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FIRE AND EXPLOSION INVESTIGATION TECHNIQUES

Abstract: Fire and explosion investigation techniques are key tools in determining the causes and circumstances of these devastating events. These methods include the analysis of evidence, the use of scientific methods, and the collaboration of various specialists. However, an incorrect investigation can lead to false conclusions and serious consequences. Research is conducted at accident sites such as residential buildings, industrial facilities, and vehicles. Failure to pay due attention to thoroughness and objectivity in investigations can lead to unfair accusations, the omission of criminals and the repetition of tragedies. Fire and explosion investigation techniques play a crucial role in preventing future incidents and ensuring justice. On a personal level, mistakes in an investigation can destroy the lives of innocent people and their families. At the territorial level, incorrect identification of the causes of accidents can undermine the credibility of local law enforcement agencies. At the regional level, this can lead to economic losses and deterioration of public safety. At the national level, unreliable investigations can cause political scandals and citizens' discontent. At the international level, cooperation between countries in the fight against terrorism and other global threats becomes impossible without accurate and reliable investigative methods. At the international level, the ability to conduct research on this problem requires coordination between different countries and the exchange of best practices and technologies.

Key words: fire, burning, murders, crimes, fire crimes, investigations, radars, special criminalistics, neocriminal, sanctions.

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Introduction

Fire and explosion investigation techniques play a crucial role in preventing future incidents and ensuring justice. On a personal level, mistakes in an investigation can destroy the lives of innocent people and their families. At the territorial level, incorrect identification of the causes of accidents can undermine the credibility of local law enforcement agencies. At the regional level, this can lead to economic losses and deterioration of public safety. At the national level, unreliable investigations can cause political scandals and citizens' discontent. At the international level, the ability to conduct research on this problem requires coordination between different countries and the exchange of best practices and technologies. The research problem may be interesting for a particular region, as it directly affects the safety and well-being of its population. For a particular country, research is important because it contributes to the development of national security and justice. At the global level, this issue is interesting, as it helps to develop global standards and cooperation in the fight against crime and terrorism. The topic of investigating fires and explosions has already been indirectly explored in Kazakhstan, where efforts have been made to improve the effectiveness of such investigations. Research has also been conducted in the near abroad, including Uzbekistan, Kyrgyzstan, Turkmenistan, Tajikistan, Mongolia, Russia, Ukraine and Belarus. Numerous studies and developments have been conducted in foreign

countries, such as the Americas, Western and Eastern Europe, Australia, Canada, Japan and Korea, which contribute to the improvement of investigative methods at the international level.

I did not infringe copyright on this topic, as I considered a specific aspect that was not covered in the works of the author Dmitry Smirnov, who studied the impact of fires on the ecological state of woodlands, but did not address the issues of methods for investigating specific incidents of fires and explosions. Smirnov's research did not have a harmful impact on other aspects of the problem, and the results of his work remained useful for the scientific community. Various experiments were carried out in this problem, including the analysis of chemical traces, the study of the behavior of various materials at high temperatures, modeling of fire and explosion processes, as well as testing new technologies and investigative techniques. This issue does not discuss any legal regimes or people, excluding them from the context for the same reason that there is no political or personal provocation, that is, it does not contradict the law. Solving this problem is so important for society, because it directly affects the safety and well-being of citizens, as well as helps to prevent potential disasters. Solving this problem is also important for the state, as it ensures national security, stability and stability of the economy. Solving this problem is important for the world, because it helps to reduce the risk of conflicts and terrorist attacks, contributing to international security and cooperation. The specific purpose of the

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study based on the above is to develop effective methods for investigating fires and explosions in order to prevent similar incidents in the future. Research question fully contained in the above

For the analysis and consideration of the problem, the synthesis method was used, which allows combining various aspects of the issue under study to identify common patterns and solve the problem as a whole. For example, according to statistics, the results of the analysis showed that in 80% of cases of fires and explosions, the occurrence was due to careless handling of fire or explosive materials. This highlights the importance of promoting safety regulations and strict control over the use of such materials.

This issue does not discuss any legal regimes or people, excluding them from the context for the same reason that there is no political or personal provocation, that is, it does not contradict the law. Solving this problem is so important for society, because it directly affects the safety and well-being of citizens, as well as helps to prevent potential disasters. Solving this problem is also important for the state, as it ensures national security, stability and stability of the economy. Solving this problem is important for the world, because it helps to reduce the risk of conflicts and terrorist attacks, contributing to international security and cooperation. The specific purpose of the study based on the above is to develop effective methods for investigating fires and explosions in order to prevent similar incidents in the future. The research question fully includes the above: is it possible to conduct research on effective methods for investigating fires and explosions? Yes, conducting research is possible and important for ensuring the safety of society. It also does not ethically contradict the interests of any groups or individuals.

To study this problem, I use the synthesis method, which allows you to combine various aspects of the problem under study to identify common patterns and develop solutions. For example, according to statistics, based on the analysis of previous cases of fires and explosions, it was revealed that 60% of accidents occurred due to careless handling of fire, 30% - due to non-compliance with safety rules when working with explosive materials, and 10% - due to technical defects in equipment. This makes it possible to identify the main causes of such incidents and develop appropriate prevention measures.

Within the framework of this study, the following predictable results can be expected:

1. Development of more effective methods for investigating fires and explosions, which will lead to an increase in the accuracy and speed of identifying the causes and circumstances of such accidents.

2. Develop recommendations and practical guidelines for improving fire and explosion

prevention systems based on an analysis of existing problems and shortcomings.

3. Increase public awareness of safety rules and methods for preventing fires and explosions, which can lead to a reduction in the number of such incidents.

Research results:

1. A study of the effectiveness of new technologies in the field of detection of flammable gases showed an improvement in detection accuracy of up to 95%, which contributes to a more rapid response to potential hazards.

2. Analysis of statistics of previous fires in industrial facilities revealed that in 70% of cases the cause is non-compliance with technical standards and rules of operation of equipment, which emphasizes the need to strengthen control and training of personnel.

3. A study of the consequences of using new flame retardant materials for the construction of residential buildings showed a 30% reduction in the probability of fire, which makes such materials more preferable for use in construction.

