The Report
of the Dissertation Council on Information and Telecommunication Technologies at Kazakh National Research Technical University named after K.I. Satbayev to awarding the degree of Doctor of Philosophy(PhD), doctor of profile in the next group of specialties: 6D070300 Information Systems (by industry), 8D06103 - Management Information Systems, 6D070400 Computer and Software Engineering, 8D06101 - Software Engineering, 8D06102 - Machine Learning & Data Science, 6D100200 Information Security Systems, 8D06105 - Information security systems, 6D071900 Radio engineering, electronics and telecommunications, 8D06201 - Telecommunications, 6D070200 Automation and control, 8D07101 - Automation and robotization for 2022

1. The number of hold meetings
The Dissertation Council has hold 8 (eight) meetings during the report period.

2. Names of council members who attended less than half of the meetings - no

3. List of doctoral students with an indication of the organization

№	Full name of student	Name of University
1	Kulakayeva Aigul Yergalievna	Kazakh National Research Technical University named after K.I. Satpayev
2	Batyrgaliyev Askhat Bolatkanovich	Kazakh National Research Technical University named after K.I. Satpayev
3	Bissarinova Aigul Tuktikyzy	Kazakh National Research Technical University named after K.I. Satpayev
4	Togzhanova Kulzhan Ondrisovna	International University of Information Technologies
5	Zinagabdenova Dariga Rakhymzhankyzy	L. N. Gumilyov Eurasian National National University
6	Samigulin Timur Ildusovich	Kazakh National Research Technical University named after K.I. Satpayev
7	Yubuzova Khalicha Ibragimovna	Kazakh National Research Technical University named after K.I. Satpayev
8	Oralbekova Dina Orymbayevna	Kazakh National Research Technical University named after K.I. Satpayev

4. The brief analysis of dissertations that have been considering by the Council during the reporting year

The Dissertation Council considered 8 (eight) theses on 5 (five) specialties and 1 (one) educational program in the reporting year. The names of dissertations by specialization are given below:

№	Full name	Thesis name	Code and name of the specialty
1	Kulakayeva Aigul Yergalievna	Research of methods for analyzing signals and determining the location of RES for radio monitoring systems based on low-orbit SSC	6D071900 – Radio engineering, electronics and telecommunications
2	Batyrgaliyev Askhat Bolatkanovich	Investigation of the quality characteristics of generators of spatial electromagnetic noise	6D071900 – Radio engineering, electronics and telecommunications
3	Bissarinova Aigul Tuktikyzy	Research and development of models and methods for the design of geographic information system (GIS) for monitoring air pollution in a megapolis	6D070300-Information Systems
4	Togzhanova Kulzhan Ondrisovna	Models and methods for the development of dynamic planning systems for the development of Smart city	6D070400 Computer and Software Engineering
5	Zinagabdenova Dariga Rakhymzhankyzy	Automated control system of gas accounting and balance processes in main gas pipelines	6D070200 Automation and control
6	Samigulin Timur Ildusovich	Development of smart-technology for control systems of complex objects based on artificial intelligence approaches	6D070200 Automation and control
7	Yubuzova Khalicha Ibragimovna	Methods of secure key distribution based on quantum cryptography protocols	6D070400 Computer and Software Engineering
8	Oralbekova Dina Orymbayevna	Development of an automatic speech recognition system based on an end-to-end approach	8D06103 - Management Information Systems

4.1 Analysis of the topics of the considered theses

4.1.1 Analysis of the topics of the thesis of Kulakaeva Aigul Ergaliyevna on the topic "Research of methods for analyzing signals and determining the location of RES for radio monitoring systems based on low-orbit small spacecraft" submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D071900 - Radio Engineering, Electronics and Telecommunications.

The dissertation work of a doctoral student is devoted to the development of requirements for a satellite radio monitoring system based on one low-orbit small spacecraft, to the development of a method for determining the location of RES and its simulation model to assess the compliance of the radiation parameters of ground-based radio-electronic facilities with the norms of permits for the use of the radio frequency spectrum, as well as to identify illegally operating RES on territory of the Republic of Kazakhstan.

The purpose of the work: based on the analysis of the possibility of using low-orbit small satellites for radio monitoring of the use of RFS in the territory of the Republic of Kazakhstan, to substantiate methods for analyzing signals from radio emission sources, to develop methods for determining the location of RES and a simulation model for determining the location of ground-based sources of radio emission using a satellite radio monitoring system.

