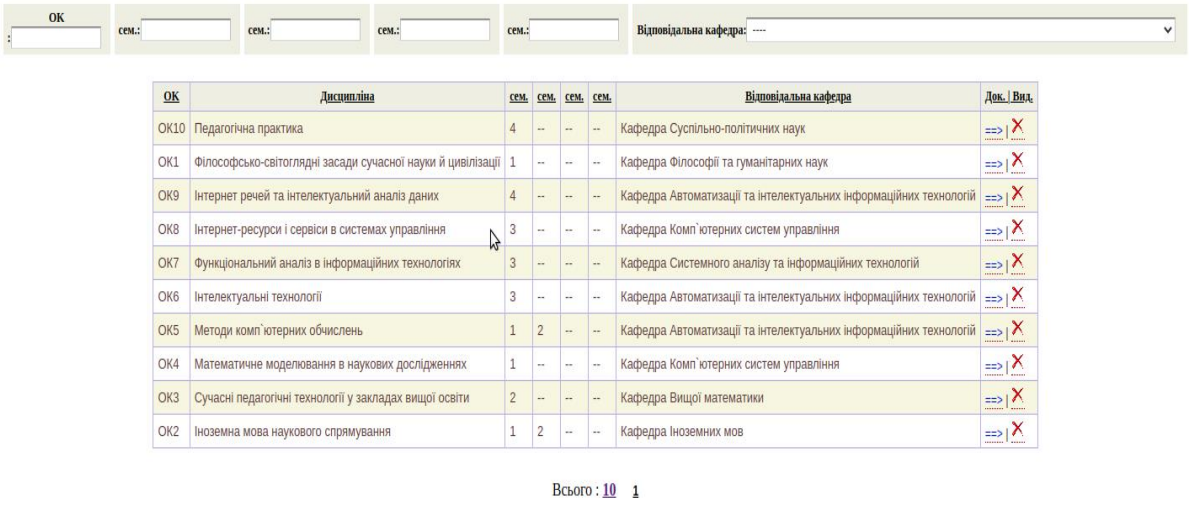


Fig. 3. Role model of management of educational programs

The curriculum lists disciplines, their distribution by academic semesters, and the departments responsible for implementing these educational programs. Fig. 4 presents a panel for creating records of educational components under the curriculum.



ОК : | сем.: | сем.: | сем.: | сем.: | Відповідальна кафедра: ----

ОК	Дисципліна	сем.	сем.	сем.	сем.	Відповідальна кафедра	Док. | Вид.
ОК10	Педагогічна практика	4	--	--	--	Кафедра Суспільно-політичних наук	==> | X
ОК1	Філософсько-світоглядні засади сучасної науки й цивілізації	1	--	--	--	Кафедра Філософії та гуманітарних наук	==> | X
ОК9	Інтернет речей та інтелектуальний аналіз даних	4	--	--	--	Кафедра Автоматизації та інтелектуальних інформаційних технологій	==> | X
ОК8	Інтернет-ресурси і сервіси в системах управління	3	--	--	--	Кафедра Комп`ютерних систем управління	==> | X
ОК7	Функціональний аналіз в інформаційних технологіях	3	--	--	--	Кафедра Системного аналізу та інформаційних технологій	==> | X
ОК6	Інтелектуальні технології	3	--	--	--	Кафедра Автоматизації та інтелектуальних інформаційних технологій	==> | X
ОК5	Методи комп`ютерних обчислень	1	2	--	--	Кафедра Автоматизації та інтелектуальних інформаційних технологій	==> | X
ОК4	Математичне моделювання в наукових дослідженнях	1	--	--	--	Кафедра Комп`ютерних систем управління	==> | X
ОК3	Сучасні педагогічні технології у закладах вищої освіти	2	--	--	--	Кафедра Вищої математики	==> | X
ОК2	Іноземна мова наукового спрямування	1	2	--	--	Кафедра Іноземних мов	==> | X

Всього : 10 1

Fig. 4. Editor of educational components of the program

Each discipline of the curriculum has its register of mandatory documents, for example, lectures, syllabi, tests, etc.