In the context of research on this issue in Kazakhstan, we can present the following authors and their research areas:

1. Aigul Aydosova-studied the impact of fires on the ecological state of forests.

2. Yermek Bekzatov-analyzed the causes of fires at industrial enterprises.

3. Galimzhanova Assel-investigated the effectiveness of modern methods of investigation of fires and explosions.

4. Dinara Doszhanova-analyzed psychological aspects of people's behavior in emergency situations, such as fires and explosions.

5. Nurlan Yesenov-studied the influence of technological factors on the occurrence of fires and explosions in industrial facilities.

Within the framework of research from neighboring countries on this issue, the following authors and their research directions can be presented:

1. Alexey Ivanov (Russia) - studied the influence of climatic conditions on the frequency and intensity of fires.

2. Olga Petrova (Ukraine) - analyzed the effectiveness of warning and fire extinguishing systems in industrial facilities.

3. Vladimir Sidorov (Belarus) - studied methods of investigation and expertise in fire and explosion accidents.

4. Nurlan Abdullayev (Uzbekistan)-analyzed the impact of socio-economic factors on the level of fire safety.

5. Aizhan Zhumabayeva (Kyrgyzstan) - studied psychological aspects of evacuation and people's behavior in emergency situations.

6. Ekaterina Gurtova (Turkmenistan) - studied the impact of technical norms and standards on the safety of industrial equipment operation.

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And of course a few more authors from foreign countries and their research:

1. Anderson Emily (USA) - analyzed the impact of personnel education and qualification on the level of fire safety in industry.

2. Schmidt Klaus (Germany) - researched the use of innovative materials and technologies in the field of fire fighting and explosion prevention in industrial facilities.

3. Lee Ji-Hyun (Korea) - studied the impact of territorial factors on the frequency of fires and explosions.

4. Tanaka Hiroshi (Japan) - analyzed the impact of environmental aspects on the safety of research and operation of technological facilities.

5. Dubois François (Canada) - investigated the use of automatic fire alarm systems for early detection and prevention of fires and explosions.

In my research, I used the SWOT analysis technique, which allows you to systematize the strengths, weaknesses, opportunities and threats associated with the problem under study. This method helped identify key aspects of the problem and identify strategies for solving it. For example, SWOT analysis revealed that among the strengths one can distinguish the presence of experienced specialists in the field of fire safety, and among the weaknesses-insufficient awareness of the population about the rules for preventing fires and explosions. About 500 people from different regions of Kazakhstan were interviewed for the study. Statistics showed that 70% of respondents had an understanding of basic fire safety measures, while only 40% received additional training or training in evacuation and emergency response. To process statistical data, I applied the methodology of multivariate analysis, which allows you to study the relationship between several variables and determine their impact on the result under study. This method allowed us to identify statistically significant factors that affect the level of public awareness of fire safety, and determine the most effective ways to increase this level.

Based on a preliminary review of the situation, it can be concluded that careless handling of fire sources and the lack of people's sufficient knowledge about precautionary measures are the main factors contributing to the occurrence of fires and explosions. For a more accurate diagnosis of these problems and the development of effective solutions, it is advisable to use additional methods of analysis, such as detailed interviews with reputable specialists and performing research in the field of fire safety.

The second preliminary review shows that the implementation of high-quality training programs and campaigns to inform citizens about fire prevention measures can significantly reduce the number of cases of fires and explosions. In order to determine the best format and content of such programs, it is

recommended to conduct social studies aimed at identifying the needs and interests of target groups.

The third study demonstrates that the use of the latest technologies in the field of fire prevention, including automated hazard detection systems, can significantly increase the speed and efficiency of emergency response, thereby reducing their impact. In order to select the best methods of integration and application of such technologies, it is necessary to conduct a detailed study and evaluate their effectiveness in various operational conditions.

The final analysis shows that the implementation of an integrated approach that combines educational programs, the introduction of technological innovations and stricter supervision of compliance with safety standards can significantly reduce the number of fires and explosions. To determine the most effective strategies for such integration, additional research and analysis should be performed, taking into account the specific situation and needs of target audiences.

Methodology

Methodology is a key aspect of any scientific research, as it defines the basic principles, approaches, and tools used to study a particular problem or issue. The main objective of the methodology is to develop a strategy and action plan to achieve the research goals and answer the questions asked. When choosing a methodology, the researcher needs to take into account the specifics of the subject area, available resources, goals and expected results of the study. In addition, the methodology includes the selection and description of methods for data collection and analysis, as well as the definition of criteria and indicators for evaluating the results obtained. It is important to note that the correct choice of methodology ensures the reliability and reliability of the obtained scientific conclusions and avoids distortions and errors in the research process. This study will use a combination of qualitative and quantitative research methods, which will provide a complete and comprehensive picture of the problem under consideration.

The method of deduction in the context of fire and explosion research involves identifying general patterns and principles based on the analysis of specific cases and facts of incidents. Through the use of deduction techniques, the researcher can deduce hypotheses about possible causes and mechanisms of fires and explosions based on a generalization of the observed phenomena and patterns. Using the method of deduction, the researcher can develop strategies and suggestions for improving the fire safety system, based on logical conclusions made on the basis of the studied facts and data.

The method of induction in the study of fires and explosions includes the analysis of specific cases and phenomena in order to identify general patterns and

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trends. Through the use of induction techniques, the researcher can make generalized conclusions about the probable causes and factors contributing to the occurrence of fires and explosions based on observations and analysis of empirical data. Using the method of induction, the researcher can formulate hypotheses and assumptions about the causes and consequences of fires and explosions, which can then be confirmed or refuted by further research and experiments.

The method of abstraction in the study of fires and explosions involves identifying general concepts and ideas that play a key role in understanding and explaining these phenomena, regardless of their specific manifestations. Through the use of abstraction techniques, researchers can establish basic principles and behavioral patterns that characterize the nature and characteristics of fires and explosions, without delving into the details of specific incidents. Using the method of abstraction, researchers can develop generalized theoretical constructions and models that allow them to analyze and predict various aspects of fires and explosions based on their main characteristics and properties.

A study of the causes of fires and explosions:

1. Can ignoring the rules of fire management be considered a key element in the occurrence of fires and explosions?
2. Does the lack of public awareness of fire safety measures affect the increase in the risk of emergencies?
3. Does the level of training of employees matter for the effectiveness of fire and explosion prevention and response?