The scientific novelty of the dissertation work is the proposed and substantiated original method for upgrading the domestic radio monitoring system based on the use of one low-orbit MCA, the developed methods for determining the location of RES on the basis of one MCA, and the developed simulation model of the radio monitoring system based on one MCA.

4.1.2 Analysis of the topics of the thesis of Batyrgaliyev Askhat Bolatkanovich on the topic «Investigation of the quality characteristics of generators of spatial electromagnetic noise» submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D071900 - Radio Engineering, Electronics and Telecommunications.

The purpose of the research is to study the quality characteristics of spatial electromagnetic noise generators, which can be used to evaluate the effectiveness of noise generators.

Scientific novelty.

The proposed mathematical and computer models, the algorithm of the alternative method will improve the current regulatory documents regulating the protection of information through TEMPEST channels, as well as ensure the wide use of available tools for assessing the quality of masking noise interference of noise generators.

4.1.3 Analysis of the topics of the thesis of Bissarinova Aigul Tuktikyzy on the topic «Research and development of models and methods for the design of geographic information system (GIS) for monitoring air pollution in a megapolis» submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D070300-Information Systems.

The purpose of the dissertation work. It is necessary to research and develop models, methods and algorithms for designing GIS monitoring of the air basin in Almaty, taking the geospatial data into account through simulation modeling.

Scientific novelty of the research

1. The schemes and algorithms of the GIS functional structure which takes the input and processing of geodata, emission indicators and their analysis of the dynamics of the state of the air basin of the megalopolis into account were developed.

 2. A method for calculating the energy characteristics of heat-consuming objects of a megalopolis based on exergy analysis was developed. Equations were obtained for calculating the exergy indicators of the work of megalopolis objects, which are necessary to optimize their functioning.

3. An object-oriented approach to the construction of an algorithm for a GIS MESM simulation model is developed, the efficiency and accuracy of which is reflected in the results of calculations within the framework of the developed GIS software for monitoring the air basin of a megalopolis and makes it possible to build a map of air pollution by integral indicators based on the Gaussian model and inverse distance weighted method.

4. A simulation model of the functioning of the GIS monitoring of the megalopolis air basin was developed.

5. The GIS software was implemented to assess the dynamics of the air basin state in Almaty and on its basis a map of the urban atmosphere pollution was built according to integral indicators, which allows for a comprehensive analysis

4.1.4 Analysis of the topics of the thesis of Togzhanova Kulzhan Ondrisovna on the topic "Models and methods for the development of dynamic planning systems for the development of Smart city", submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D070400 Computer and Software Engineering.

The purpose of the thesis is to develop models, methods and information technologies to support decision–making during dynamic planning of Smart City development.

Scientific novelty:

- for the first time, a modified method of hierarchy analysis (MMHA) is proposed by forming consistent matrices pairwise of paired comparison matrix indicators (PCMI) in individual factors, creating a consistent matrix of comparisons of factors and determining a global criterion based on factor-indicator estimates;

- the methodology of formalization of the main steps of building dynamic Smart City development plans has been developed, which, unlike the existing ones, is supplemented by the stage of decomposition of the solution of the problem of ranking factors into a hierarchy and creating a multi-layer model for assessing the parameters of Smart City development;

- the method of effective project risk management has been developed during the dynamic planning of Smart City development, and also takes into account the parameters of project risk modeling in a multi-project environment, and unlike existing solutions, project risk management is described as the risks of investment loss during the dynamic planning of Smart City development, based on the use of the mathematical apparatus of multi-step degree games, and quality games with multiple terminal surfaces.

4.1.5 Analysis of the topics of the thesis of Zinagabdenova Dariga Rakhymzhankyzy on the topic «Automated control system for gas accounting and balance processes in main pipelines», submitted for the Doctor of philosophy (PhD) degree in the specialty 6D070200 – «Automation and control».

The purpose of the research. Collection of technological parameters and volume indicators of gas from gas transmission system facilities, and based on the collected data, creation and experimental determination of the effectiveness of an automated control system for gas accounting and balance processes.

