Strategies for Minimizing Errors in Forensic Expert Practice

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The Article Purpose is to enhance the understanding of error minimization strategies in forensic expert activity through an in-depth analysis of the most frequent errors and the development of new approaches to avoid them; to emphasize the classification of errors in order to identify key factors of their occurrence; to focus on the impact of cognitive biases, inadequate training of forensic experts and the lack of uniform standards; to develop recommendations for improving the system of training and certification of forensic experts; to address ethical aspects for the work of forensic experts. General scientific and special methods have been used to achieve this goal. The paper outlines strategies for minimizing errors in forensic expert activity; the impact of cognitive biases; issues of introducing state-of-the-art technologies, improving the system of forensic experts' training and certification, as well as ethical dimensions of work. The author develops the main strategies for minimizing errors in forensic expert activity, which are of paramount theoretical and practical importance. A comprehensive approach to minimizing errors has been developed. Different aspects of the problem have been brought together to create a comprehensive approach to its resolution. Emphasis has been made on cognitive biases, insufficient training of forensic experts, and the lack of uniform standards. The impact of modern technologies on reducing the number of errors has been assessed. Recommendations have been proposed to improve the

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system of training and certification of forensic experts, as well as to adhere to high ethical standards.

Keywords: *forensic activity; forensic examination; error minimization; cognitive bias; modern technologies; artificial intelligence; automated systems; standardization; professional training; ethical standards.*

Research Problem Formulation

Despite considerable progress in studying and minimizing errors in the work of forensic experts, there are still a number of unresolved issues in this field. One of these is the excessive reliance on subjective judgement, reducing the reliability of experts' conclusions.

A major concern is the influence of cognitive biases. Despite being aware of them, they are difficult to eliminate. The lack of uniform standards for conducting forensic examinations in various countries, and even various institutions in the same country, makes standardizing procedures difficult. That is also a problem.

The training system for forensic experts is often flawed, as existing training programs oftentimes overlook state-of-the-art advances in science and technology. Ethical issues are also relevant, despite the development of ethical codes, because their practical implementation and compliance are not always properly ensured. The study of these aspects is necessary to develop efficient strategies in order to minimize errors in forensic practice. This will further contribute to the objectivity and accuracy of court decisions.

Minimizing errors in forensic expertise is crucial for ensuring justice, since errors in expert conclusions can result in inaccurate judicial decisions and undermine public trust in justice.

It is important to understand the nature of errors in forensic expert activity, identify their factors, and develop efficient tools to reduce them. It is necessary to analyze and systematize errors that often occur during forensic expert activities, develop and implement methodologies intended to prevent them.

The relevance of the issue related to expert error prevention is due to the significance of ensuring the credibility of experts' conclusions, which is a key element of the proof process in criminal and civil cases. Errors in forensic expert activity can significantly affect the outcome of trial, so their prevention is a top priority of forensic science institutions.

One of the ways to minimize expert errors is a thorough analysis of both objective and subjective factors that have led to them. *Objective factors:* imperfection of existing research methods; limited resources; insufficient technical support and scientific and technical problems. *Subjective factors:* Inadequate qualifications of forensic experts; lack of experience; unwillingness to raise one's professional level; psychological aspects that may affect objectivity of the expert's conclusion.

Errors in forensic practice not only affect the outcome of a trial, but also have economic consequences, as they may require re-examination and additional resources for revision and elimination.

Expert research is directly linked to the needs of the judiciary and law enforcement

agencies to enhance the quality and objectivity of court proceedings. Implementation of the developed error minimization strategies will substantially improve the quality of the expert's conclusions and reduce the number of miscarriages of justice resulting from inaccurate expert conclusions.

The research findings can be utilized to train new and experienced forensic experts, enhance the regulatory framework and practice of conducting forensic examinations, and prepare methodological guidelines for reducing errors in the expert's conclusions.

Analysis of Essential Researches and Publications

Minimization of errors in forensic expert activity is a significant research avenue internationally. *S. M. Kassin, I. E. Dror,* and *J. Kukucka* made a valuable contribution to resolving this issue: they investigated the impact of cognitive biases on forensic examination results and proposed methods for their minimization, emphasizing the importance of training experts to be aware of their own biases and develop critical thinking skills [1].