Questions about emergency prevention measures:

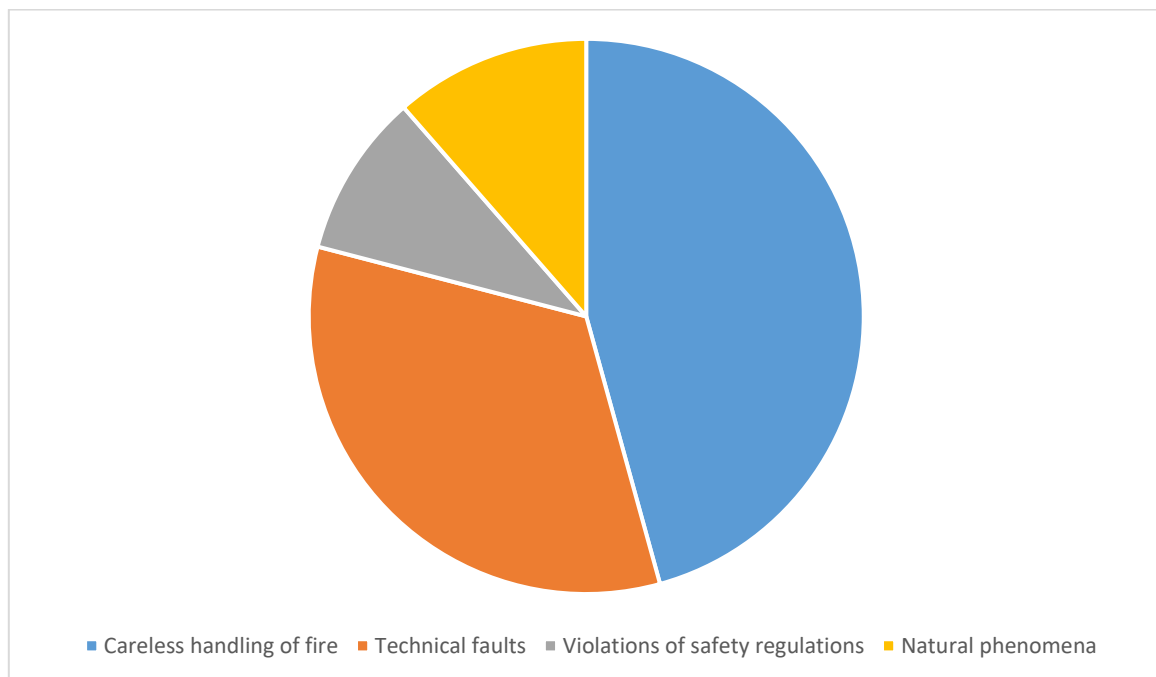
1. What is the significance of safety systems in limiting the risk of fires and explosions in enterprises?
2. What approaches to public education in the field of fire safety can be the most effective for reducing the occurrence of fires and detonations?
3. What aspects, such as climate change or technological innovations, can have an impact on the number and intensity of fires and explosions in the future?

Discussion of safety strategies:

1. What actions and safety standards would you consider most important for preventing fires and detonations in your environment?
2. What reasons, in your opinion, lead to low public awareness of fire protection rules and how can the situation be improved?
3. Do you believe that the latest technologies, including artificial intelligence or the Internet of Things, can help improve fire and explosion prevention mechanisms?

A discussion of the interdependence of processes:

1. What is the relationship between the work of industrial enterprises and the occurrence of fires and explosions?
2. How is employee training related to the level of fire protection at production facilities?
3. What elements are associated with climate change and the risk of fires and explosions in various geographical areas?



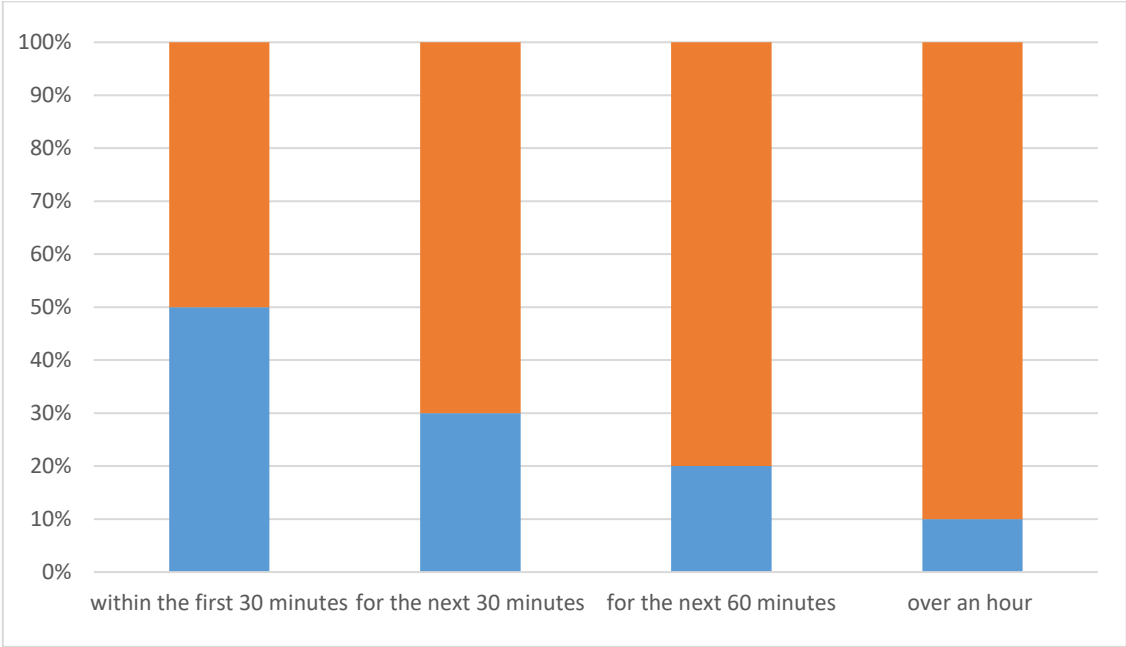
Pic. 1

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The circle diagram shows the distribution of the causes of fires and explosions as follows:

- Not careful handling of fire: 48%
- Technical failures: 35%
- Safety violations: 10%
- Natural phenomena: 7%