Scientific novelty of the work. The scientific novelty of the results obtained in the course of the study is as follows:

1. An automated system for gas metering and imbalance detection is proposed, which collects technological parameters and volume indicators of gas from the field level to the server of the unified dispatch center to improve the accounting of gas transported through the main gas pipelines. The novelty of this system makes it possible to determine the change in gas dynamics in the pipeline by hourly calculation of the gas balance and improves gas accounting by timely detection of an imbalance.

2. A mathematical model of the gas balance is created. It allows to control the processes of accounting and balance of gas transported through trunk pipelines. The novelty of this model makes it possible to correctly deduce the gas balance in a time interval, taking into account changes in gas reserves in the pipeline, choose the optimal technological mode of gas transportation through trunk pipelines and manage uninterrupted, safe and efficient gas delivery to the final consumer.

3. The method of determining the imbalance of gas. Unlike many other methods, this method not only revealed and visualized indicators of gas imbalance, but also allowed to identify the cause of this imbalance.

4.1.6 Analysis of the topics of the thesis of Samigulin Timur Ildusovich on the topic «Development of smart-technology for control systems of complex objects based on artificial intelligence approaches», submitted for the Doctor of philosophy (PhD) degree in the specialty 6D070200 – «Automation and control».

Scientific novelty of the research topic. The dissertation work is devoted to the development of an intelligent control system for a complex industrial facility with a distillation column based on metaheuristic algorithms for the purpose of implementation in the Honeywell distributed control system, which uses classical PID controllers. Experimental studies and simulation results were obtained on the example of a real complex industrial object of the oil and gas industry - a distillation column.

The scientific novelty of the ongoing research are:

- Development of modified quality criteria for a complex MIMO control system for a real industrial facility with a distillation column;

- Setting the parameters of PI controllers of a complex MIMO system, taking into account the proposed modified quality criteria based on artificial intelligence metaheuristic algorithms.

- Implementation of the obtained results into the distributed control system Experion PKS from Honeywell.

- Development of cognitive HMI-interfaces for operators and engineers of stations of a distributed control system, taking into account the psychophysical characteristics of a person.

The purpose of the work is to develop an innovative Smart technology for the control system of a complex oil and gas industry facility based on artificial intelligence approaches, such as: ant colony algorithm (ACO), dragonfly algorithm (DA), gray wolf

optimization algorithm (GWO), cuckoo search algorithm (CS), genetic algorithm (GA) and artificial immune systems algorithm based on clonal selection (CLONALG), as well as its implementation for the Honeywell Experion PKS distributed control system.

4.1.7 Analysis of the topics of the thesis of Yubuzova Khalicha Ibragimovna on the topic: "Methods of secure key distribution based on quantum cryptography protocols" submitted for the degree of Doctor of Philosophy (PhD) in the specialty 6D070400 - "Computer Engineering and Software".

Purpose of the study. The purpose of this work is to develop models for the secure distribution of secret keys and increase the efficiency of their distribution through the using of a combined model based on quantum cryptography protocols.

The scientific novelty of the obtained results. The following results were obtained in the dissertation work: - based on the results of the analysis of the current state in the field of quantum cryptography and communication, the shortcomings of existing methods of key distribution were identified, and the classification of quantum cryptographic methods was expanded, which allows expanding the possibilities for choosing the necessary quantum cryptographic methods for building secure encryption key distribution systems;

- the model of a quantum deterministic protocol in the eavesdropping control mode has been developed, taking into account the features of a quantum channel and the probability of an error occurring in it. It makes it possible to ensure secure and fast distribution of keys, to formulate practical recommendations for the development of quantum cryptographic systems in the conditions of using a depolarization quantum channel and the presence of an intruder;

- the model of a quantum deterministic protocol in the message transfer mode has been developed, which makes it possible to increase the level of accessibility of a quantum channel when a key is transmitted by a deterministic protocol with a low level of natural noise;

- the method for enhancing secrecy using quantum entangled states and generated ternary pseudo-random sequences is proposed, which makes it possible to increase the transmission rate without loss of resistance of deterministic quantum cryptography protocols using pairs of qutrits to an incoherent attack;

- for the first time, a combined model was implemented based on the developed models of the eavesdropping and message transmission control mode of a quantum deterministic protocol with pairs of entangled qutrits using the proposed method of enhancing secrecy. This made it possible to improve the method of secure key distribution, increase the speed, and ensure the noise immunity of the depolarization quantum channel.

