

The Role of Covert Investigative (Search) Actions in Combating Illegal Border Crossing

Pavlo Bielyu¹, Alla Zinevych^{2*}, Olha Lytvynenko³, Maryna Derevyanko⁴,
Tymur Loskutov⁵

¹Interregional Academy of Personnel Management, Kyiv, Ukraine, ²Department of Operation and Technical Measures, National Academy of the Security Service of Ukraine, Mykhaila Maksymovycha Str, Kyiv, Ukraine, ³Department of Criminal Procedure and Criminalistics, Donetsk State University of Internal Affairs, Kropyvnytskyi, Ukraine, ⁴Department of Criminal Procedure and Forensics, Educational and Scientific Institute of Law, Taras Shevchenko Kyiv National University, Kyiv, Ukraine, ⁵Department of Criminal and Legal Disciplines, Kryvyi Rih Educational and Scientific Institute, Donetsk State University of Internal Affairs, Kryvyi Rih, Ukraine.
*Corresponding Author's Email: alla1.education12@gmail.com

Abstract

The relevance of this study is driven by the necessity of effectively protecting Ukraine's state border, which remains critical even in complex security conditions. The investigation of crime detection methods, particularly covert investigative (search) actions, allows for the improvement of procedural algorithms, the strengthening of interagency cooperation and the enhancement of national security measures. The objective of this study is to analyze methods for investigating illegal migration crimes, assess the role of covert investigative (search) actions in these processes, and develop solutions to optimize efforts in combating illegal border crossings. The study employs the following methods: a two-iteration anonymized survey; mathematical modeling in relative units based on the parameters "Operational Efficiency" and "Legitimacy"; and step-by-step chronometric analysis. The study identifies the role of covert investigative (search) actions in the investigation of illegal border crossing crimes, highlights procedural challenges in this type of proceeding, and develops a specialized system for evaluating the efficiency of investigative algorithms. Additionally, it proposes optimization solutions that have been positively evaluated by experts. The scientific novelty of this study lies in the first-ever application of procedural process modeling for organizing effective investigations of illegal cross-border migration crimes. Future studies should prioritize the empirical validation of the proposed optimization mechanisms by measuring their practical impact on investigative efficiency and the prevention of cross-border migration-related crimes, while also accounting for the logistical constraints and environmental challenges inherent in remote border regions to ensure realistic and context-sensitive assessments.

Keywords: Border Violation, Cross-Border Migration, Investigative Actions, Operational Efficiency, Search Actions, State Border.

Introduction

Specialized migration and border protection agencies in leading countries and state formations report a continuous increase in illegal migration flows and a rise in organized criminal activities related to unlawful border crossings. This trend is confirmed by relevant units of the EU, the USA, and the United Kingdom (1-3). Similarly, ensuring the integrity of Ukraine's state border remains highly relevant, even considering the current security conditions (4). This study addresses procedural proceedings, forensic science, border protection, anti-corruption legislation, and interagency cooperation. The main challenges are associated with imperfect procedural algorithms and the high adaptability of offenders engaged in illegal cross-border migration. A key focus is the analysis of

investigative methods, particularly covert investigative (search) actions (CI(S)A), to optimize procedures. Identifying deficiencies and overloads in their application contributes to procedural optimization and the harmonization of interagency and international cooperation. The study aims to enhance the effectiveness of investigations, structure security measures, and strengthen national and international security policies. The objective of this study is to analyze existing methods for investigating illegal cross-border migration crimes, determine the role of CI(S)A in these processes, and develop optimization solutions to improve the current procedure for combating unlawful border crossings. To achieve this objective, the following tasks must be

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completed: Examine and standardize expert opinions of professionals involved in investigating illegal border crossings at all stages of procedural organization; assess the effectiveness of the current algorithm for applying CI(S)A methods within the system of measures for investigating cross-border migration crimes by developing a specialized set of evaluation criteria. Based on the correlation between expert conclusions and relative specialized evaluation criteria, formulate proposals for optimizing procedural processes related to the application of CI(S)A in combating illegal border crossings, incorporating pre-algorithmized assessment calculations. The analysis of sources indicates publications by authors whose research findings align with the interests of this study. The authors point to the causes leading to uncontrolled migrations (5). The group of authors found that Nigeria faces the problem of illegal migration due to unemployment, poverty, and a poor healthcare system. The authors recommend addressing socio-economic issues and strengthening cooperation with the EU. In turn, the researcher expands the range of reasons for illegal migration (6). The author identifies wars and non-military conflicts as the main causes of intensified illegal cross-border migration and places this issue among the top security challenges for humanity. The group of authors in addition to identifying the causes of intensified illegal migration flows, studied the routes and mechanisms of the investigated criminal activity (7). The research findings show that the tendency toward illegal migration is higher among young people, skilled individuals, and those with an informational advantage. Another cause of migration-related crime was identified by another researcher (8). The author establishes that migrant smuggling is a highly profitable business that attracts organized criminal groups forming international networks. Smugglers constantly adapt routes and methods, putting people's lives at risk. Meanwhile, it has been proven that expanding legal border-crossing channels reduces illegal crossings since they serve as substitutes (9). The effect intensifies over time, directing migrants toward legal pathways. A similar impact of state migration policy was identified in another research paper (10). The author found that informal actions by migration authorities violate the law, increasing dependence

on migrants' illegal status. The author emphasizes that the problem can be addressed through migration law reform (10).

