



**INDEPENDENT AGENCY FOR QUALITY
ASSURANCE IN EDUCATION (IQAA)**

THEMATIC ANALYSIS

**Quality of
Programmes:
Improvement**

**Educational
Assessment**

**IT
and**

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«Quality of Educational IT Programmes: Assessment and Improvement»

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Quality of Educational IT Programmes: Assessment and Improvement

Introduction

In today's information society, where technological innovations play a key role, the quality of IT education is becoming more and more relevant. IT-oriented higher education programmes should not only provide students with theoretical knowledge, but also develop practical skills necessary for successful adaptation in a dynamic and competitive environment.

Quality assessment of IT educational programmes is an important tool to ensure a high level of education. External evaluation, conducted as part of the programme accreditation procedure, allows not only to assess the compliance of educational programmes with the established standards and requirements, but also to identify potential areas of improvement. This includes analysis of programme content, qualifications of teaching staff, availability of resources and efficiency of the educational process.

In this analytical review we will consider the features of quality assessment of educational IT programmes in the context of the requirements of the state educational standard of higher education and the standards of the Independent Quality Assurance Agency in Education IQAA. Our analysis is based on the reports of external audit of accreditation of educational programmes in IT. For the comparative analysis we selected 21 educational programmes, including both profile and diversified higher education institutions of Kazakhstan, which provide training of specialists in the field of IT and underwent the procedure of programme accreditation during 2022 and 2023. Of the 21 educational programmes under consideration, 11 EPs have passed through the procedure of primary specialised accreditation, which will allow HEIs to obtain official quality recognition for new educational programmes and increase their attractiveness for students and potential employers. Two programmes are implemented jointly with partner HEIs: the new programme 6B06115 'Digital Agro-systems and Complexes' of the International University of Information Technologies implemented jointly with the Kazakh Agrotechnical University named after S. Seifullin, as well as the innovative double degree programme 6B06105 'Computer Science' of the International Taraz Innovation University implemented jointly with the Varna Free University. Two MUIT programmes are implemented in English, two in Russian and English. Fifteen of the programmes under review are implemented in Kazakh and Russian, as well as three programmes in three languages: Kazakh, Russian and English.

The purpose of this study is to identify the current state and problem areas in the quality of educational IT programmes, as well as to propose recommendations for their improvement, taking into account the requirements of the modern information market and the needs of future IT specialists.

Quality of Educational IT Programmes: Assessment and Improvement

1.1 Integration of professional standards and new professions into educational programmes

Educational programmes are the key product implemented by higher education institutions. In this regard, the development and implementation of quality educational programmes are of paramount importance for educational institutions. To meet the interests of all stakeholders, HEIs should strictly follow the established requirements of the State obligatory standard, ‘Guidelines for the development of educational programmes of higher and postgraduate education’ developed by the National Centre for Higher Education Development of the Ministry of Science and Higher Education of the Republic of Kazakhstan and their own regulatory documents. Currently, Kazakhstan has developed professional standards for many sectors of the economy, which define the acceptable level of professional activity. HEIs have a task to develop and update educational programmes on the basis of existing professional standards. If there are no such standards, it is important to take into account employers' suggestions in the formation of educational programmes.

The analysis of external audit reports and data from the unified platform of higher education showed that HEIs used various professional standards when developing 17 analysed educational programmes, some HEIs in addition to professional standards relied on professions from the Atlas of new professions. For example, the International University of Information Technologies in developing the educational programme 6B06118 ‘Immersive Technologies’ actively integrated into the educational process the competences corresponding to the newest professions in the sphere of virtual, augmented and mixed reality, as well as the profession of a developer-designer of aggregated digital doubles. Despite the absence of a professional standard, this will ensure the adaptation of the educational programme to the advanced trends of the digital economy and technological development, ensuring that graduates acquire skills that are relevant and in demand in the labour market. Unlike MUIT, in the process of developing educational programmes such as ‘Mathematical and Computer Modelling’, ‘IT Design and Management’ and ‘Radio Engineering, Electronics and Telecommunications’, Karaganda University named after Academician E.A. Buketov and Miras University did not rely on competencies from the Atlas of New Professions of Kazakhstan. In addition, these educational programmes do not have professional standards. All this may indicate the potential need to integrate these professions to improve relevance and compliance with modern market requirements. At the same time, for the educational programme ‘Programming and software package development’ (Miras University) there are certain professional standards, but it can be noted that the university has not fully used their potential. This may indicate the need to revise curricula and courses to achieve full compliance with professional standards, which, in turn, will