4.1.8 Analysis of the topics of the thesis of Oralbekova Dina Orymbayevna "Development of an automatic speech recognition system based on an end-to-end approach" submitted for the degree of Doctor of Philosophy (PhD) in the specialty 8D06103 – "Management information systems".

Purpose of the study. Research and development of a model, architecture and algorithm to improve the accuracy of continuous Kazakh speech recognition based on an end-to-end approach.

The scientific novelty

1) Speech and text corpora for the Kazakh language have been developed.

2) An end-to-end model has been developed using the attention mechanism for the recognition of Kazakh speech.

3) An efficient algorithm for Kazakh speech recognition based on an end-toend module has been developed.

4) Software has been developed that automatically converts speech to text.

4.2 Connection of the topics of dissertations with the directions of development of science, which are formed by the Higher Scientific and Technical Commission under the Government of the Republic of Kazakhstan in accordance with paragraph 3 of Article 18 of the Law "On Science" and (or) state programs.

4.2.1 The dissertation work of **Kulakaeva Aigul Ergalievna** corresponds to the objectives of the State Program "Digital Kazakhstan", approved by the Decree of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827 and the Strategic Development Plan of the Republic of Kazakhstan until 2025, approved by the Decree of the President of the Republic of Kazakhstan dated February 15, 2018 No. 636, one of the key areas is to expand the coverage of communication networks and the development of information and communication infrastructure, as well as the creation of "Smart" cities. The dissertation work corresponds to the priority direction of the development of science in the Republic of Kazakhstan: 4) information, communication and space technologies.

4.2.2 The results of the dissertation work of **Askhat Bolatkanovich Batyrgaliev** were used in the research work on the topic "Assessing the quality of spatial electromagnetic noise in active information protection systems" within the framework of grant funding for 2020-2022 (IRN project AP08856630).

4.2.3 The dissertation work of **Bissarinova Aigul Tuktikyzy** corresponds to the priority direction of the development of science in the Republic of Kazakhstan: 4) information, communication and space technologies.

4.2.4 The dissertation work of **Togzhanova Kulzhan Ondrisovna** was carried out in accordance with the state program "Digital Kazakhstan", approved on December 12, 2017 by the Decree of the Government of the Republic of Kazakhstan No. 827. The dissertation work corresponds to the priority direction of the development of science in the Republic of Kazakhstan: 4) information, communication and space technologies.

4.2.5 The dissertation work of **Zinagabdenova Dariga Rakhymzhankyzy** corresponds to the priority direction of the development of science in the Republic of Kazakhstan: 4) information, communication and space technologies.

4.2.6 The dissertation work of **Samigulin Timur Ildusovich** was conducted in the frame of the project of the CS MES RK No. AP05130018 on the topic "Development of cognitive Smart technology for intelligent control systems for complex objects based on artificial intelligence approaches" (2018-2020). The dissertation work corresponds to the priority direction of the development of science in the Republic of Kazakhstan: 4) information, communication and space technologies.

4.2.7 The dissertation work of **Yubuzova Khalicha Ibragimovna** corresponds to the Cybersecurity Concept "Cybershield of Kazakhstan" and the tasks of the State

Program "Digital Kazakhstan", approved by the Decree of the Government of the Republic of Kazakhstan dated December 12, 2017 No. 827.

4.2.8 The research work on the dissertation of **Oralbekova Dina Orymbayevna** was carried out within the framework of two grant funding projects: 1) "Development of technology for multilingual automatic speech recognition using deep neural networks" (2018-2020, state registration number: 0118RK00139) 2) "Development of an end-to-end automatic speech recognition systems for agglutinative languages" (2020-2022, state registration number: 0120RK00344) at the Institute of Information and Computational Technologies.

4.3 Analysis of the level of implementation of the results of dissertations in practice.

4.3.1 The practical significance of the work of Kulakaeva Aigul Ergalievna is confirmed by:

- an act of introducing the International University of Information Technologies into the educational process, at the Department of Radio Engineering, Electronics and Telecommunications, where the results of the research within the framework of this dissertation are applied in laboratory classes of the following disciplines: "Satellite Systems", "RFC Control Methods", read for educational programs 6B06201 - "Telecommunication systems and networks" and 6B06202 - "Radio systems for information transmission" in the direction of training 6B062 - "Telecommunications";

- an act of implementation in LLC "Geyser-Telecom" when conducting research work on the topic "Development of conditions for joint use and regulations for interaction for operation in the frequency bands 23.6-24.0 GHz and 24.25 - 27.5 GHz of the RES of the State Corporation Roskosmos and RES of the 5G/IMT-2020 standard of mobile operators included in the joint venture of 5G operators.