The process of preparing EP data:

- The system administrator (employee of the University Education Quality Assurance Centre) enters the initial metadata of the EP (speciality, level of education) into the system and appoints the Guarantor and responsible departments. The Guarantor is given the right to enter other data regarding the EP and place documents in its file containers.

- All members of the responsible departments have the right to review the current data of the EP and its documents. They also receive the right to create and edit the curriculum of the EP and its components (Fig. 4).

- The Guarantor adds to the parameters of the EP dates of the start and the end of its discussion, information about contacts, and a file with the educational program project.

Discussion, work on the project of the educational program, and approval:

- the system administrator enables the display of EP data on the websites of the responsible departments;
- during this period, work is underway on improving the educational program, collecting and placing documents in file containers, entering and correcting plans of disciplines, etc. The Guarantor enters new data and documents regarding educational programs into QEd;
- all changes are automatically updated on the Jet-sites of the departments;
- the curricula entered in QEd on the Jet-sites of the responsible departments automatically create WEB pages with a list of disciplines and their distribution by semesters and provide information about the availability of relevant syllabi and educational resource navigators in the system;
- participants in preparing the EP can receive and correct all the complex information.

Fig. 5 shows the view of the window with metadata of educational programs on the department's website.

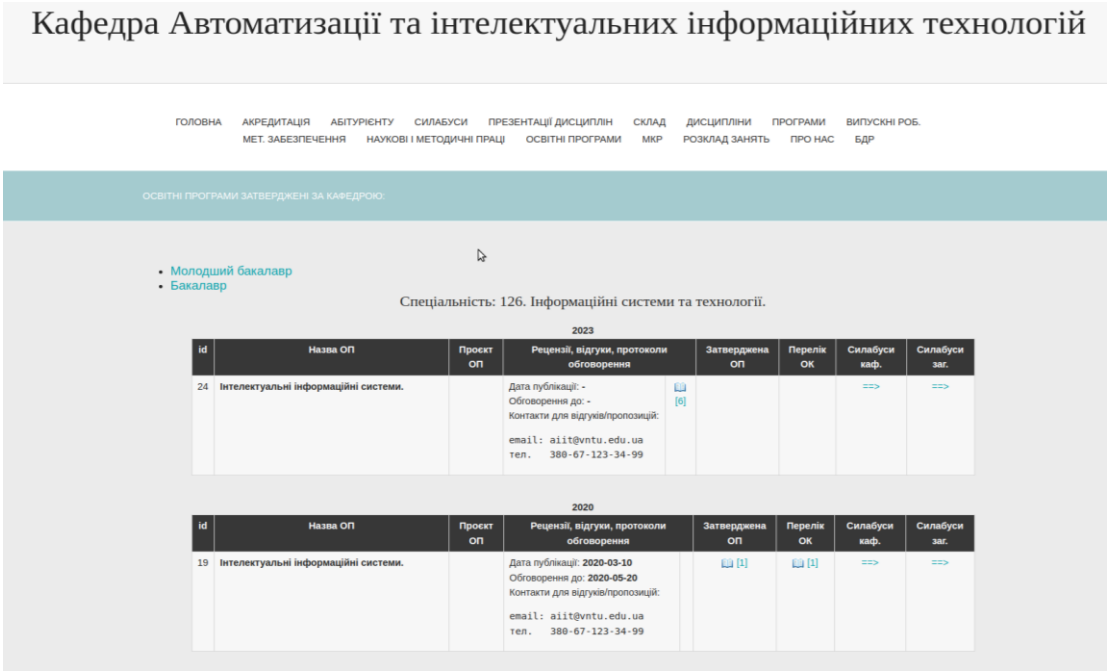


Fig. 5. Information window on the creation and implementation of the EP on the website of the department

Updated information from the QEd module automatically changes information on the websites of the responsible departments, the syllabus showcase, and the public information section on the main university website.

3. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The results of the study of the management processes of the university and the principles of quality management allow us to conclude that the management of a higher education institution has its characteristics and requires special software tools for the automation of management. The primary management modules for evaluating the level of education quality assurance are the educational program management system and the licensing requirements control module.

The process approach to the creation of management modules made it possible to determine the roles of each actor and create scenarios for the implementation of basic procedures to improve the quality of the results of the implementation of educational programs, to automate the work of guarantors and specialists of the education quality assurance department.