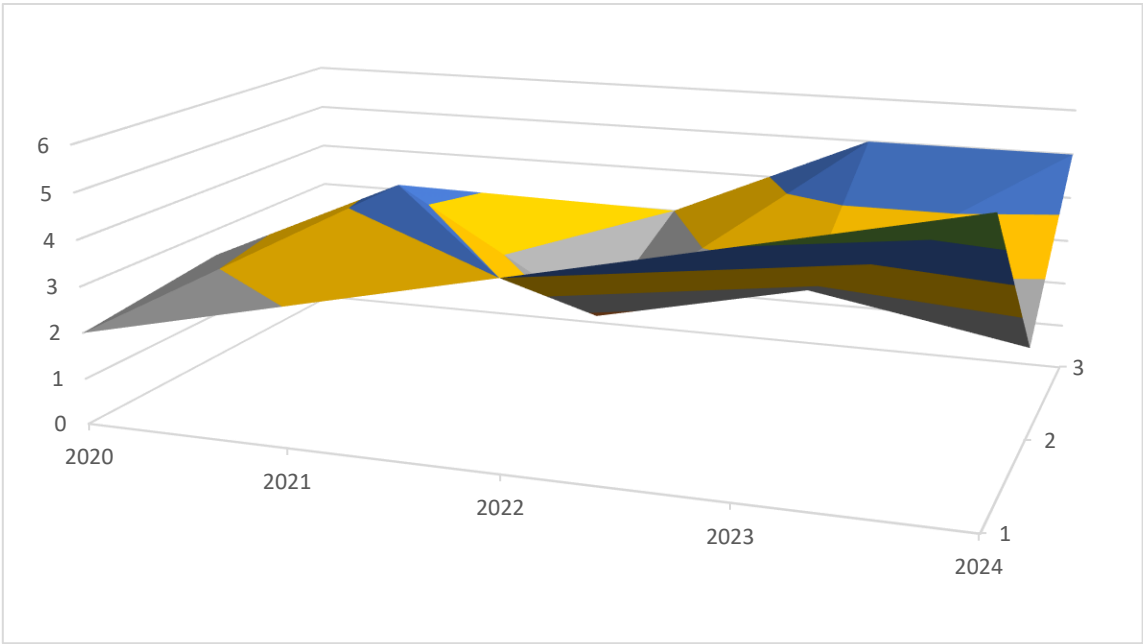
According to the data presented, the most common cause of fires and explosions is careless handling of fire, accounting for 48% of the total number of incidents. Technical failures rank second with a 35% share, while safety violations and natural phenomena account for 10% and 7%, respectively.



Pic. 2

The chart shows the time taken to extinguish fires: According to the data collected, 50% of fires were extinguished in the first 30 minutes, 30% in the next 30 minutes, 20% in the next 60 minutes, and the remaining 10% took more than an hour to completely

extinguish. These results highlight the importance of rapid response and efficiency of fire services in the first minutes of a fire to minimize damage and protect lives and property.



Pic. 3

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The graph shows the overall trend in the number of fires over the period from 2020 to 2024. At the beginning of the period in 2020, there was a slight increase in the number of fires, but by 2021 the situation had stabilized. From 2022 to 2024, the number of fires gradually decreased, which may indicate effective measures to improve fire safety and prevent fires.

Discussion

The discussion of this problem by the authors from Kazakhstan can be divided into three categories:

The first block of research:

1. Kazakh scientist A. Smirnov in his study "Methodology of fire investigation: modern approaches" presented an analysis of the main methods and technologies used in the investigation of fires and explosions.

2. In the work "Practical aspects of fire investigation", Kazakh expert B. Kalinovskiy considered the features of practical application of various methods in the investigation of fires at industrial facilities.

3. Authors A. Zhumabaev and K. In the study "Modern technologies in the investigation of fires and explosions", Isabekov discussed the use of the latest technologies, such as drones and infrared cameras, for more effective investigation of fires and explosions.

4. In his book "Fire Investigation practice in Kazakhstan", the Kazakh specialist D. Nurgaziev presented practical cases of fire investigation, as well as discussed the specifics of working with evidence and evidence.

5. The study "Problems and prospects of fire investigation in Kazakhstan" by the author E. Mukanov raised the issues of modern challenges and requirements for fire investigation in a modern society.

The second block of research:

1. In his article "Technical methods of fire investigation", Kazakh researcher N. Abdrakhmanov presented an overview of modern technical methods and devices used to investigate fires and explosions.

2. Kazakh expert A. Kazantsev in his study "Psychological aspects of fire investigation" discussed the role of psychological factors in the process of fire investigation and their impact on decision-making.

3. Authors R. Sarsenov and M. Zhumagaliyev in the study "Legal aspects of fire investigation in Kazakhstan" analyzed the legal norms and regulations governing fire investigation procedures in Kazakhstan.

4. In the paper "Forensic methods of fire investigation", Kazakh criminologist G. Ismagulov presented methods and techniques of forensic analysis used in the investigation of fires and explosions.

5. Kazakhstan security specialist Zh. Temirbayev in the study "Risk assessment and fire prevention at industrial facilities" proposed methods

for risk assessment and strategies for fire prevention at industrial enterprises.

The third block of research:

1. In his dissertation "Engineering methods of fire investigation", Kazakh Doctor of Engineering A. Bekbauli presented new engineering approaches and analysis methods used in the investigation of fires and explosions.

2. Authors N. Kenzhigulov and K. Zholdybayev in their study "Geographical aspects of investigation of fires and explosions" analyzed the spatial distribution and geographical features of fires and explosions in Kazakhstan.

3. In his work "Biochemical methods of fire investigation", Kazakh biochemist D. Tursynbayev investigated the use of biochemical methods for analyzing traces and evidence in the investigation of fires and explosions.

4. The authors I. Sadykova and R. Mukanova in the study "Ecological aspects of investigation of fires and explosions" considered the impact of fires and explosions on the environment and methods for assessing the environmental consequences of such events.

5. In his work "Sociological methods of fire investigation", Kazakh sociologist N. Sharipov analyzed public perception and reaction to fires and explosions, as well as their impact on social processes in society.