The issues of imperfect state regulatory measures are also highlighted in the work of another author (11). The author points to the inefficiency of Indonesia's migration policy due to the lack of clear sanctions and deterrent measures against illegal migrants, who are treated as victims.

The researcher also directly points to the lack of balance between the UK's migration legislation and migrants' rights under the 1951 UN Convention (12). The author criticizes the actions of official authorities and emphasizes the need to comply with both local and international migration regulation laws. Another issue of flawed state policy regarding the criminalization of illegal migration-related crimes was identified (13). The author found deficiencies in Italy's criminalization policy, where since 2014, individuals assisting migrants have been accused of smuggling. The author proposes three reforms: alignment with the UN Protocol, differentiation between smuggling and migration assistance, and exemption from criminal liability for those accused of smuggling.

In turn, the need to strengthen control over the open border between Nepal and India to prevent illegal migration and security threats was emphasized (14). The author proposes the introduction of fixed checkpoints, identification systems, and enhanced regulation.

Conversely, it points to the low effectiveness of border securitization in South Africa and suggests focusing on regional cooperation (15). The author recommends establishing specialized groups and consultations among stakeholders for an effective resolution of the issues. Another author's work also adheres to the principles of deepening interstate and interagency cooperation in protecting the integrity of state borders (16). The author analyzes the problem of forged travel documents in the EU, which facilitates illegal migration and is linked to other crimes. The author emphasizes the importance of enhancing document security, using the Interpol database, and improving information exchange between law enforcement agencies.

Similar conclusions regarding deep integrative interaction were reached by a group of Ukrainian researchers (17). The authors studied crime prevention methods in the border regions of

southern Ukraine through advanced technologies, security actors' coordination, and international cooperation. They propose social and criminological measures, cross-border interaction, and automated security systems (17).

It was confirmed the need to deepen interagency and interstate cooperation (18). The group of authors studied migration trends on the Balkan route, emphasizing international cooperation, readmission agreements, strengthened border control, and legal harmonization. The authors propose the creation of liaison officers for monitoring and information exchange.

The issue of insufficient interagency cooperation was also identified (19). The author points to interagency cooperation problems in Bangladesh, particularly poor coordination between border forces and communities, bureaucracy, and inefficient post placement, which facilitate smuggling. Husain underscores the importance of improving cooperation, using technology, and upgrading border post infrastructure for effective border management (19).

Researchers identify key issues in ensuring border integrity, including the lack of interagency and interstate interaction, flawed legislation, corruption, document forgery, and intensified migration flows. They propose measures to reduce the risks of illegal border crossings, including improving legalization, legal harmonization, strengthening cooperation, and enhancing the technical capabilities of border services. However, the issue of forensic activities by border control services, particularly covert investigative actions, is not addressed, highlighting the need to study this aspect for effectively combating illegal border crossings.

Methodology

Research Procedure

Covert investigative (search) actions (CI(S)A) are legally defined procedural measures conducted by authorized migration control or law enforcement agencies without prior notification to individuals, aimed at collecting evidence or intelligence within criminal proceedings. These actions include: interception of communications (wiretapping), technical and physical surveillance, covert operations (e.g., infiltration or simulated crime), and informant-driven interventions, each carried

out under strict legal regulation, often requiring judicial authorization.

CI(S)A are particularly relevant in the context of criminal border crossings, where covert means enable timely exposure of organized illegal activity. Clear differentiation between these types of actions is critical for evaluating their legality, proportionality, and operational viability within the rule-of-law framework.

Covert investigative (search) actions are authorized at the national level by Chapter 21 of the Criminal Procedure Code of Ukraine, which establishes the legal basis, procedural conditions, and mandatory judicial oversight for their implementation. Internationally, such actions must comply with Article 8 of the European Convention on Human Rights and the standards set by the European Court of Human Rights, requiring that any interference with private life be lawful, proportionate, and subject to effective supervision. Covert investigative actions, while essential for combating serious crime, carry inherent risks of abuse or unlawful surveillance if not strictly regulated. Legal safeguards – such as prior judicial authorization, clearly defined procedural limits, proportionality requirements, and ex post facto oversight – are critical to prevent arbitrary interference, ensure accountability of law enforcement, and protect fundamental rights under both national law and international human rights standards.

Theoretical frameworks from security studies confirm that covert measures often demonstrate higher operational effectiveness than conventional enforcement tools, particularly in environments with asymmetrical threats, high criminal concealment, and limited accessibility to overt policing. These approaches validate the strategic value of covert actions in enhancing state capability to detect, disrupt, and prevent transnational criminal activity.

The following research procedure is proposed:

First Stage: Conducting an initial iteration of an anonymized survey among participants in the investigation of illegal cross-border migration crimes involving CI(S)A methods.