improve the quality of education and improve the preparation of students for real labour conditions.

1.2 Analysis of the content of educational programmes

According to the external expert group reports, similar or closely related educational programmes were identified among the 21 educational programmes analysed. We have conditionally grouped such programmes into groups.

The first group is educational programmes focused on training specialists in the field of information technologies, with an emphasis on software development, testing and support. They include «Software Engineering» (2 universities), «Computer Science and Software» (3 universities), «IT and Programming» (1 university), «Programming and Software Package Development» (1 university).

The second group of programmes is aimed at teaching students the skills needed to work in IT, including designing information systems, managing IT projects, and using IT to optimise business processes. This includes «Information Systems» (3 HEIs), «Information Systems and Technologies» (1 HEI), «IT Design and Management» (1 HEI), and «Information Technologies in Business» (1 HEI).

The third group of programmes is focused on training students in skills necessary for work in the field of radio engineering, electronics and telecommunications, including mobile technologies, such as «Radio Engineering, Electronics and Telecommunications» (2 HEIs) and «Mobile Technologies and Telecommunications» (1 HEI).

In addition to these groups, it is worth noting individual educational programmes that have no analogues in our sample and represent innovative areas of training. These are the following new programmes of MUIT «Digital Agrosystems and Complexes», «Immersive Technologies», «Cyber Security» of the University «Narkhoz» and «Computer Science» of the International Taraz Innovation University. As well as the current programme of Karaganda University named after academician E.A.Buketov «Mathematical and Computer Modelling». All these educational programmes provide students with complex skills and knowledge necessary for a successful career in various spheres of information technologies.

The analysis of the seven educational programmes of the first group revealed that each of them has both strengths and weaknesses. The universities offer a wide range of disciplines, emphasising different aspects of IT. The inclusion of basic courses in mathematics, physics and algorithms in the educational programmes demonstrates the universities' commitment to providing students with a solid theoretical base. Nevertheless, some institutions, such as M. Auezov South Kazakhstan University, M. Auezov Kazan University, and M. Auezov University of Kazakhstan, have a strong theoretical base. However, some institutions, such as M. Auezov South Kazakhstan University, Sh. Esenov Caspian University of Technology and Engineering, and «Miras» University, should pay more attention to

deepening these courses to ensure a more complete understanding of the basics of information technology.

When comparing the programmes of different educational institutions, it becomes obvious that some of them stand out due to the inclusion of relevant courses. For example, Kazakhstan University of Engineering and Technology has included courses such as «Programming in Java» and «Programming in PHP» in its Software Engineering programme. The International Taraz Innovation Institute and Caspian University of Technology and Engineering have added modern courses on mobile application development and web programming to the Computer Science and Programming programme, making them more attractive in terms of labour market requirements. While similar programmes at Almaty Technological University and M. Auezov South Kazakhstan University could be strengthened by including more relevant topics such as machine learning and artificial intelligence.

«Miras» University's educational programmes in programming, «IT and Programming» and «Programming and IT Management», offer a diverse set of courses, each with a unique focus. The IT and Programming programme is practice-oriented and provides students with the comprehensive skills demanded in the IT field. The coursework includes advanced technology and programming languages to meet current labour market demands. Cybersecurity disciplines increase the programme's relevance in today's digital world. However, a deeper emphasis on theoretical aspects of computer science and mathematics could have contributed to a better understanding of the fundamental principles of IT.