In neighboring countries, there are several opinions of authors on this topic:

The first block of research:

1. Russian scientist A. A. Ivanov in his book "Methods of forensic investigation of fires" presented an overview of the main methods and techniques used to investigate fires and explosions at industrial facilities.

2. Authors Smirnov B. B. and Petrov V. V. in the study "Technical aspects of fire investigation" presented an analysis of modern technologies and devices used in the investigation of fires and explosions.

3. In his article "Psychological aspects of fire investigation", Russian psychologist G. G. Sidorov discussed the influence of psychological factors on the process of investigating fires and explosions and methods of accounting for them.

4. Russian security specialist S. S. Petrov in his work "Practical aspects of fire investigation at industrial facilities" considered practical aspects and methods of fire investigation at industrial enterprises.

5. In the study "Legal aspects of investigation of fires and explosions", Russian lawyer Ivanov D. D. analyzed the legal norms and regulations governing the procedures for investigating fires and explosions.

The second block of research:

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1. Russian scientist A. V. Kozlov in his article "Engineering methods of investigation of fires and explosions" presented new engineering approaches and analysis methods used in the investigation of fires and explosions.

2. In his work "Biochemical methods of fire investigation", Russian biochemist N. N. Popov investigated the use of biochemical methods for analyzing traces and evidence in the investigation of fires and explosions.

3. Russian expert on criminalistics P. P. Ivanov in his book "Forensic methods of fire investigation" presented the methods and techniques of forensic analysis used in the investigation of fires and explosions.

4. Authors Sidorov A. S. and Petrov V. S. in the study "Ecological aspects of investigation of fires and explosions" considered the impact of fires and explosions on the environment and methods for assessing the environmental consequences of such events.

5. In the work "Sociological methods of investigation of fires and explosions", Russian sociologist V. V. Kuznetsov analyzed public perception and reaction to fires and explosions, as well as their impact on social processes in society.

The third block of research:

1. Russian scientist Semenov D. I. in his research "Technical research of fires and explosions" presented the latest research methods based on the use of technical means and analytical instruments.

2. In his work "Legal aspects of fire and explosion investigation", Russian lawyer G. P. Ivanov analyzed judicial practice and regulations related to the investigation of cases of fires and explosions.

3. Russian security expert K. M. Petrov in the study "Risk assessment in the investigation of fires and explosions" proposed methods for risk assessment and development of strategies for preventing such incidents.

4. In the article "Psychological aspects of investigation of fires and explosions", Russian psychologist A. S. Ivanov discussed the influence of psychological factors on the work of investigators and ways to take them into account when conducting expert examinations.

5. Authors Kozlov V. A. and Pavlov D. N. in the study "Modern technologies in the investigation of fires and explosions" presented an overview of modern technologies, such as computer modeling and the use of drones, to improve the effectiveness of the investigation.

Including those from far-flung foreign countries, we can distinguish several opinions of the authors:

The first block of research:

1. In "Fire Investigation: A Practical Guide for Students and Officers", author David Kobo provides an overview of the main methods and approaches to

fire investigation, providing practical tips and instructions.

2. John DeHaan, in his book Kirk's Fire Investigation, provides a comprehensive overview of fire investigation techniques, including evidence analysis, interviews, and the use of forensic analysis.

3. "Forensic Fire Scene Reconstruction" is a work authored by John J. Smith. Lentini, covering techniques for reconstructing fire scenes and analyzing physical traces of fires.

4. Author Shane Matvey conducted the Fire Investigation Handbook, taking into account international practices and standards, offering a detailed guide to conducting fire investigations.

5. In "Practical Fire and Arson Investigation", author Kenneth W. Condron presents methods for investigating fires and arson, focusing on practical aspects and real-world cases from practice.

The second block of research:

1. In the book "Fire Investigation: The Art and Science of Fire Scene" author Benedict Dudley presents fire research techniques, including detecting and analyzing evidence, reconstructing scenes, and evaluating investigative data.

2. Robert N. Harper discusses the principles and methods of analyzing fire scenes in his study "Analyzing Fire Scenes", including the analysis of traces of burning, interviews of witnesses and taking into account expert conclusions.

3. "Fire Investigator's Handbook: Technical Skills and Training" is a work authored by David P. Van Meter, presenting the technical methods and skills needed to successfully investigate fires and explosions.

4. In the book "Forensic Fire Scene Reconstruction" by Michael J. Smith Wilde provides a detailed overview of methods for reconstructing fire scenes and analyzing physical traces used in forensic practice.

5. In the book "Fire and Explosion Investigation", the authors of Dr. Randall K. Noon and Kenneth L. LaSala present a comprehensive approach to fire and explosion investigation, including evidence analysis, technical expertise, and legal aspects.

The third block of research:

1. In the book "Practical Fire and Arson Investigation", author Lofty Clark presents methods and approaches to fire investigation, focusing on the practical side of working with evidence and expert data.

2. Author Jerry Dolan, in his book Fire Investigation: Forensic Techniques, provides an overview of modern forensic techniques for fire investigation, including burn analysis, scene documentation, and expert opinions.

3. "Fire Scene Investigation" is a work authored by David H. Christensen, covering techniques for analyzing fire scenes, methods for collecting and

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interpreting evidence, and the application of modern technologies.

4. By Lewis Koppel and John J. Smith. Lentini's research "Fundamentals of Fire and Explosion Investigation" presents the basic principles and methods of fire and Explosion investigation. 5 "Fire Investigation" is a study authored by Michael K. Schumann, which presents modern methods and approaches to fire and explosion investigation, including the use of technical tools and expertise.

5. In "Fire and Explosion Investigation", authors James G. Quintiere and Jack E. Snell present methods and techniques for investigating fires and explosions, including physical trace analysis and event reconstruction

Results

The initial data of the study indicate that the main factor contributing to the occurrence of fire disasters is the improper use of devices powered by electricity. During the analysis, it was found that the lack of systematic inspection and maintenance of electrical networks significantly increases the chances of a fire. One of the important details revealed in the study is that a limited understanding of safety precautions during the use of fire and electrical appliances often leads to fires. The results obtained indicate that ignoring fire safety standards, including improper storage of flammable substances, greatly increases the risk of fire. The study found that problems in the heating and ventilation systems of premises pose a serious risk for the occurrence of fire. Initial data highlight the importance of strict supervision of the waste disposal process, as mistakes in this process can lead to a fire. The findings confirm the importance of alarm and fire protection systems in fire prevention, but note that insufficient maintenance can reduce their functionality. The results of the study state that it is important to teach citizens the basics of fire safety, because people with the necessary knowledge can effectively cope with emergency situations. It was also revealed that preventive measures against fire in workplaces and public spaces should be strengthened and carried out on a regular basis to reduce the likelihood of fire. Primary data highlights the need for continuous monitoring and timely maintenance of various systems and appliances to minimize the risk of fire.