Second Stage: Analyzing the results of the confidential survey. The anonymized survey ensures the empirical foundation of the study and helps identify indirect causes of low effectiveness and slow response in investigating illegal border

crossings. This stage facilitates the subsequent consideration of optimizing the investigation procedure.

Third Stage: Assessing the existing algorithm for investigating illegal cross-border migration crimes using conditional units based on the parameters of "Efficiency" and "Legitimacy," as well as their balance. The "Efficiency" parameter determines how each investigative step contributes to the speed of obtaining actionable results.

$$O = f(S) = \sum_{i=1}^n o_1, o_2, \dots, o_n \quad [1]$$

Where S is operational speed of the investigation;

o_1, o_2, \dots, o_n is evaluation of the timeliness of each step in the investigation procedure; the 'Legitimacy' parameter determines how well the legislative norms are adhered to at each stage of the investigation procedure for the investigated crimes.

$$L = f(LO) = \sum_{i=1}^n l_1, l_2, \dots, l_n \quad [2]$$

Where LO is a set of legislative norms for the investigation procedure; l_1, l_2, \dots, l_n is evaluation of the legitimacy of each step of the investigation; at the same time, a unified approach is introduced for the two defined parameters: if a step in the investigation procedure contributes to improving the parameter's score, the step is rated as '+1', and in the opposite case – "-1":

$$\begin{cases} O \in \{-1; +1\}; \\ L \in \{-1; +1\}; \end{cases} \quad [3]$$

To assess the balance of the parameters 'Operationality' / 'Legitimacy', the calculated conditional units are converted to relative ones;

Based on the results of the fourth stage of the research, recommended optimization measures for the existing crime investigation algorithm related to illegal border crossing are developed using methods of CI(S)A. The principle of maximizing the parameters 'Operationality' and 'Legitimacy' was applied for this:

$$\begin{cases} O \rightarrow \max; \\ L \rightarrow \max; \end{cases} \quad [4]$$

In the fifth stage, according to principle (3), a recalculation of the optimized algorithm is performed, with the formation of corresponding conclusions regarding the effectiveness of the proposed optimization solutions.

In the sixth stage of the research, a second iteration of an anonymized survey of those involved in investigating crimes of illegal cross-border migration was conducted to assess the effectiveness of the optimized procedure for applying CI(S)A methods, with corresponding conclusions being drawn.

The overall research scheme is presented in Figure 1.

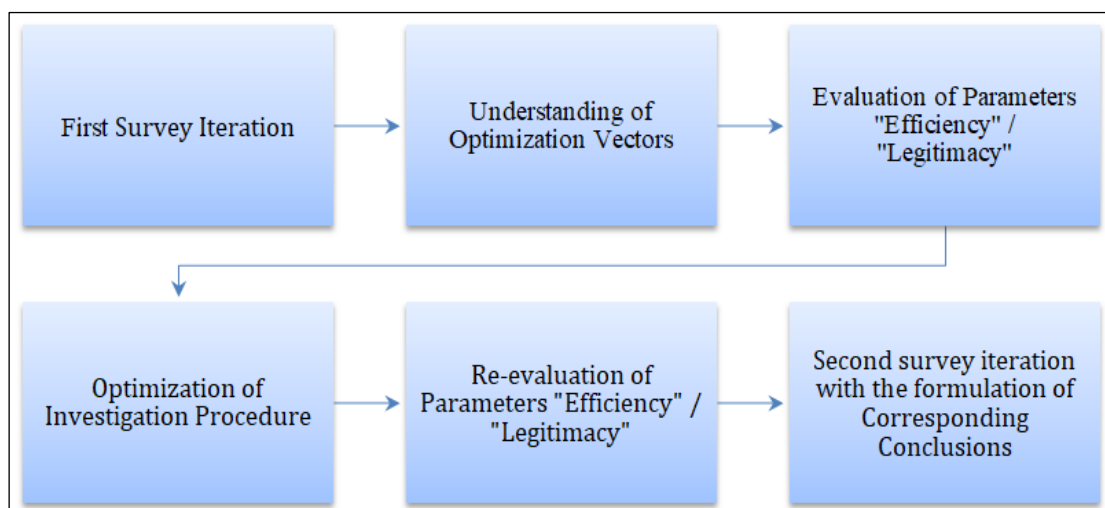


Figure 1: Linearized Research Procedure

Methods

The following methods were applied in the study:

- Two-iteration anonymized survey. As part of this study, an anonymized survey was conducted among participants involved in the application of CI(S)A for investigating crimes related to illegal border crossings to identify procedural issues. The confidential nature of the survey ensured an empirical foundation for the research and allowed for the establishment of an indirect median assessment and an analysis of the challenges in investigating illegal cross-border migration using CI(S)A methods, both before and after the recommended optimization measures. The first iteration helped identify key issues and areas for a detailed examination of the investigation procedure, while the second iteration provided a direct assessment of the proposed optimization measures and the balance between operational efficiency and legal compliance in investigative activities;
- Mathematical modeling in relative units based on the parameters “Operationality” and “Legitimacy”. A specially developed mathematical model and parameterization approach tailored to this study enabled an assessment of the existing procedure for investigating illegal border crossing crimes using CI(S)A methodology. This approach also allowed for the identification of procedural stages recommended for optimization through the implementation of corresponding procedural solutions;
- Step-by-step chronometric analysis. A detailed analysis of each step in the existing procedure for investigating illegal border crossing crimes using CI(S)A methods was conducted using a specially designed mathematical model across the entire chronometric sequence of procedural stages. This approach facilitated the identification of inefficient procedures and the development of appropriate optimization measures.