P. C. Giannelli analyzed ethical challenges faced by forensic experts and stressed the importance of adhering to ethical standards helping to reduce the number of errors caused by personal and professional conflicts of interest: since ethics are an integral part of forensic expert activity, adherence to them contributes to enhancing the quality and reliability of expert conclusions [2].

Sh. Nakhaeizadeh, I. E. Dror, and *R. M. Morgan* emphasized the need to automate processes in forensic expert practice and integrate artificial intelligence into it in order to increase the accuracy of forensic examinations and reduce the influence of the human factor [3].

E. J. Reese believes that high quality training of forensic experts and their continuous improvement is the key to successful forensic work: to maintain a high level of professionalism, she suggests introducing stricter training standards and regular retraining [4].

The *Strengthening Forensic Science in the United States: A Path Forward* Collective Work discusses the importance of audits and inspections to enhance the quality of forensic examinations and facilitate identification and elimination of shortcomings in the work of forensic experts, as quality control is an essential tool for ensuring reliability of forensic expert activities [5].

1 Kassin S. M., Dror I. E., Kukucka J. The forensic confirmation bias: Problems, perspectives, and proposed solutions. *Journal of Applied Research in Memory and Cognition.* 2013. Vol. 2. Is. 1. Pp. 42—52. DOI: 10.1016/j.jarmac.2013.01.001 (дата звернення: 01.11.2024).

2 Giannelli P. C. Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs. *North Carolina Law Review.* 2007. Vol. 86 Is. 1. Art. 4. Pp. 162—235. URL: https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=4293&context=nclr (дата звернення: 01.11.2024).

3 Nakhaeizadeh Sh., Dror I. E., Morgan R. M. Cognitive bias in forensic anthropology: Visual assessment of skeletal remains is susceptible to confirmation bias. *Science & Justice.* 2014. Vol. 54. Is. 3. Pp. 208—214. DOI: 10.1016/j.scijus.2013.11.003 (дата звернення: 01.11.2024).

4 Reese E. J. Techniques for Mitigating Cognitive Biases in Fingerprint Identification. *UCLA Law Review*. 2012. Vol. 59. Is. 5. Pp. 1252—1290. URL: https://www.uclalawreview.org/pdf/59-5-3.pdf (дата звернення: 01.07.2024).

5 Strengthening Forensic Science in the United States: A Path Forward / National Academy of Sciences. Washington, D. C., 2009. 350 p. URL: https://www.ojp.gov/pdffiles1/nij/grants/228091.pdf (дата звернення: 01.11.2024).

The topic of expert errors and their prevention in forensic expert activities was studied by the following domestic researchers: V. Abramova [6]; T. Kopylchenko [7]; K. Latysh, Ye. Demydova, O. Domashenko and I. Kolesnikova [8]; M. Maksymenko [9]; M. Sehai at el. Despite the weighty contribution of these researchers to the development of the issues discussed earlier, certain aspects still require an exhaustive scientific study. One of these essential issues is the analysis of the causes of expert errors and the development of effective preventive measures.

Scientific studies demonstrate that in order to efficiently prevent expert errors, it is crucial to systematically improve the professional training of forensic experts, introduce new standards and methodologies, and ensure their regular updating in compliance with current scientific achievements. Emphasis is made on the introduction of novel technologies that can significantly improve the accuracy and objectivity of forensic research.

Therefore, the study of existing issues and the development of new methods for resolving them are important for improving the quality of forensic expert activities: the introduction of modern technologies, the improvement of training and certification standards, and compliance with ethical norms will contribute to reducing the number of errors and increasing the reliability of forensic examinations.

Article Purpose

To deepen the understanding of strategies for minimizing errors in forensic expertise through a detailed analysis of the most common errors and the development of new approaches to preventing them; to focus on the classification and systematization of errors in order to identify primary factors affecting their occurrence; to stress the influence of cognitive biases, insufficient training of forensic experts and the lack of uniform standards; to develop recommendations for improving the training and certification system for forensic experts; to consider ethical aspects of forensic experts' work.

Research Methods

The study stems from the integrated use of quantitative and qualitative methods of analysis. The principal tool is a systematic approach enabling the classification of technical, cognitive, and organizational errors in forensic expert activities. This classification helps to determine key factors resulting in errors and develop efficient strategies to minimize them.