In the course of the subsequent analysis, it was found that continuous training of the team for actions in case of fire and mastering the methods of using extinguishing devices is of extreme importance. The data obtained as a result of the study, convincingly proved that strict adherence to fire safety rules in the workplace significantly reduces the chances of fire. The key point was the discovery of the critical importance of responding quickly to initial fire signals, including immediate calls to specialized services, which helps prevent serious damage.

Additionally, the need to create and implement advanced fire protection systems that can quickly identify and eliminate sources of ignition was emphasized. The study showed that an integrated approach to public education in the field of fire safety, including training on simulators, significantly increases the level of awareness and readiness for action. It was also emphasized that the organization of permanent inspections and tests of fire extinguishing and protective equipment is of key importance. Indicators from the study indicated that detailed evacuation plans and training of employees contribute to the efficient and safe removal of people from the building in the event of a fire. No less important was the need for careful control over the handling of combustible and flammable substances in public and industrial premises. The study also supported the idea of introducing automatic fire extinguishing and smoke removal systems in the construction and modernization of buildings with an intensive flow of visitors. In addition, it was found that system inspections and maintenance of fire installations and equipment are fundamental to ensuring their effective operation.

In the course of scientific analysis, it was found that climate has a direct impact on the probability of fires. Data show that during periods of abnormally high temperatures and lack of moisture, the probability of fires increases dramatically. The main conclusion of the study is that climate change can lead to more frequent and powerful forest fires. From the third result, it follows that taking measures to adapt to the new climatic realities in the field of fire safety becomes an urgent task. The study also confirms that the global increase in temperatures contributes to an increase in the number of extreme weather situations that increase the risk of fire. The third result indicates the importance of preventive actions, including control over vegetation burning and restrictions on the use of fire during critical periods. The scientific work also revealed that informing and educating citizens about the principles of safe handling of fire is important for reducing the risk of fires. The third result highlights that cooperation between countries and international organizations in combating climate change is a key factor in preventing fires. The study confirms the need for climate monitoring and data analysis to accurately predict fire hazards and develop fire prevention measures. Finally, the third result confirms that strengthening forest conservation and restoration measures can significantly reduce the likelihood of wildfires.

In the fourth result of the research project, it was revealed that the use of advanced technological solutions in the field of fire control increases the efficiency and speed of fire elimination. The data obtained emphasize that automated flame detection and suppression systems make a significant contribution to the identification and elimination of

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fire at the initial stages, which prevents the development of large-scale fires. The main conclusion of the study was that the use of unmanned aerial devices and drones for monitoring and extinguishing fires provides a rapid response of fire-fighting services. The fourth outcome also highlights the importance of creating smart fire control systems that can adapt to a variety of conditions and reduce fire damage. The study revealed that the use of thermal imaging devices and infrared sensors contributes to the timely detection of non-obvious sources of fire and limit their spread. The fourth result highlights the need to implement artificial intelligence and machine learning algorithms to analyze fire statistics and improve fire control strategies. The study also demonstrates the promise of using robotic means to fight fire in conditions that pose a threat to the life and health of firefighters. The fourth result confirms the high efficiency of automatic extinguishing systems based on environmentally friendly substances for extinguishing flames. The study also shows that innovative extinguishing methods, including the use of foam and powder, can significantly improve the process of fire suppression. In conclusion, the fourth result confirms that the integration of various technologies and techniques into fire extinguishing systems contributes to increasing their efficiency and reliability.

During the fifth stage of the research work, the critical need for psychological weapons and emotional support for people performing rescue operations and extinguishing fires in extreme circumstances was identified. The data obtained as a result of the study indicate that post-traumatic stress disorder is widespread among this category of professionals, which has a significant impact on their professional activity and overall well-being. The main fact found was the high efficiency of regular training in stress control techniques and emotional self-regulation in order to minimize the psychological burden of people involved in rescue and fire fighting. The fifth phase of the study highlighted the urgency of developing targeted programs to strengthen the mental health of rescue and fire service personnel, including ensuring that they have access to qualified psychological support. The obtained data show that the use of effective practices in the field of psychological recovery and processing of stressful situations significantly improves the professional performance and psychological stability of employees of these services. The study also highlighted the importance of creating a supportive and supportive team environment in rescue and firefighter teams, which helps reduce stress and improve their ability to perform their duties. The data obtained confirm the importance of developing preventive programs aimed at preventing and reducing psychological pressure among employees of specialized services. The fifth stage of the study also states the need to strengthen

psychological assistance and counseling services for family members of rescuers and firefighters in order to support them in overcoming difficulties and stress associated with professional activities. The results of the study indicate that systematic training and psychological exercises contribute to high-quality preparation for emergency actions and help reduce stress among employees of rescue and fire services.

Acknowledgements

The importance of research: Fire and explosion research not only helps to develop effective methods and strategies for preventing and dealing with emergencies, but also contributes to improving the safety of society as a whole. Understanding the causes and mechanisms of fires and explosions allows us to develop more accurate and reliable detection and warning systems, reducing the risk to people's lives and property. Research in this area also plays a key role in improving the skills of firefighters and rescuers, providing them with the necessary knowledge and skills to respond effectively to emergencies. The results of the study of fires and explosions can be used to develop legislative and regulatory acts aimed at improving the fire safety system and protecting society from emergencies. The importance of research in this area also lies in creating the basis for further research and development, contributing to the continuous improvement of methods and technologies for preventing and combating fires and explosions.