Sample

The study utilized anonymized surveys conducted among representatives of the State Border Guard Service of Ukraine (DPSU), the State Migration Service (DMS), the Ministry of Internal Affairs (MIA), the Prosecutor's Office, and the judiciary—participants in the investigation process of crimes

related to illegal cross-border migration using the CI(S)A methodology. The survey was conducted through a confidential electronic questionnaire using Google Forms (20). During the designated research period, 358 anonymous responses were collected, ensuring the objectivity and empirical validity of the study's findings.

Tools

The key analytical concepts defined for this study (described above) were “Operationality” (1) and “Legitimacy” (2), along with standard statistical analysis tools. Google Forms was used for the two-iteration survey (20). For statistical analysis of the survey results, Google Sheets was employed (21).

Results and Discussion

The results of the first iteration of the anonymized survey indicate a moderate level of effectiveness of the current system for investigating crimes related to illegal border crossings – measured at 65.8% (Figure 2). Additionally, based on the first survey iteration, the most frequently cited reasons for the lower subjective assessment of the effectiveness of CI(S)A application in investigating illegal border crossings were identified among the anonymized respondents (Figure 3): Complex procedural requirements (104 respondents / 29.05%), corruption component (75 respondents / 20.95%), high adaptability of criminal groups to legal border protection methods (51 respondents / 14.25%), low technical capacity (43 respondents / 12.01%), low level of interstate cooperation (39 respondents / 10.89%), low level of interagency cooperation (32 respondents / 8.94%).

The survey analysis showed in Figure 3 that the lower assessment of CI(S)A effectiveness in investigating illegal border crossings correlates with findings from academic publications, which highlight flaws in legislation and weak interagency and international cooperation as key issues reducing investigative efficiency.

Given the role of CI(S)A in combating illegal migration, it is essential to conduct a detailed examination of current criminal law, forensic, and investigative parameters in such crime investigations.

In accordance with established practices in Ukraine, the application of CI(S)A involves three main stages: preparation, execution, and completion (Figure 4) (22). To enhance the analytical robustness of the study, a comparative

analysis was conducted examining how other countries implement covert investigative measures in the sphere of border control, along

with the corresponding legal outcomes and established precedents (Table 1).

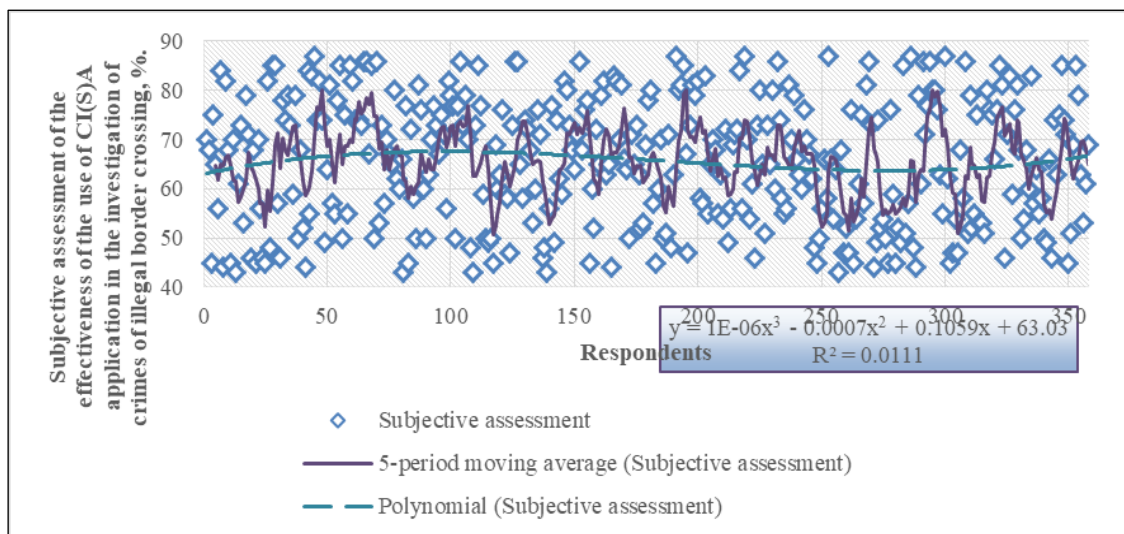


Figure 2: Results of the Subjective Assessment of the Effectiveness of CI(S)A Application in Investigating Crimes of Illegal Border Crossing, % (First Survey Iteration)