The method of cognitive analysis is employed to assess cognitive biases affecting forensic expert activities.

A comparative analysis of modern technologies (automated systems and artificial intelligence) has been performed

6 Абрамова В. М. Експертні помилки: сутність, генезис, шляхи подолання : дис. ... канд. юрид. наук. Київ, 2004. 266 с.

7 Копильченко Т. Ю. Експертні помилки у почеркознавчому дослідженні та шляхи їх подолання : автореф. дис. ... канд. юрид. наук. Київ, 2010. 16 с. URL: https://dspace.nlu.edu.ua//jspui/handle/123456789/13676 (дата звернення: 04.11.2024).

8 Латиш К., Демидова Є., Домашенко О., Колеснікова І. Експертні помилки під час проведення окремих видів судових експертиз у сфері інформаційних технологій. *Юридичний вісник*. 2022. № 2. С. 93—99. DOI: 10.32837/yuv.v0i2.2326 (дата звернення: 04.11.2024).

9 Максименко М. І. Напрямки профілактичної діяльності по недопущенню експертних помилок. *Юридичний науковий електронний журнал*. 2022. № 10. С. 577—579. DOI: 10.32782/2524-0374/2022-10/144 (дата звернення: 04.11.2024).

to assess their impact on the accuracy and efficiency of forensic research.

A methodological approach has been used to analyze the implementation of expert training and certification systems.

Main Content Presentation

Forensic expert practice plays a pivotal role in ensuring fair court proceedings and safeguarding citizens' rights. However, high demands on the accuracy and reliability of forensic examination results require the implementation of error minimization strategies.

Errors in forensic expert activity can have serious consequences, including wrongful convictions, undermining confidence in the justice system, and other social and economic consequences. Errors in forensic expert research can occur for a variety of reasons, which can be grouped into three categories: human error, technical failures, and methodological shortcomings.

Human errors are made due to insufficient qualifications and/or experience, the expert's decreased attentiveness as a result of psychological pressure, stress, fatigue, and other factors. Insufficient preparation and lack of systematic training substantially increase the likelihood of such mistakes.

Technical failures are associated with the use of outdated or imperfect equipment. Sudden failures in the operation of equipment or its incorrect calibration may result in inaccuracy and/or misleading results.

Methodological shortcomings are caused by the use of imperfect or outdated research methods as well as by the lack of standards and minutes governing the conduct of forensic examinations.

For the purpose of minimizing errors, it is essential to implement systematic training programs for forensic experts: basic training and regular advanced training courses. Training should encompass novel methods and technologies, as well as psychological aspects of working in stressful conditions. It is important to implement clear minutes and standards governing the conduct of forensic examinations. This will help reduce the influence of subjective factors and ensure high quality results.

Automating certain aspects of forensic research utilizing specialized software can significantly reduce the risk of errors. Software solutions enable the automatic processing of large volumes of data, reducing the workload of forensic experts and minimizing the likelihood of errors. Improving and regularly updating technical equipment is an essential element of minimizing errors. Modern technologies allow us to achieve a high level of accuracy and reliability of research results. Regular audits and quality checks of equipment ensure its uninterrupted operation and conformity with standards.

Methodological strategies stipulate regular quality inspections of applied methodologies, along with the development of new, more efficient algorithms. Multi-level verification of forensic examination results by several forensic experts, including independent analysis of results, also helps to reduce the risk of errors. Organizational measures are capable of ensuring independence and impartiality of forensic experts, and internal control and external audit: verification of forensic examination quality and accuracy.

Creating conditions for the exchange of experience and best practices between forensic experts from different regions and countries also contributes to enhancing the quality of forensic activities. Modern technologies (artificial intelligence

and machine learning) can substantially minimize expert errors and automate data analysis and interpretation. The use of digital technologies to document and track forensic examination process ensures transparency and control over all stages of research. Innovative approaches also involve the use of modeling and simulation to train forensic experts and assess their skills. This allows forensic experts to practice their skills in realistic scenarios and advance their qualifications.

To fulfill the paper's purpose, we first classify errors that take place in forensic expert activity. This will help identify the key factors of their occurrence and develop strategies for their minimization *(see Table 1)*.