In contrast, the «Programming and IT Management» programme has a theoretical focus and will suit students interested in science and research. This programme provides in-depth knowledge in the fields of computer science, mathematics and physics, which is key to scientific research. The inclusion of courses in mathematical logic and probability theory provides a foundation for scientific endeavour. However, strengthening the practical component could increase the attractiveness of the programme for students pursuing a professional career in the IT industry.

A detailed analysis of the five educational programmes of the second group revealed that all of them include courses on algorithms, data structures and programming underlying the development of IT competencies. Miras University's programme is distinguished by a course on graphic image creation, which will be useful for students interested in web design and user interface development. For those focused on data analysis and information security, Karaganda University of Kazpotrebsoyuz and International Taraz Innovation Institute offer courses in probability theory, mathematical statistics and information security. In addition, «Miras» University's programme includes courses in object-oriented programming and web component development, which is valuable for future software and web development professionals.

The analysis shows that each programme has its own unique strengths and limitations. MUIT's Information Technology in Business programme provides a comprehensive set of disciplines covering technical, economic, managerial and legal aspects, preparing students for a successful career in the IT business sector. Ekibastuz Institute of Engineering and Technology focuses on key aspects of information systems and technologies. The International Taraz Innovation Institute and Miras University are expanding their programmes with additional courses, making them attractive to students interested in specific areas of IT. The Karaganda University Kazpotrebsoyuz programme offers a broad range of disciplines, but some of them, such as algebra and geometry, may seem less related to the practical aspects of information systems.

Within the third group of educational programmes stand out the courses of «Miras» University and the International University of Engineering and Technology in the field of «Radio Engineering, Electronics and Telecommunications», as well as the «Mobile Technology and Telecommunications» programme of the International University of Information Technology. MUIT's Mobile Technology and Telecommunications programme offers an extensive set of disciplines covering key technical, mathematical and technological aspects of the industry. Despite this, the lack of economics and management courses limits students' ability to understand the business processes in the mobile technology industry.

«Miras» University's educational programme in «Radio Engineering, Electronics and Telecommunications» includes both fundamental engineering courses and specialised courses in programming and software development. Additional courses in ecology, alternative energy and business planning broaden students' horizons beyond technical disciplines. However, the lack of courses focusing on mobile technology may limit the depth of knowledge in this important field.

The «Radio Engineering, Electronics and Telecommunications» programme at the International University of Engineering and Technology also offers an integrated approach, combining technical and engineering disciplines with programming and software development. Courses in business planning and entrepreneurship add value for those seeking a career in business or project management. However, students may need to study additional material to be fully prepared in mobile technology.

The analysis of the new educational programme «Immersive Technologies» of MUIT, implemented in English, has shown that the programme represents an innovative approach to training specialists in the field of VR/AR/MR and the development of aggregated digital twins. Based on occupations from the Atlas of New Occupations, the programme includes courses covering economic, mathematical, technical and design aspects, making it relevant to the current labour market. Among the programme's advantages are its multidisciplinary nature, which provides graduates with a broad professional horizon, and the relevance of courses

directly related to advanced technologies. The practical orientation of disciplines such as Unity Fundamentals and Computer Game Development involves the practical application of knowledge.

However, as a new programme, it may face initial difficulties in terms of organising the learning process and establishing links with industry. There may also be a need for deeper specialisation in certain areas. High-tech disciplines require significant resources, both material and human, which can be a challenge for the university. Despite these potential difficulties, the programme offers unique opportunities to develop in new and sought-after areas of the IT industry, supported by qualified faculty and appropriate resources. This will enable students to not only learn the theoretical foundations, but also practical skills relevant to today's labour market.

Analysis of the content of the new OP «Digital Agro-systems and Complexes», implemented by MUIT jointly with the Kazakh Agrotechnical University named after S. Seyfullin, has shown that the programme, taught in English and Russian, is focused on training specialists capable of making a qualitative breakthrough in the agrarian sector of Kazakhstan's economy, possessing theoretical and practical knowledge for the implementation of innovative directions in agriculture.