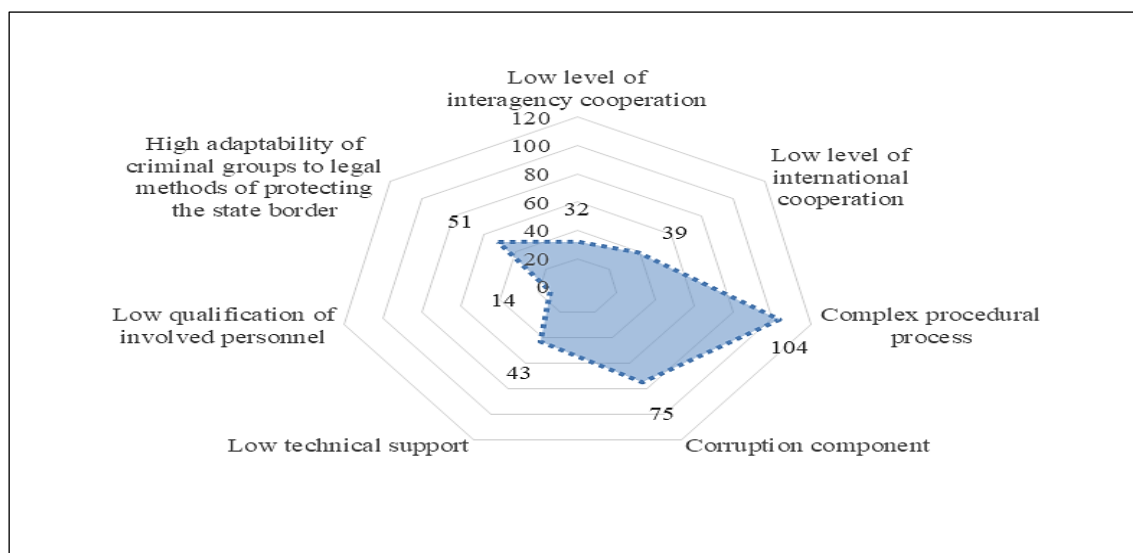
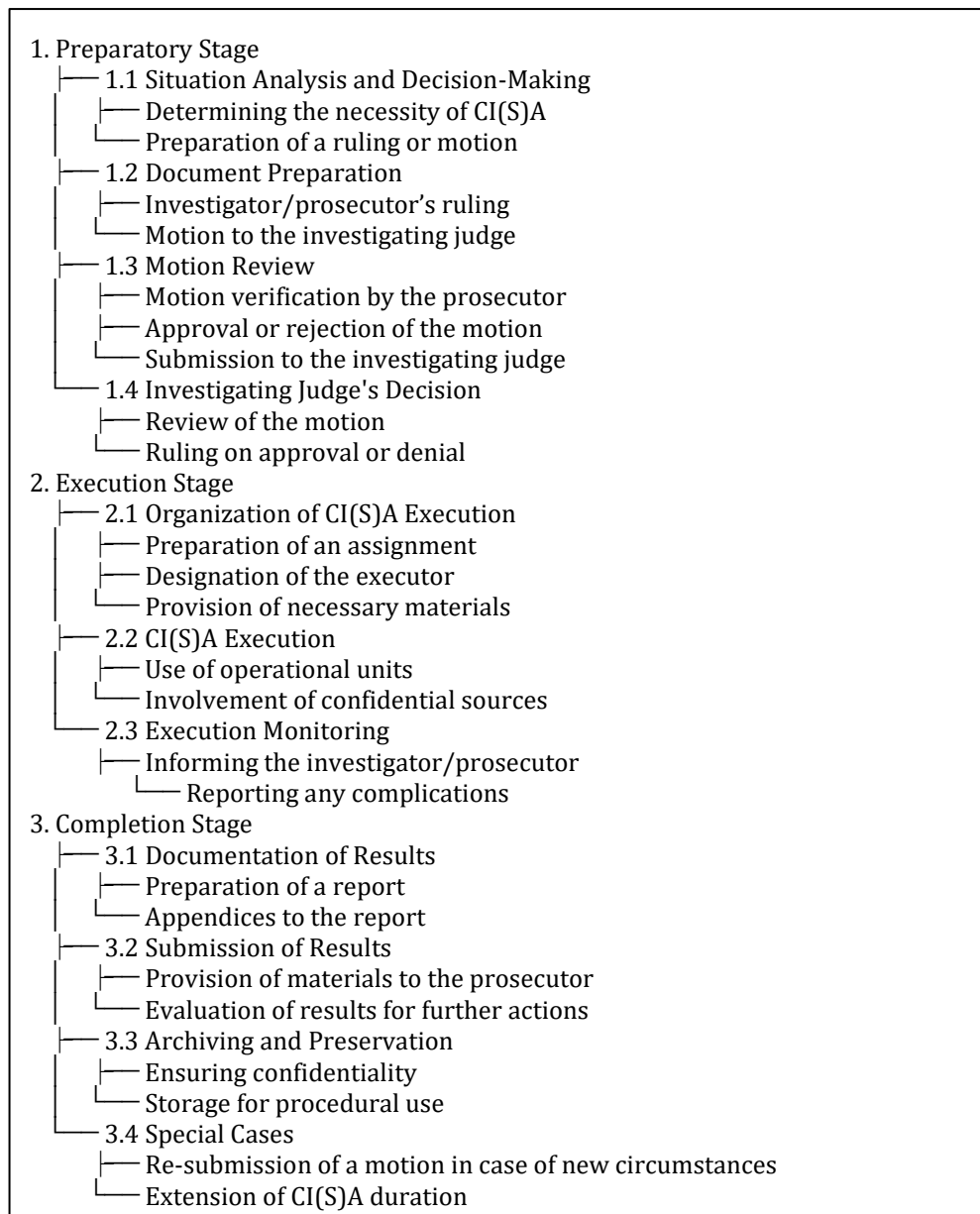