Table 1

Classification of errors

Types of errors	Description
Technical	Use of outdated or faulty equipment; improper calibration of instruments; failures in the software employed for analysis
Cognitive	Cognitive biases; overlooking details due to stress or fatigue; the influence of prior expertise and expectations on the outcome of research
Organizational	Lack of uniform standards and minutes; inadequate training and certification of forensic experts, internal and external quality assurance

One should pay close attention to the influence of cognitive biases on the results of forensic research. As evidenced by the studies of *G. Cooper* and *V. Meterko* [10], *P. Croskerry* [11], and *D. Kahneman* [12], cognitive biases can distort research findings (*see Table 2*).

It is therefore crucial to develop and implement systematic measures that will minimize the impact of these factors: introduce independent peer review and rotation of forensic experts, optimize working hours, and ensure proper working conditions to reduce the severity of fatigue. Researching cognitive biases and studying their influence on forensic activities will help develop new approaches to preventing expert errors.

Table 2

Impact of Cognitive Biases

Bias type	Description
Confirmation	Forensic experts may be inclined to interpret data in a way that supports their initial hypotheses
Anchoring	Forensic experts may be subconsciously anchored to previous results or authoritative opinions
Fatigue and stress	Long working hours without a break can reduce concentration and enhance the risk of errors

10 Cooper G., Meterko V. Cognitive Bias Research in Forensic Science: A Systematic Review. *Forensic Science International*. 2019. Vol. 297. Pp. 35—46. DOI: 10.1016/j.forsciint.2019.01.016 (дата звернення: 01.11.2024).

11 Croskerry P. The importance of cognitive errors in diagnosis and strategies to minimize them. *Academic Medicine*. 2003. Vol. 78. Is. 8. Pp. 775—780. DOI: 10.1097/00001888-200308000-00003 (дата звернення: 01.11.2024).

12 Kahneman D. Thinking, Fast and Slow. New York, 2011. 512 p. URL: http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/2224/1/Daniel-Kahneman-Thinking-Fast-and-Slow-.pdf (дата звернення: 01.11.2024).

It is crucial to emphasize another aspect of error minimization: the introduction of modern technologies. Technological innovations can both reduce the risk of human error and enhance the accuracy and efficiency of forensic examinations.

Automating AI processes and their performance enhances the quality of expert research and contributes to their transparency and optimization of expert activity (*see Table 3*). The introduction of modern technologies in forensic activity reduces the influence of the human factor on forensic examination findings. Automated systems and artificial intelligence are capable of performing routine tasks with high accuracy and efficiency, significantly reducing the likelihood of errors, enabling tracking of all expert research stages, and contributing to increased transparency and quality assurance of forensic examinations. The use of innovative technologies is an essential step towards mitigating expert errors: it will further increase reliability and credibility of conclusions and enhance trust in the work of forensic experts.

Table 3

Modern technologies to minimize expert errors

Technology type	Description
Automated systems	Perform routine tasks with less chance of errors
Artificial intelligence	Analyzes large volumes of data faster and more accurately than humans
Digital technologies	Help to thoroughly document all forensic examination stages, contributing to increased transparency and control

In addition to the introduction of modern technologies, the continuous improvement of the system of training and certification for forensic experts is of particular importance. The objectivity and quality of forensic examinations are also affected by a high level of training and continuous professional development. Ensuring a sufficient level of expertise among forensic experts (in particular by introducing mandatory certification and up-to-date training programs) helps to avoid many errors related to the human factor. All of the above boosts confidence in forensic examination results, ensuring greater reliability and accuracy in forensic examinations.

The main areas for improvement in the system of training and certification of forensic experts are shown in Table 4.

Table 4

Enhancing expert training and certification

Direction	Description
Curriculum expansion	Supplement with courses on the state-of-the-art technologies and methodologies as well as psychological aspects of work
Regular advanced training	Regular training courses aimed at updating forensic experts' knowledge and skills
Certification	Mandatory certification of forensic experts with periodic qualification confirmation

A key component in ensuring the quality of forensic activities is conformity with ethical standards. Ethical aspects of experts' work play a pivotal role in ensuring objectivity, transparency, and impartiality of forensic examinations. They boost

confidence in research findings and ensure that forensic experts are accountable for their conclusions.