The software modules we've developed cater to the information needs of a broad range of stakeholders. These include applicants, students, educational program guarantors, Department of Quality Assurance of Education specialists, employers, and experts.

The development of university management modules is included in the IT strategy of its development.

Modelling of scenarios for the use of software modules was performed according to the needs of each of the actors listed.

The results of testing and implementation of the system management of educational programs allow the following conclusions:

1. The implemented EP management system is based on management processes and criteria for ensuring the quality of higher education.

2. Approved documents of educational programs are automatically published on the university's main website and the departments' Jet sites.

3. The system provides for the use of metadata, names of specialities and educational programs, and their components by the EDEBO database.

4. As a public information resource of an educational program, Syllabuses are publicly available and structured according to the names and levels of educational programs.

5. The file container system allows for internal control of EP development processes, its audit, the introduction of changes, and acceptance/rejection of stakeholder proposals.

6. The automated publication system of approved EP documents allows external expert control and analysis of the educational program's quality. It provides access to documents to applicants and all other interested persons.

7. The proposed module is an "Electronic University" digital ecosystem component. Its functionality made it possible to increase the automation of management processes to implement defined IT development strategies.

Based on the research results, the primary information resources formed at the stages of management of educational programs - from the project to implementation and internal and external audit are determined.

The educational program management subsystem is a component of the educational process management information ecosystem, supporting the methodical, scientific and managerial activities of JetIQ VNTU. The subsystem was developed based on the proposed models and implemented in practice at the Vinnytsia National Technical University. The primary users of the subsystem are specialists of the Center for Quality Assurance of

Education, guarantors and experts who highly appreciate the methodology of managing educational programs and program implementation.

Prospects for further research include improving educational program management modules and monitoring indicators of professional activity and professional development. In particular, the addition of emotional and motivational elements based on the results of monitoring and control of indicators and accreditation of educational programs.

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ЕЛЕКТРОННА СИСТЕМА УПРАВЛІННЯ ОСВІТНІМИ ПРОГРАМАМИ УНІВЕРСИТЕТУ

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Анотація У статті наведено результати дослідження створення системи управління освітніми програмами (ОП) університету. Аналіз наукових праць показав, що заклади вищої освіти потребують впровадження інтегрованих інформаційних систем. Такі системи є технічною основою електронного університету, мають функціонал для управління навчанням та забезпечення комунікацій, управління університетом. Проведено аналіз основних процесів управління закладом вищої освіти та визначено зацікавлені сторони, їх роль та участь в процесах. Запропонована математична модель є основою розробки системи управління освітніми програмами, контролем її впровадження на основі параметрів якості. Програмний модуль є частиною системи підтримки процесів управління університетом та комплексної інформаційної системи JetIQ Вінницького національного технічного університету (ВНТУ). Для аналізу предметної галузі та формування оптимальних управлінських процесів використано методичні рекомендації Національного агентства забезпечення якості освіти, експорт та імпорт даних з використанням системи державної бази освіти. Використано досвід та рекомендації фахівців відділу забезпечення якості освіти ВНТУ, експертів та гарантів освітніх програм. Прецедентні моделі формуються щодо таких рольових сценаріїв – абітурієнт, студент, викладач, гарант, менеджмент, експерт, роботодавець. Такі моделі дозволили створити не лише програмний модуль управління освітніми програмами, який автори назвали «Якість освіти» (QEd), а й визначити умови розміщення на головному сайті ВНТУ освітніх програм та документації їх розробки, конспектів на головній вітрині та Jet-майданчиків кафедри, допомогли у створенні сценаріїв автоматичного контролю якості ОП. Результатом створення програмного модуля для управління освітніми програмами є система структурованої інформації щодо розробки та реалізації освітньої програми, яка дозволяє гаранту та фахівцям кафедри забезпечувати якість навчання шляхом використання спеціальних контейнерів. для документації та зацікавленим особам використовувати публічну актуальну інформацію на вебсайтах університету.

Ключові слова: оцифрування; електронний університет; система управління; освітня програма; інформаційне електронне освітнє середовище; інформаційне електронне середовище управління; модуль управління освітньою програмою; JetIQ.

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