Figure 3: Most Frequently Cited Reasons for the Decline in the Subjective Assessment of the Effectiveness of CI(S)A Application in Investigating Crimes of Illegal Border Crossing

**Figure 4:** Linearized Algorithm for Applying CI(S)A Methods**Table 1:** Comparative Analysis of Covert Investigative Measures

Country	Legal Basis	Scope of Covert Actions	Judicial Oversight	Use in Border Control	Notable Outcomes/Precedents
Ukraine	Criminal Procedure Code of Ukraine, Chapter 21	Wiretapping, surveillance, covert operations, informants	Mandatory judicial authorization	Applied in cases of illegal migration and organized crime	Increased disruption of smuggling networks; ECHR compliance
Germany	Code of Criminal Procedure (StPO), §100a–100f	Telecom interception, surveillance, undercover	Strict judicial control required	Used in smuggling, trafficking cases at	Federal Court rulings on proportionality; high public trust

		operations		Schengen borders	
United States	Title 18 U.S. Code §2510–2522 (Wiretap Act), FISA	Electronic surveillance, informants, FISA warrants, GPS tracking	FISA court or federal judge approval	Applied in terrorism, trafficking, illegal entry investigations	High-profile convictions; debates on privacy vs. security
France	Code de procédure pénale, Articles 706-80 to 706-95	Judicially authorized surveillance, infiltration, informants	Authorization by investigating judge	Employed in intelligence-led operations at border zones	Council of State rulings affirming legality; limited criticism
Poland	Code of Criminal Procedure, Articles 237a–237e	Telecom surveillance, informants, special investigations	Court approval mandatory	Implemented for cross-border criminal group investigations	Border operations dismantling organized groups; EU-compliant

The comparative analysis (Table 1) shows that despite differing legal systems, most countries ensure clear regulatory frameworks, judicial oversight, and targeted use of covert measures in border control, maintaining a balance between security objectives and fundamental rights. According to the developed research methodology, a step-by-step chronometric analysis was introduced to assess the effectiveness of the current practice of applying covert investigative (search) actions methods (Figure 4), incorporating the previously described concepts of "Operational

Efficiency" and "Legitimacy" of investigative actions.

The results of the effectiveness assessment of the current algorithm for applying covert investigative (search) actions methods are presented in a structured tabular format, which includes calculated values in absolute and normalized units – Table 2.

To evaluate the balance between the "Operational Efficiency" and "Legitimacy" indicators, a graphical interpretation of the calculated data (Table 1) is provided – Figure 5.

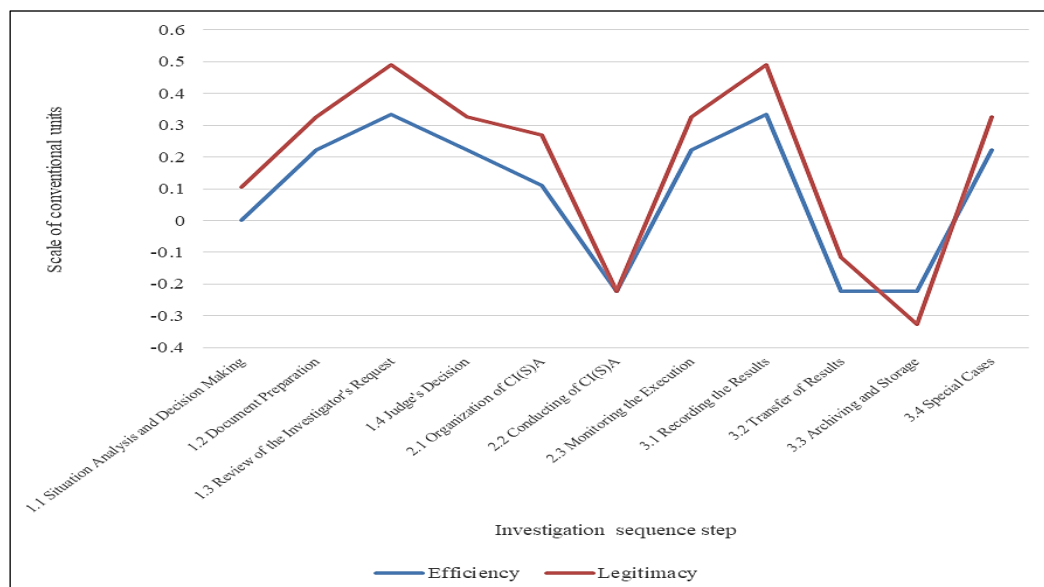


Figure 5: Graphical Interpretation of the Effectiveness Assessment of the Current Algorithm for Applying CI(S)A Methods (Before Optimization)