The autonomy of forensic experts from external pressures guarantees that forensic examination results remain unbiased and reliable. Transparency in the conduct of forensic examination earns the trust of all concerned parties and facilitates easier verification of results. Holding forensic experts accountable for their conclusions enhances their performance and reduces the likelihood of errors. Thus, compliance with ethical standards is a cornerstone principle ensuring quality and reliability of forensic research.

Table 5 presents principal ethical aspects important for the proper performance of expert duties.

Table 5

Ethical aspects of forensic experts' work

Type	Content
Independence	Forensic experts are free from external influence
Transparency	Openness and availability of forensic examination results for all parties concerned
Accountability	Experts must be accountable for their research and its consequences.

Methods and approaches suggested by us stem from the current achievements of science and practice, contributing to enhancing objectivity and reliability of forensic examinations. Integration of innovative technologies, improvement of the system of training and certification for forensic experts, as well as compliance with high ethical standards are key elements of a comprehensive approach to reducing errors in forensic expert practice.

Conclusions

Following the study, the author develops the main strategies for minimizing errors in forensic expert activities. They are of great theoretical and practical importance.

Scientific novelty of this study lies in the development of a comprehensive approach to reducing errors. Errors in forensic activities are classified into three main types (technical, cognitive, and organizational), enabling more accurate identification of the causes of errors and the development of appropriate strategies for their prevention.

Theoretical value of research: understanding of cognitive biases and their impact on forensic examination results has been deepened; it has been pointed out that confirmation bias and anchoring bias are the main factors that distort forensic examination results; the need to advance methods of forensic experts' training with an emphasis on identifying and eliminating cognitive biases has been stressed.

Practical value of research: it is proposed to introduce modern technologies (automated systems) that can considerably minimize the risk of human error and enhance the accuracy of research and digital technologies (for greater transparency of forensic examination process and its control); to employ artificial intelligence in order to analyze large volumes of data (to reduce the burden on forensic experts and ensure objective findings); to improve the system of training and certification for forensic experts (to supplement the curriculum with courses on the latest

technologies and methodologies and regularly raise experts' qualification level); adhere to high ethical standards, including independence, transparency, and accountability (to increase objectivity and reliability of forensic examination results, contributing to strengthening trust in the judicial system).

Therefore, the main outcomes of the performed research stress the need for a comprehensive approach to mitigating errors in forensic expert activity. The proposed methods and approaches are based on modern achievements of science and practice, which enable to create a more efficient and transparent system of forensic expert activities. This will help enhance the quality and reliability of forensic examinations, ensure fair justice, and protect citizens' rights.

Стратегії мінімізації помилок у судово-експертній практиці

Валерія Бондаренко-Берегович

Мета статті — поглибити розуміння стратегій мінімізації помилок у судово-експертній діяльності шляхом докладного аналізування найпоширеніших помилок і розроблення нових підходів до запобігання їм; зосередити увагу на класифікації помилок з метою виявити ключові чинники їх виникнення; приділити увагу впливу когнітивних упереджень, недостатній підготовці експертів і відсутності уніфікованих стандартів; розробити рекомендації щодо вдосконалення системи навчання та сертифікації експертів; розглянути етичні аспекти роботи експертів. Для досягнення поставленої мети застосовано загальнонаукові та спеціальні методи. Розглянуто стратегії мінімізації помилок у судово-експертній діяльності; вплив когнітивних упереджень; питання впровадження сучасних технологій, удосконалення системи навчання та сертифікації експертів, а також етичні аспекти роботи. Сформульовано основні стратегії мінімізації помилок у судово-експертній діяльності, які мають важливе теоретичне та практичне значення. Розроблено комплексний підхід до мінімізації помилок. Об'єднано різні аспекти проблеми для створення комплексного підходу до її розв'язання. Увагу акцентовано на когнітивних упередженнях, недостатній підготовці експертів і відсутності уніфікованих стандартів. Оцінено вплив сучасних технологій на зменшення кількості помилок. Запропоновано рекомендації щодо вдосконалення системи навчання та сертифікації експертів, а також дотримання високих етичних стандартів.