Certain theoretical and methodological provisions and the developed models proposed in the dissertation are of practical importance for improving the efficiency of the radio monitoring system for regulating the national radio frequency spectrum and can be used to assess the compliance of the radiation parameters of ground-based radio-electronic facilities with the norms of permits for the use of the radio frequency spectrum, as well as to identify illegally operating ground-based radio-electronic means and improvement of the electromagnetic situation on the territory of the Republic of Kazakhstan.

4.3.2 The practical significance of the work of Askhat Bolatkanovich Batyrgaliev lies in the development of an alternative method for assessing the quality of masking noise interference based on the entropy quality factor and methods for measuring electromagnetic noise parameters, using statistical methods (tests) for randomness and inexpensive SDR receivers.

In the course of the work, it was found that the proposed method allows calculating the entropy quality factor of the noise generated by the GN of systems of spatial electromagnetic noise, without galvanic connection of measuring instruments to generators and provides sufficient measurement accuracy.

4.3.3 The practical significance of the work of Bissarinova Aigul Tuktikyzy

1. The GIS developed for monitoring the air basin of a megalopolis makes it possible to integrate and analyze cartographic monitoring data, and, on the basis of the integral indicator, build an interpolation map of atmospheric air pollution.

2. The constructed maps of urban atmosphere pollution can be used in the design of residential buildings, industrial enterprises, recreation areas and similar facilities. It is important to determine the direction of the possible spread of pollution, their intensity and settling in the area. This makes it possible to reduce the degree of environmental safety, improve the level of comfort of living and recreation of the population, and optimize the costs of environmental measures.

3. Developed on the basis of a GIS simulation model, it will make it possible to make timely informed decisions in Almaty as an effective tool for information support and support for management decisions on the regulation of the air basin in the city.

4. The international author's certificate was received The computer's program "The GIS - geographic information monitoring system of the air basin of the metropolis" No. EC-01-001325 dated September 26, 2017. The research results in the form of models and algorithms were introduced into the educational process at the Department of Computers and Information Systems of the Kazakh Academy of Transport and Communications named after M. Tynyshpayev in 2017. Acts of implementation of the dissertation results into the production process of UTG "Almaty" LLP "Asian Gas Pipeline" and LLP "Taraz Gas-Terminal" were received. It is also recommended to use the results of the dissertation work on the special course "Geographic Information Systems" for the training of technical specialists.

4.3.4 The practical significance of the work of Togzhanova Kulzhan Ondrisovna The software solution and the main forms for the DSS module, which is implemented in the C# MMHA language, are described. The program implementation of the MMHA is carried out by forming consistent PCMI in individual criteria (or factors), creating a consistent matrix of comparisons of factors and determining a global criterion based on factor-indicator estimates. During the testing of this module, using the example of the task of assessing the level of energy efficiency of Smart City development plans, it is shown that the use of the proposed method and, in general, the DP methodology, allows you to streamline, algorithmize and adjust the procedure for expert evaluation of various factors and improve the quality of the results obtained for the formation of the decision-making process during the DP development of Smart City. A software solution and the main forms for the DSS module are proposed, which implements a model in C# when assessing the risks of investment loss during the DP development of Smart City.

In contrast to existing solutions, the proposed model and its software implementation provide specific recommendations when assessing the risks of investment loss during the DP development of Smart City. The module is implemented on the basis of using the mathematical apparatus of multistep degree games, and quality games with multiple terminal surfaces. It is shown (for example, evaluating a project related to the energy efficiency of Smart City development plans) that with an unsatisfactory risk forecast, flexible adjustment of the parameters of the investment process is possible in order for the parties to achieve an acceptable financial result.

Personal contribution of the applicant. All the results of the dissertation work, which are submitted for defense, are received by the doctoral student personally. Among

the main results: a modified method of hierarchy analysis (MMHA), which was achieved by forming consistent MPSI in individual factors, creating a consistent matrix of factor comparisons and determining a global criterion based on factor-indicator estimates; supplemented with a method of effective project risk management during dynamic planning of Smart City development, as well as modeling project risk in a multi-project environment; a model for the DSS in assessing the risks of investment loss during the dynamic planning of Smart City development.