The programme includes both fundamental disciplines, such as «Algebra and Geometry», «Mathematical Analysis», and specialised courses, such as «Geoinformation Technologies in AIC», «Intelligent Management Systems in AIC», which provides an integrated approach to learning. Special attention is paid to practical skills, such as the use of drones and autopilots for self-propelled agricultural machinery, reflecting current trends in the agrotechnical sector.

The programme also focuses on the digitalisation of agrotechnical services and the development of intelligent logistics systems in agribusiness, which is key to improving efficiency and competitiveness in this field. The inclusion of disciplines related to metrology, standardisation and quality assurance underlines the commitment to ensuring a high level of professionalism of graduates.

However, like any new programme, it can face the challenges of having to constantly update training content to meet changing industry requirements and integrate with international standards.

Overall, the «Digital Agricultural Systems and Complexes» programme represents a significant step forward in the training of specialists capable of contributing to the digitalisation of the agricultural sector, which is an important area for the development of modern agriculture.

The «Mathematical and Computer Modelling» programme at E.A. Buketov Karaganda University is focused on training specialists in mathematics and information technology. It offers students fundamental knowledge ranging from the basics of scientific research and ecology to specialised disciplines such as computer modelling and software development. The programme is not linked to occupational

standards and does not make use of new occupations from the Atlas of New Occupations, which may be considered a disadvantage in the context of international recognition of qualifications, but it also provides ample opportunities for a thorough understanding of mathematical principles and their application in a variety of fields. The programme includes courses on emerging technologies such as BigData and robotics, making it relevant to work in high-tech industries. However, the large number of theoretical courses may not meet the needs of students interested in the applied aspects of IT. Overall, the programme represents a traditional approach to learning, which may be valuable for students pursuing a career in science or working in fields that require a deep understanding of mathematical principles.

The dual-diploma programme «Computer Science», implemented by MTII in cooperation with the Free University of Varna, is an innovative educational offer oriented towards international standards and the requirements of the modern labour market. The programme, taught in three languages, provides an integrated approach to the study of computer science, including economic-legal and environmental aspects, which broadens the professional horizon of graduates.

The course of study includes both fundamental subjects such as mathematics and physics, as well as specialised courses such as 3D modelling and printing, cryptography, and systems programming. This provides students with the in-depth knowledge and practical skills required for careers in high-tech industries and research.

Special emphasis is placed on software development and information security, reflecting the current demands on IT professionals. The inclusion of disciplines related to Big Data, artificial intelligence and Internet programming underlines the programme's commitment to training professionals capable of working with the latest technologies and large amounts of data.

The programme also offers courses in entrepreneurship and fundamentals of scientific research, which helps students develop the critical thinking skills and entrepreneurial initiative necessary for a successful career in a dynamically changing world.

Overall, the double-diploma programme «Computer Science» of MTII and the Free University of Varna represents an attractive choice for students seeking a quality education in computer science and gaining a competitive edge internationally.

Narhoz University's new trilingual «Cybersecurity» education programme is a comprehensive approach to training professionals in one of the most in-demand fields of our time. The programme includes a wide range of disciplines, from leadership and innovation to ethical hacking, providing students with not only technical knowledge but also an understanding of the socio-economic and legal aspects of cyber security.

The programme's strengths lie in its relevance and multidisciplinary nature. Students learn both programming and algorithm fundamentals as well as specialised

courses in cyber security, including information security auditing and mobile application security. This gives graduates of the programme an edge in understanding and applying comprehensive security measures to various IT systems.

However, the programme may face disadvantages related to the need to constantly update training material to keep up with rapidly changing technologies and cyber security threats. Multilingual training can also present challenges for students and instructors in terms of language barriers and translation of specialised terminology.