Based on the assessment of the effectiveness of the current algorithm for applying CI(S)A methods (Table 2, Figure 5), it has been established that the implemented investigative practice experiences significant delays at certain stages (in terms of the "Operational Efficiency" parameter), which is due to lengthy bureaucratic procedures such as the preparation of documents and petitions. In contrast, the "Legitimacy" parameter demonstrates fairly high values, indicating full compliance with procedural legislation. However, certain actions, such as involving confidential sources, while enhancing operational efficiency, may pose challenges to the legitimacy of investigative actions. Through the graphical analysis (Figure 5) of the calculated data (Table 2), a balance point for the "Operational Efficiency" / "Legitimacy" parameters have been identified, which is localized at stage "2. Conducting CI(S)A." This again highlights the limitations of the current and legally established algorithm regarding the application of operational investigative actions to

detect and prevent crimes related to illegal cross-border migration.

Based on the conducted analysis, it is advisable to implement optimization solutions within the current algorithm for applying CI(S)A, such as: reducing preparation time by standardizing document formats; introducing digital systems for submitting and reviewing petitions, thereby shortening their verification time; increasing operational efficiency at the execution stage by automating control processes; revising the archiving procedure by eliminating unnecessary actions that are not critical to confidentiality; automating documentation, implementing electronic document management, utilizing modern monitoring and data storage technologies, and integrating platforms for action coordination. As a result of implementing optimization measures within the current algorithm for applying CI(S)A to investigate crimes related to illegal border crossings, a redistribution of the "Operational Efficiency" / "Legitimacy" parameters is expected (Table 2).

Table 2: Calculation of the Effectiveness Assessment of the Current Algorithm for Applying CI(S)A Methods

Sequence of Investigation Steps	Before optimization				After optimization			
	Absolute values		Normalized values		Absolute values		Normalized values	
	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy
1. Preparatory Stage	-7	9	0,778	0,474	3	9	0,188	0,409
1.1 Situation Analysis and Decision-Making	0	2	0,000	0,105	0,5	2	0,031	0,091
Determining the necessity of CI(S)A	1	1	-0,111	0,053	1	1	0,063	0,045
Preparation of a resolution or petition	-1	1	0,111	0,053	-0,5	1	-0,031	0,045
1.2 Document Preparation	-2	2	0,222	0,105	-1	2	-0,063	0,091
Investigator/prosecutor's resolution	-1	1	0,111	0,053	-0,5	1	-0,031	0,045
Petition to the investigating judge	-1	1	0,111	0,053	-0,5	1	-0,031	0,045

Sequence of Investigation Steps	Before optimization				After optimization			
	Absolute values		Normalized values		Absolute values		Normalized values	
	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy	Operational Efficiency	Legitimacy
1.3 Petition Review	-3	3	0,333	0,158	1,5	3	0,094	0,136
Prosecutor's review of the petition	-1	1	0,111	0,053	1	1	0,063	0,045
Approval or rejection of the petition	-1	1	0,111	0,053	1	1	0,063	0,045
Submission to the investigating judge	-1	1	0,111	0,053	-0,5	1	-0,031	0,045
1.4 Decision of the Investigating Judge	-2	2	0,222	0,105	2	2	0,125	0,091
Consideration of the petition	-1	1	0,111	0,053	1	1	0,063	0,045
Ruling on approval or rejection	-1	1	0,111	0,053	1	1	0,063	0,045
2. Execution Stage	-1	5	0,111	0,263	7	5,5	0,438	0,250
2.1 Organization of CI(S)A Execution	-1	3	0,111	0,158	3	3	0,188	0,136
Preparation of an assignment	-1	1	0,111	0,053	1	1	0,063	0,045
Designation of executor	-1	1	0,111	0,053	1	1	0,063	0,045
Provision of necessary materials	1	1	-0,111	0,053	1	1	0,063	0,045
2.2 Conducting CI(S)A	2	0	-0,222	0,000	2	0,5	0,125	0,023
Use of operational units	1	1	-0,111	0,053	1	1	0,063	0,045
Engagement of confidential sources	1	-1	-0,111	-0,053	1	-0,5	0,063	-0,023
2.3 Execution Control	-2	2	0,222	0,105	2	2	0,125	0,091
Informing the investigator/	-1	1	0,111	0,053	1	1	0,063	0,045