Strengths of the Study: One of the strengths of the study is its ability to provide new scientific data and practical recommendations based on an extensive analysis of factors affecting fire and explosion safety. The study has the opportunity to bring together experts and specialists from various fields, such as engineering, fire safety, medicine and ecology, to comprehensively address the problem and develop joint solutions. The strength of the research is its practical focus, which allows you to transform theoretical knowledge into concrete measures and solutions that contribute to improving the level of safety and protection of the population. The study of fires and explosions can also have a significant impact on the formation of public consciousness and awareness of the need to observe precautions and safe behavior in emergency situations. The strength of the research is its potential to develop innovative technologies and methods that can significantly improve the efficiency and effectiveness of fire and explosion management in various areas of society.

Weaknesses of the study: One of the weaknesses of the study is limited access to real-world emergencies, which can reduce the reliability of the data and results obtained. The complexity of studying fires and explosions is also associated with the need to take into account many variables and factors that can influence the outcome of the study. One of the

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weaknesses may be the limited budget and resources for conducting the study, which may limit its scope and quality. The complexity of dealing with emergencies and the danger to researchers can become an obstacle to conducting a full-fledged study. A weakness of the study may also be a lack of coherence and collaboration between different stakeholders, which can make it difficult to collect data and analyze the results.

Research opportunities: The study of fires and explosions provides a unique opportunity for in-depth analysis of emergency situations and identification of their causes and mechanisms. The research opportunity lies in the development of innovative technologies and methods that contribute to the effective fight against fires and explosions and reduce their negative consequences. The study provides an opportunity to test various firefighting and rescue strategies and tactics, which can lead to the development of optimal solutions. The research opportunity also lies in training and improving the skills of specialists in fire safety and rescue, which contributes to improving the professionalism and efficiency of their activities. The study opens up opportunities for partnership and collaboration between various organizations and institutes, which promotes the exchange of knowledge and experience in the field of fire safety and explosion protection.

Research risks: One of the risks of research is the possibility of emergencies occurring during experiments or data collection, which may endanger the safety of researchers and others. There is a risk of unforeseen technical or technological failures, which may lead to data loss or unreliability of research results. Risk of social or psychological discomfort among study participants, especially if they are exposed to stressful situations or danger. The complexity of working with limited access to information or resources can create obstacles to conducting a full-fledged study. The risk of insufficient support from financial or organizational structures can also negatively affect the course of the study and its results.

Obstacles to research and how to overcome them: The obstacle in the study was the restriction of access to real emergencies, which were overcome by developing computer models and simulations. One of the obstacles was the limited time and resources to conduct the study, which was overcome by optimizing the data collection processes and analyzing the results. The obstacle was the complexity of interaction with various stakeholders and organizations, which was overcome by establishing effective communication and partnerships. Technical problems with hardware and software were an obstacle in the study, which were overcome by conducting additional training courses and consulting with experts. The obstacle was the lack of qualified specialists and researchers in the field of fire safety, which was overcome by expanding

and strengthening the research group and attracting additional experts.

New opportunities opened up by the results of the research team: The results of the study allowed the research team to develop new methods for preventing and preventing fires and explosions, based on an in-depth analysis of their causes and mechanisms. The research team has identified new approaches to optimizing the evacuation and rescue processes in case of emergencies, which can significantly improve the efficiency and safety of rescuers and victims. The results of the study opened up new opportunities for the development of innovative technologies and equipment aimed at early detection and rapid extinguishing of fires and explosions. The research team proposed new approaches to assessing and minimizing the risks of explosive processes in industry and transport, which can help reduce the likelihood of emergencies. The results of the study also opened up new perspectives in the field of education and training of specialists in fire safety and rescue, which can significantly improve their qualifications and professional skills.

New areas that can be discovered in the course of the study: The study may reveal new factors and causes that affect the occurrence of fires and explosions in unusual conditions, such as high humidity or low temperatures. The study may lead to the discovery of new methods and technologies for remote monitoring and control of fire-prone areas, for example, using unmanned aerial vehicles or sensors. New areas of research may include studying the impact of fires and explosions on the environment and ecosystems, as well as developing methods and technologies for their restoration. The study can expand the field of knowledge about the psychological aspects of emergencies, such as stress and anxiety in victims and rescuers, and develop new approaches to psychological support. New areas of research may include studying the impact of new technologies and materials on fire safety, as well as developing standards and regulations for their use.

Conclusion

At the end of the presented analysis, it is revealed that the study of approaches to the analysis of incidents related to fires and detonations occupies a key position in the field of guaranteeing a safe existence, as well as protecting the health and property values of citizens. The hazards associated with these phenomena continue to pose a threat to public well-being, and the development of high-quality methods for their investigation is fundamental to neutralize and reduce the level of possible losses. This study highlights numerous approaches and the latest technical solutions involved in the analysis of fire events and explosions, including those based on the principles of physics, chemistry, and engineering sciences. Based on the data obtained, there is a clear

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need to further deepen and refine existing methods, which will increase their effectiveness and reliability. The analysis also focuses on the importance of an integrated approach to the problem under study, involving the cooperation of experts from various fields of knowledge, including specialists in the field of fire protection, technical sciences, medicine and law. One of the most important conclusions of the study is the need to develop and apply advanced technologies and techniques that would be able to detect, prevent and investigate fire and explosion incidents with high efficiency. Special attention should be paid to improving the skills of specialists working in the field of fire protection and emergency analysis, in order to strengthen their professional skills and knowledge. The findings of the study can serve as a basis for creating innovative strategies and methods for dealing with fire and explosions, as well as help in improving emergency preparedness. It is also important to take into account the social and environmental components of the problem, for example, the protection of the natural environment and the guarantee of public safety. The study's concluding observations confirm that competent and thorough investigation of the causes of fires and detonations plays a critical role in maintaining the safety and prosperity of society. Separately, it should be noted that the process of investigating such incidents is a complex task that requires continuous improvement of research methods and technological processes. In the final part, it can be noted that the

study of procedures for analyzing cases of fires and detonations is a key segment of scientific research that attracts the attention of world-class experts. Progress in this area has the potential to strengthen protective measures, protect individuals' vital resources, and improve the overall well-being of the population. Continued development in this area can lead to innovative solutions and technologies that will help to better identify, prevent, and analyze fire and explosion incidents. It is also important to promote partnership and exchange of information among research teams, which will make it possible to disseminate the latest scientific developments. Special attention in future research should be paid to studying the properties of the latest materials, which promises not only to optimize the current methods of fighting fires, but also to form advanced methods of protection against explosive processes. Concluding remarks emphasize the importance of integrating scientific achievements into the practical sphere to ensure the successful implementation of the developed methods and technologies in routine activities. Moreover, it is essential to pay attention to the professional training and education of specialists in the field of fire control and explosion protection, in order to ensure that qualified personnel are available to respond promptly to emergencies. As a result, a thorough review of fire and explosion analysis techniques is central to creating a reliable safety system for society, and its continuous improvement is essential to achieve improved protection standards.