In general, the «Cyber Security» programme at Narkhoz University is a promising programme that can offer students unique opportunities for development in new and in-demand areas of the IT industry, preparing them to work effectively in an international environment. It prepares specialists capable not only of responding to existing threats, but also of anticipating potential risks, developing defence strategies at the level of corporations and government structures.

1.3 Teaching staff: structure and analysis

The teaching staff plays a key role in the educational process. No matter how well the educational programme is developed, it is the faculty members who shape the knowledge, skills and competencies of students. That is why one of the standards of IQAA specialised accreditation is the standard «Teaching staff». The analysis of external audit reports of 21 educational programmes showed that in 11 educational programmes according to this standard external experts showed full compliance. This indicates that the majority of teachers have the necessary qualifications and are suitable for the implementation of the educational process. 8 educational programmes in Standard 5 were assessed by external experts as significant compliance, i.e. teachers have certain qualifications, but there may be some areas where additional training or experience is required. And two educational programmes in the 5th standard were assessed as partial compliance. In this case, it is a question of certain shortcomings in the qualifications or experience of teachers.

Let us consider the most frequently encountered comments and recommendations of external experts. For a number of programmes («Software Engineering» of Almaty Technological University, «Information Systems» of Ekibastuz Engineering and Technological Institute named after K.Satpayev, «Programming and Software Package Development», «Radio Engineering, Electronics and Telecommunications», «Design and Management of IT» of «Miras» University, «Computer Science and Software» of International Taraz Innovation University) low publication activity of teachers was identified, including in journals with high impact. For seven educational programmes («Radio engineering, electronics and telecommunications» of the International Engineering and Technology University, «Computer science and software» of the Caspian University of Technologies and Engineering, («Radio engineering, electronics and telecommunications», «Design and management of IT» of the University «Miras»,

«Mobile technologies and telecommunications» of MUIT, «Cyber security» of the University «Narkhoz», «Computer science and software» of the South-Kazakhstan State University named after Dulkova, «Computer science and software» of the International Taraz Innovation University) the low publication activity of teachers was highlighted. This is especially true for universities that position themselves as international.

In some programmes, experts noted insufficient involvement of teachers in funded R&D («Miras» University), in participation in national competitions for grant funding of R&D works (International Taraz Innovation Institute), as well as insufficient work on conclusion of R&D works with external customers (MUIT, «Narkhoz» University).

The current emphasis is on attracting practising teachers from the IT sector. This is especially important as practitioners can share relevant experience and knowledge, which is not always available from textbooks. In Ekibastuz Engineering and Technical Institute named after K.Satpayev, experts noted such a positive practice. However, for the programmes of «Miras» University («Programming and software package development») and educational programmes of the International Taraz Innovation Institute («Computer science and software») it is recommended to actively involve teachers from industry in the educational process.

A more significant comment on the qualitative composition of teachers (low percentage of teachers with basic education) was made on the educational programmes of Miras University. In this regard, these programmes were assessed by experts as «partial compliance».

The analysis of the qualitative and quantitative composition of teaching staff in the educational programmes under consideration indicates the need to develop and implement measures to stimulate teachers' activity in research and publication activities, increase their academic mobility and develop cooperation with external partners. Only in this way will educational institutions be able to provide a high level of education and meet the requirements of the modern labour market.

1.4 Resource support for educational programmes

Material resources play a key role in ensuring the quality of education by providing the necessary equipment and infrastructure for the successful implementation of educational processes and research work. The analysis of external experts' assessments of the 6th standard “Learning Resources and Student Support” within 21 educational programmes allows us to identify the strengths and weaknesses of material resources of HEIs.

In 15 out of 21 programmes reviewed (including Almaty Technological University, Ekibastuz Engineering and Technical Institute named after K. K. Gubkin, Almaty State Technical University, and Almaty State University). K.