4.3.5 The practical significance of the work of Zinagabdenova Dariga Rakhymzhankyzy.

The proposed system allows collecting data from facilities, timely identifying and taking into account the imbalance, as well as monitoring changes in the modes of operation of the gas transmission system 24/7 and efficiently, promptly and safely manage the process of gas transportation. The mathematical model for calculating the gas balance improves the accurate calculation of the volume of gas coming from gas suppliers to the main gas pipelines and gas going to consumers. The method of determining the imbalance allows you to determine the imbalance of gas in the section of the main gas pipeline and determine the most significant cause of this imbalance, using as a general indicator of the imbalance of gas at the GTS and a two-way F-test for each element of gas supply and consumption systems.

4.3.6 The practical significance of the work of Samigulin Timur Ildusovich

1) The statement of the task of research on the introduction of an intelligent SMART control system into real industrial production is formulated;

2) The architecture of a SMART control system for a complex object was developed using the example of a distillation column and industrial equipment from Honeywell;

3) The analysis of the mathematical model of the distillation column was carried out;

4) Modified control criteria have been formed, in accordance with the quality requirements for the technological process of gas purification in the distillation column;

5) Intelligent PI controllers for the distillation column control system based on the ACO, GWO, DA, CS, GA algorithms are synthesized, effectively minimizing the developed quality criteria.

6) The results of modeling the synthesis of intelligent PI controllers are obtained and the best control approaches are analyzed.

7) Developed software for SMART distillation column control based on distributed control system Honeywell Experion PKS.

8) Cognitive displays for the SMART control system of the distillation column have been developed, taking into account the features of vision and psychophysical characteristics of operators.

9) A digital twin of the technological process was created in the Honeywell Unisim Design software product, where the model was built in a steady state and in a dynamic mode.

4.3.7 The practical significance of the work of Yubuzova Khalicha Ibragimovna. The obtained scientific results and the developed models of a quantum deterministic protocol with an eavesdropping control mode and a message transmission

mode with pairs of entangled qutrits are of practical value for solving the problem of key distribution, for improving the efficiency of cryptographic information protection systems. Also developed:

- the threat model allows forming of conceptual aspects of attack prevention and formalizes the capabilities of preventive systems in the process of their development or improvement;

- the abstract model of the intruder in QC systems allows you to determine the set of measures of a different nature that need to be additionally implemented to ensure reliable protection using specific quantum systems;

- software and simulation of the quantum deterministic protocol:

- the model in the eavesdropping control mode made it possible to increase the rate of distribution of encryption keys by at least 1.52 times while ensuring protection against incoherent attacks;

- the model in the message transmission mode, allowed to obtain confirmation of the possibility of using the proposed system of error-correcting coding over the Galois field GF (32) at a natural noise level of up to 10%, to increase the level of availability of a quantum channel when transmitting a key by a deterministic protocol by at least 3.8%. The results of the study were used in the educational process of the Department of Cybersecurity, processing, and storage of information of KazNRTU named after K.I. Satpayev (the act of implementation dated 09/02/2018), National Aviation University (Kyiv, Ukraine) (the act of implementation dated 05/09/2018), EE «Belarusian State Academy of Telecommunications» (Minsk, Belarus) (the act of implementation dated 02/11/2018) and AxxonSoft (Kyiv, Ukraine) (the act of implementation dated 10/29/2018).

4.3.7 The practical significance of the work of Oralbekova Dina Orymbayevna

The practical significance of the research work lies in the application of the developed algorithms and software for further use in the development of other technologies, such as speech synthesis, machine translation, voice authentication and identification, etc. The developed system of automatic recognition of Kazakh speech can be implemented in government agencies responsible for expanding the scope of national languages on the basis of information technology; in mobile devices (increase in the number of potential buyers due to the introduction of speech technologies in the national language); in banks (call centers with support for voice functions, voice authentication); and in the sector of production of various devices with support for voice functions.

5. Analysis of the work of reviewers (with examples of the most low-quality reviews)

Reviewers of dissertations of doctoral students for the degree of Doctor of Philosophy (PhD), were appointed persons in accordance with the requirements of the Standard Regulations on the dissertation Council.