Ключові слова: *судово-експертна діяльність; судова експертиза; мінімізація помилок; когнітивні упередження; сучасні технології; штучний інтелект; автоматизовані системи; стандартизація; професійна підготовка; етичні стандарти.*

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Participants

The author has contributed solely to intellectual discussion underlying this document, case law research, writing and editing, and assumes responsibility for its content and interpretation.

Declaration of Competing Interest

Author declare no conflict of interest.

References

Abramova, V. M. (2004). *Ekspertni pomylky: sutnist, henezys, shliakhy podolannia* [Expert Errors: Essence, Genesis, Ways to Overcome Them] : dys. ... kand. yuryd. nauk. Kyiv [in Ukrainian].

Cooper, G., Meterko, V. (2019). Cognitive Bias Research in Forensic Science: A Systematic Review. *Forensic Science International*. Vol. 297. DOI: 10.1016/j.forsciint.2019.01.016.

Croskerry, P. (2003). The importance of cognitive errors in diagnosis and strategies to minimize them. *Academic Medicine*. Vol. 78. Is. 8. DOI: 10.1097/00001888-200308000-00003.

Giannelli, P. C. (2007). Wrongful Convictions and Forensic Science: The Need to Regulate Crime Labs. *North Carolina Law Review*. Vol. 86 Is. 1. Art. 4. URL: https://scholarship.law.unc.edu/cgi/viewcontent.cgi?article=4293&context=nclr.

Kahneman, D. (2011). *Thinking, Fast and Slow*. NY. URL: http://dspace.vnbrims.org:13000/jspui/bitstream/123456789/2224/1/Daniel-Kahneman-Thinking-Fast-and-Slow-.pdf.

Kassin, S. M., Dror, I. E., Kukucka, J. (2013). The forensic confirmation bias: Problems, perspectives, and proposed solutions. *Journal of Applied Research in Memory and Cognition*. Vol. 2. Is. 1. DOI: 10.1016/j.jarmac.2013.01.001.

Kopylchenko, T. Yu. (2010). *Ekspertni pomylky u pocherkoznavchomu doslidzhenni ta shliakhy yikh podolannia* [The Expert Mistakes in Handwriting Research and the Way of Their Overcoming] : avtoref. dys. ... kand. yuryd. nauk. Kyiv. URL: https://dspace.nlu.edu.ua//jspui/handle/123456789/13676 [in Ukrainian].

Latysh, K., Demydova, Ye., Domashenko, O., Kolesnikova, I. (2022). Ekspertni pomylky pid chas provedennia okremykh vydiv sudovykh ekspertyz u sferi informatsiinykh tekhnolohii [Expert's Mistakes During Conducting Some Types of Criminalistics Expertise in the Field of Information Technologies]. *Yurydychnyi visnyk*. № 2. DOI: 10.32837/yuv.v0i2.2326 [in Ukrainian].

Maksymenko, M. I. (2022). Napriamky profilaktychnoi diialnosti po nedopushchenniu ekspertnykh pomylok [Directions of Preventive Activities in Order to Prevent Expert Errors]. *Yurydychnyi naukovyi elektronnyi zhurnal*. № 10. DOI: 10.32782/2524-0374/2022-10/144 [in Ukrainian].

Nakhaeizadeh, Sh., Dror, I. E., Morgan, R. M. (2014). Cognitive bias in forensic anthropology: Visual assessment of skeletal remains is susceptible to confirmation bias. *Science & Justice*. Vol. 54. Is. 3. DOI: 10.1016/j.scijus.2013.11.003.

Reese, E. J. (2012). Techniques for Mitigating Cognitive Biases in Fingerprint Identification. *UCLA Law Review*. Vol. 59. Is. 5. URL: https://www.uclalawreview.org/pdf/59-5-3.pdf.

Strengthening Forensic Science in the United States: A Path Forward (2009) / National Academy of Sciences. Washington, D. C. URL: https://www.ojp.gov/pdffiles1/nij/grants/228091.pdf

Bondarenko-Berehovych, V. (2024). Strategies for Minimizing Errors in Forensic Expert Practice. *Theory and Practice of Forensic Science and Criminalistics.* Issue 4 (37). Pp. 29—38. DOI: 10.32353/khrife.3.2024.03.