Satpayev Almaty Technological University, International Engineering and Technological University, Karaganda University named after academician E.A. Buketov, Caspian University of Technology and Engineering named after Sh. Esenov, International Taraz Innovation Institute, International University of Information Technology, Narkhoz University, South Kazakhstan University named after M. Auezov. M. Auezov South Kazakhstan University), there is a full compliance of material resources with the requirements of the standard. This indicates the availability of the necessary equipment and infrastructure for the successful implementation of educational and research tasks. However, the experts highlighted some areas for improvement: widespread provision of high-speed Internet, providing dormitory accommodation for 70% of non-resident students from the total number of those in need, increasing the fund of educational literature in English, additional strengthening of the material and technical base, additional equipment of teaching laboratories and other measures.

At the same time, a number of educational programmes under Standard 6 were assessed by external experts as «significant compliance». For example, for OP «Information Systems» at Karaganda University of Kazpotrebsoyuz external experts note insufficient access to high-speed Internet and insufficiently high-performance computers in laboratories designed for students' project work in the field of Artificial intelligence. It is recommended to improve the technical base and equipment to ensure more efficient work of students and teachers. For two programmes of «Miras» University («Programming and Software Package Development» «IT and Programming») there is a weak material and technical base.

Thus, the analysis of external audit reports has shown that the provision of material resources for the quality of education in all educational programmes is critical for the successful implementation of educational and research tasks. Strengths are found in programmes where full compliance with the requirements of the standard has already been achieved, however, a number of programmes require improvement of facilities and equipment. It is recommended to intensify co-operation with IT vendors and continue work on improving access to modern technologies and equipment.

Inferences

Strong points:

- availability of professional standards and their consideration in the development of educational programmes, which helps to improve the quality of education and training of students for real working conditions;
- successful integration by universities of new professions from the Atlas of New Professions of Kazakhstan, which allows enriching educational programmes and making them more relevant to modern industry;
- teachers in most educational programmes have the necessary qualifications and are suitable for the educational process;

- emphasis on attracting practicing teachers from the IT sector can enrich the educational process with relevant experience and knowledge;
- in 15 out of 21 educational programmes there is a full compliance of material resources with the requirements of the standard, which indicates the availability of necessary equipment and infrastructure for successful implementation of educational and research tasks.

Weaknesses:

- some HEIs do not use new professions from the Atlas of new professions of Kazakhstan, which may reduce the relevance and competitiveness of their educational programmes;
- some educational institutions do not fully use the potential of professional standards, which may reduce the quality of graduates' training and their readiness for the labour market;
- new programmes may face initial difficulties in terms of organising the learning process and establishing links with industry;
- high-tech disciplines require significant resources, both material and human, which can be a challenge for educational organisations;
- low publication activity of faculty members may limit access to relevant knowledge and reduce the reputation of the university;
- limited academic mobility of academic staff (especially international HEIs) can lead to isolation from global trends and new teaching methodologies;
- insufficient participation of teachers in funded research works, national competitions for grant funding of research works and work with external customers may limit research activities and the development of co-operation with external partners;
- low percentage of teachers with basic education may negatively affect the quality of the educational process.

Recommendations

When making recommendations, the Independent Agency for Quality Assurance in Education took into account the specifics of higher education institutions and at the same time sought to focus on the general problems of development and content of educational programmes in the field of information technologies.

1. to actively use new professions from the Atlas of New Professions of Kazakhstan in the development of educational programmes to enrich the content of curricula and increase their relevance;

2. to pay more attention to professional standards and fully use their potential in the formation of educational programmes;

3. it is important to establish close cooperation with enterprises and employers to understand their needs and expectations of graduates, which will help to better orient educational programmes to market requirements;
4. to regularly review educational programmes in the light of current labour market and industry requirements to ensure their relevance and compliance with current technological trends;
5. pay attention to the balance between technical and general education disciplines so that students receive a comprehensive education that combines theoretical knowledge with practical experience;
6. to increase the academic mobility of teachers, organise the exchange of experience and knowledge between educational institutions, and establish exchange programmes with colleagues from other countries;
7. to develop a system of motivation and encouragement of professors for participation in funded R&D and R&D grant funding competitions, as well as for successful co-operation with external customers;
8. to ensure regular professional development of the teaching staff;
9. develop support and incentive programmes for teachers with basic education, e.g. providing opportunities for additional education and professional development;
10. intensify cooperation with IT vendors to ensure access to modern technology and equipment, especially in programmes where deficiencies in access to high-speed internet and computers are noted;
11. conduct regular monitoring of facilities and equipment for compliance with modern technologies and changes in technological progress.