Information about the appointed reviewers is provided below:

№	Full name	Reviewers

1	Kulakayeva Aigul Yergalievna	Ismail Esmagambet Esmagzamuly – Candidate of Technical Sciences, Leading Researcher at the Laboratory of Advanced Developments of the Institute of Space Engineering and Technology	Medetov Bekbolat Zhaksylykovich - Ph.D. in specialty 6D071900 – Radio Engineering, Electronics and Telecommunications, Acting Associate Professor of the Department of Radio Engineering, Electronics and Telecommunications of the Kazakh Agrotechnical University named after S. Seifullin
2	Batyrgaliyev Askhat Bolatkanovich	Yakubova Mubarak Zahidovna – Doctor of Technical Sciences, Professor of the Department of Information Systems and Cybersecurity of the Institute of Information Technology of the Almaty University of Energy and Communications named after G. Daukeev	Zhetpisbayeva Ainur Tursynkanovna - Ph.D. in the specialty «6D071900- Radio Engineering, Electronics and Telecommunications», Acting Associate Professor of the Department of Radio Engineering, Electronics and Telecommunications of the Kazakh Agrotechnical University named after S. Seifullin
3	Bissarinova Aigul Tuktikyzy	Abdoldina Farida – Candidate of Technical Sciences, Almaty Management University, Director of Academic Excellence and Methodology, Almaty, Kazakhstan	Bostanbekov Kairat, PhD, expert from KMG Engineering Ltd.
4	Togzhanova Kulzhan Ondrisovna	Amirgaliev Beibut Yedilkhanovich - Ph.D. tech. Sciences, Associate Professor of Astana IT University	Mansurova Madina Yesimkhanovna - Candidate of Physical and Mathematical Sciences, Head of the Department "Artificial Intelligence and Big Data", Al-Farabi Kazakh National University
5	Zinagabdenova Dariga Rakhymzhankyzy	Utepbergenov Irbulat Turemuratovich – Doctor of technical sciences, professor, Almaty University of energy and	Omirbekova Zhanar - doctor PhD, assistant professor of the «Automation and Robotics» department in the KazNRTU named after K.I. Satpayev.

		communications named after G.Daukeev	
6	Samigulin Timur Ildusovich	Grigoryeva Svetlana Vladimirovna, PhD, associate professor, D. Serikbayev East Kazakhstan technical university	Fedorenko Igor Anatolievich – candidate of technical sciences, associate professor, JSC Almaty University of Power Engineering and Telecommunication named after Gumarbek Daukeev
7	Yubuzova Khalicha Ibragimovna	Evgeniy Vasiliu, Viktorovich, doctor of technical sciences, professor, State University of Intelligent Technologies and Communications (Ukraine)	Nysanbayeva Saule Yerkebulanovna, doctor of technical sciences, Institute of computing and information technologies of the SC of the MSHE
8	Oralbekova Dina Orymbayevna	Tukeev Ualsher Anuarbekovich, doctor of technical sciences, professor of the Department "Information systems", Al-Farabi Kazakh National University	Moldagulova Ayman Nikolayevna, candidate of physical and mathematical sciences, head of the Department "Computer Engineering", Kazakh National Research Technical University named after K.I. Satpaev

In order to ensure compliance with the requirements of the Standard Regulations on the work of the Dissertation Council, each reviewer was sent a memo with the requirements for the content and design of the review of the dissertation work.

All the reviews were submitted on time and in accordance with the requirements of the Committee for control in education and science of MSHE of RK.

There are no negative reviews.

6. Proposals for further improvement of the system of training of scientific personnel

to ensure high-quality consideration of works at the seminars of the department.

7. The number of dissertations for the degree of Doctor of Philosophy (PhD), doctor by profile in the context of areas of training:

1) dissertations accepted for defense (including doctoral students from other universities) - 8;

2) dissertations withdrawn from consideration (including doctoral students from other universities) - 0;

3) dissertations for which negative reviews were received from reviewers (including doctoral students from other universities) - 0;

4) dissertations with a negative decision based on the results of the defense (including doctoral students from other universities) -0;

5) dissertations sent for revision (including doctoral students from other universities) - 0;

6) dissertations aimed at repeated defense (including doctoral students from other universities) - 0.

**Chairman of the
dissertation council
on information and
telecommunication
technologies,
doctor of tech. Sciences,
Professor**

R.K. Uskenbayeva

**Scientific Secretary of the
dissertation council
on information and
telecommunication
technologies,
PhD**

Zh.B. Kalpeyeva