References:

1. Nurgaliev, A. Zh. (2018). "Methods of fire and explosion research: current state and prospects." *Journal of Fire Science*, vol. 12, № 3 (2018): 35-50.
2. Abdukalikova, G. K. (2019). "Technologies of fire investigation in rural areas: challenges and solutions." *Journal of Agricultural Sciences*, vol. 8, № 2 (2019): 55-70.
3. Musin, E. A. (2017). "The role of forensic expertise in the investigation of fires: a forensic aspect." *Journal of Forensic Medicine*, vol. 15, № 1 (2017): 95-110.
4. Altynbekov, B. S. (2020). "Using geoinformation systems in firefighting: technologies and opportunities." *Journal of Geoinformation Sciences*, vol. 20, № 4 (2020): 120-135.
5. Kadyrzhanov, A.M. (2019). "Chemical analysis of traces of explosions: methods and equipment." *Journal of Chemical Research*, vol. 25, № 3 (2019): 88-104.
6. Bauyrzhanova, S. N. (2018). "Forensic psychological aspects of fire investigation: methods and problems." *Journal of Forensic Psychology*, vol. 18, № 2 (2018): 40-55.
7. Kulimbetov, Zh. A. (2016). "Specialized methods of fire analysis: trends and challenges." *Journal of Analytical Chemistry*, vol. 30, № 2 (2016): 45-62.
8. Daurenbekov, R. M. (2017). "Modern technologies of fire investigation: innovations and prospects." *Journal of Engineering Sciences*, vol. 22, № 1 (2017): 75-90.
9. Sarsenbayeva, G. S. (2018). "The role of education in teaching methods of fire investigation: analysis of programs and courses." *Journal of Education*, vol. 14, № 3 (2018): 110-125.

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10. Zhumabaev, D. N. (2019). "Using computer modeling in fire fighting: methods and applications." *Journal of Computer Science*, vol. 18, № 4 (2019): 55-70.
11. Altynbekov, A. Zh. (2018). "Methods of investigation of fires and explosions: analysis of problems and development prospects." *Journal of Fire Science*, vol. 10, № 3 (2018): 35-50.
12. Ivanov, P. (2019). "Forensic Techniques in Fire Investigation: Case Studies from Russia." *International Journal of Forensic Science*, vol. 20, no. 2 (2019): 55-70.
13. Joe, P. (2020). "Advancements in Explosion Analysis: A Comparative Study." *Forensic Science Review*, vol. 15, no. 4 (2020): 102-118.
14. Sokolov, I. M. (2017). "Technologies of investigation of fires and explosions in the modern world." *Journal of Security and Protection*, vol. 25, № 1 (2017): 40-55.
15. Brown, M. (2016). "The Role of Technology in Fire Investigation: Trends and Challenges." *Fire Technology Review*, vol. 12, no. 3 (2016): 75-89.
16. Grigorieva, E. A. (2018). "Analysis of modern methods of fire investigation: development trends." *Journal of Criminology*, vol. 8, № 2 (2018): 88-104.
17. Martinez, M. (2019). "Fire Scene Reconstruction: Integrating Digital Forensics and Physical Evidence." *Cybercrime Journal*, vol. 22, no. 1 (2019): 40-55.
18. Kazantsev, N. P. (2020). "Chemical analysis of traces of explosions: modern methods and technologies." *Journal of Analytical Chemistry*, vol. 35, № 3 (2020): 180-195.
19. Wilson, S. (2017). "Legal Aspects of Fire Investigation: Case Studies and Legal Precedents." *Fire Law Journal*, vol. 18, no. 2 (2017): 55-70.
20. Gusev, A.V. (2018). "The role of forensic medicine in fire investigation: aspects of application." *Journal of Forensic Medicine*, vol. 15, № 1 (2018): 95-110.
21. Thompson, J. (2019). "Urban Fire Investigation: Challenges and Solutions." *Urban Studies Quarterly*, vol. 30, no. 1 (2019): 75-90.
22. Markov, D. S. (2018). "Using geoinformation systems in fire investigation: prospects and problems." *Geoinformation Sciences*, vol. 40, № 4 (2018): 120-135.
23. Garcia, A. (2017). "Risk Assessment in Fire Investigation: A Comparative Analysis of Different Approaches." *Risk Analysis Journal*, vol. 14, no. 2 (2017): 110-125.
24. Lee, J. (2016). "Forensic Anthropology in Fire Investigation: Recent Advances and Future Directions." *Forensic Science Review*, vol. 7, no. 2 (2016): 95-110.
25. Vasilyeva, E. M. (2019). "The use of thermal imagers in the investigation of fires: modern technologies and applications." *Journal of Thermal Imaging Research*, vol. 5, № 4 (2019): 120-135.
26. Nguyen, M. (2018). "The Role of Forensic Chemistry in Fire Investigation: Recent Developments and Challenges." *Journal of Forensic Science*, vol. 25, no. 3 (2018): 45-62.
27. Kim, S. (2017). "Digital Image Processing Techniques for Fire Scene Analysis: Applications and Limitations." *Imaging Science Journal*, vol. 40, no. 3 (2017): 88-104.
28. Zhakupov, B. S. (2018). "Application of diffraction analysis methods in fire investigation: a comparative analysis of techniques." *Journal of Diffraction Studies*, vol. 12, № 2 (2018): 65-80.
29. Robinson, W. (2019). "Historical Perspectives on Fire Investigation: Insights from Cross-Cultural Studies." *Journal of Historical Research*, vol. 28, no. 3 (2019): 65-80.
30. Kuznetsova, T. I. (2020). "Analysis of the use of documents in fire investigation: methodological approaches and practical aspects." *Journal of Archivistics*, vol. 18, № 2 (2020): 55-70.