Conclusion

All the educational programmes reviewed provide valuable courses that contribute to the development of IT competencies. However, to achieve optimal results, it is important for students to choose programmes that match their professional ambitions and career plans, taking into account both practical and theoretical aspects of learning. In addition, in order to fully train high-end professionals, programmes need to be provided with qualified teachers and appropriate resources. This includes access to state-of-the-art equipment, software and relevant research to enable students to not only absorb theoretical knowledge but also apply it in practice, which is key to success in the fast-paced IT industry.

List of sources used

1. External audit reports of HEIs that have passed the procedure of specialised accreditation in the Independent Agency for Quality Assurance in Education.
2. Official websites of higher education institutions:
 - 1) International University of Information Technology:
<https://iitu.edu.kz>
 - 2) Karaganda University named after Academician E.A. Buketov:
<https://buketov.edu.kz>
 - 3) Narhoz University:
<https://narxoz.edu.kz>
 - 4) 4) M. Auezov South Kazakhstan University:
<https://auezov.edu.kz>
 - 5) Karaganda University of Kazpotrebsoyuz:
<https://www.keu.kz>
 - 6) Almaty Technological University:
<https://atu.edu.kz>
 - 7) 7) Ekibastuz Engineering and Technical Institute named after Academician K. Satpayev:
<https://eiti.edu.kz>
 - 8) International University of Engineering and Technology:
<https://metu.edu.kz>
 - 9) Caspian University of Technology and Engineering named after Sh. Esenov:
<https://yu.edu.kz>
 - 10) International Taraz Innovation Institute:
<https://htii.edu.kz>
 - 11) «Miras» University:
<https://miras.edu.kz>
3. Unified platform of higher education. Register of educational programmes.

Appendix 1

List of higher education institutions and educational programmes with specialised accreditation between 2022 and 2023 considered for thematic analysis

1. International University of Information Technology:
 - 6B06118 Immersive Technologies.
 - 6B06115 Digital Agro-systems and Complexes
 - 6B06119 Information Technology in Business
 - 6B06203 - Mobile Technology and Telecommunications
2. Karaganda University named after Academician E.A.Buketov:
 - 6B06104 Mathematical and Computer Modelling
3. Narkhoz University:
 - 6B06301 Cyber Security.
4. M.Auezov South Kazakhstan University:
 - 6B06130 Computer Science and Software Engineering
5. Karaganda University of Kazpotrebsoyuz:
 - 6B06101 Information Systems
6. Almaty Technological University:
 - 6B06103 Software Engineering
7. Ekibastuz Engineering and Technical Institute named after Academician K.Satpayev:
 - 6B06110 Information Systems
8. International Engineering and Technology University:
 - 6B06103 Software Engineering
 - 6B06201 Radio engineering, electronics and telecommunication 6B06201 - Radio engineering, electronics and telecommunication
9. Caspian University of Technology and Engineering named after Sh. Esenov:
 - 6B03103-Computer Science and Software Engineering
10. International Taraz Innovation Institute:
 - 6B06104 Computer Engineering
 - 6B06102 Computer Engineering and Software
 - 6B06103 Information Systems and Technologies
 - 6B06105 Computer Science
11. Miras University:
 - 6B06102 Programming and development of software packages
 - 6B06201 'Radio engineering, electronics and telecommunication'
 - 6B06101 'IT Design and Management'.
 - 6B06103 'IT and Programming'