Sequence of Investigation Steps	Before optimization				After optimization			
	Absolute values		Normalized values		Absolute values		Normalized values	
	Operati onal Efficien cy	Legitim acy	Operati onal Efficien cy	Legitim acy	Operati onal Efficien cy	Legitim acy	Operati onal Efficien cy	Legitim acy
prosecutor								
Reporting complications	-1	1	0,111	0,053	1	1	0,063	0,045
3. Completion	-1	5	0,111	0,263	6	7,5	0,375	0,341
3.1 Documentation of Results	-3	3	0,333	0,158	1,5	3	0,094	0,136
Drafting a protocol	1	1	-0,111	0,053	1	1	0,063	0,045
Attachments to the protocol	1	1	-0,111	0,053	1	1	0,063	0,045
3.2 Transmission of Results	2	2	-0,222	0,105	2	2	0,125	0,091
Submission of materials to the prosecutor	1	1	-0,111	0,053	1	1	0,063	0,045
Evaluation of results for further actions	1	1	-0,111	0,053	1	1	0,063	0,045
3.3 Archiving and Storage	2	-2	-0,222	-0,105	2	0,5	0,125	0,023
Ensuring confidentiality	1	-1	-0,111	-0,053	1	-0,5	0,063	-0,023
Preservation for procedural use	1	-1	-0,111	-0,053	1	1	0,063	0,045
3.4 Special Cases	-2	2	0,222	0,105	0,5	2	0,031	0,091
Re-submission of a petition in case of new circumstances	-1	1	0,111	0,053	-0,5	1	-0,031	0,045
Extension of the CI(S)A duration	-1	1	0,111	0,053	1	1	0,063	0,045

For the optimized algorithm for involving CI(S)A methods (Table 2), a corresponding graphical interpretation is provided in Figure 6.

The optimized algorithm significantly outperforms the current procedure for incorporating CI(S)A methods into investigations in terms of operational efficiency (16 CU vs. -9 CU) and legitimacy (22 CU vs. 19 CU), demonstrating improvements across all stages, particularly in execution (7 CU vs. -1 CU) and completion (6 CU vs. -1 CU). Thanks to process automation,

simplification of document preparation procedures, and organization of CI(S)A, the optimized algorithm ensures a better balance between efficiency and legal compliance. However, further optimization is needed in the preparatory phase, data archiving, and the involvement of confidential sources to minimize their impact on legitimacy.

The optimization measures were presented to anonymously involved respondents from the first iteration of the study, and they were invited to

reassess the effectiveness of the investigative procedure for crimes related to illegal border crossings, incorporating CI(S)A methods and the proposed optimization solutions (Table 1). The assessment results from the second iteration of the anonymous survey are presented below – Figure 7. Based on the reassessment of the investigative procedure for illegal cross-border migration crimes using the CI(S)A methodology and the inclusion of optimization measures (Figure 7), it

was found that most confidentially surveyed respondents expect increased procedural efficiency while ensuring better compliance with relevant legal norms. They also highly rated the proposed solutions for rationalization and the implementation of modern specialized technologies. The average rating among respondents in the second iteration of the anonymous survey was 87.1%.

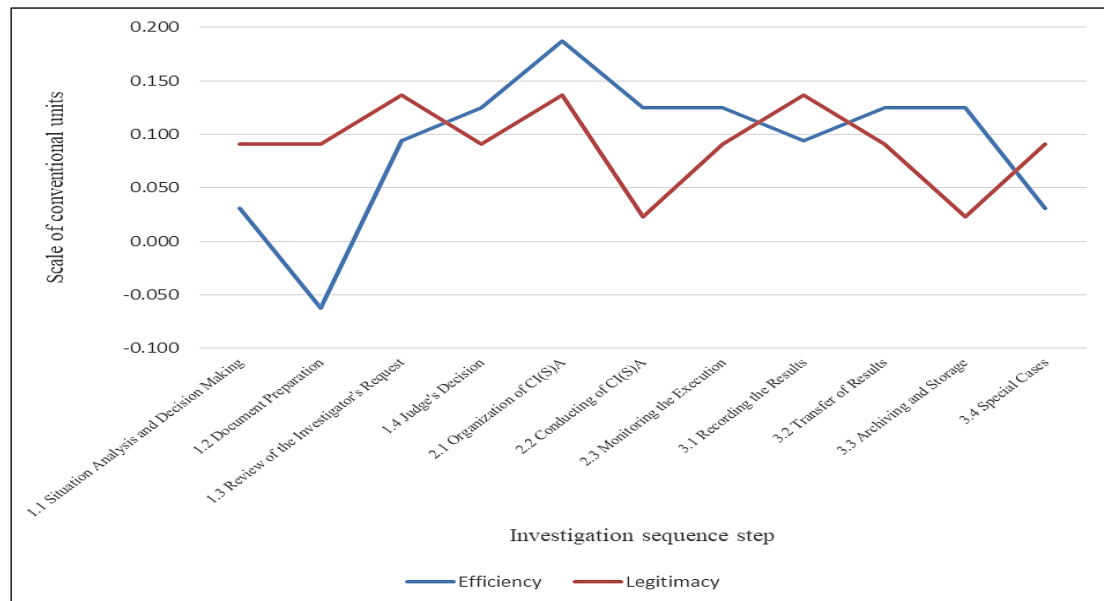


Figure 6: Graphical Interpretation of the Calculation of the Effectiveness Assessment for the Current CI(S)A Methods Involvement Algorithm (After Optimization)

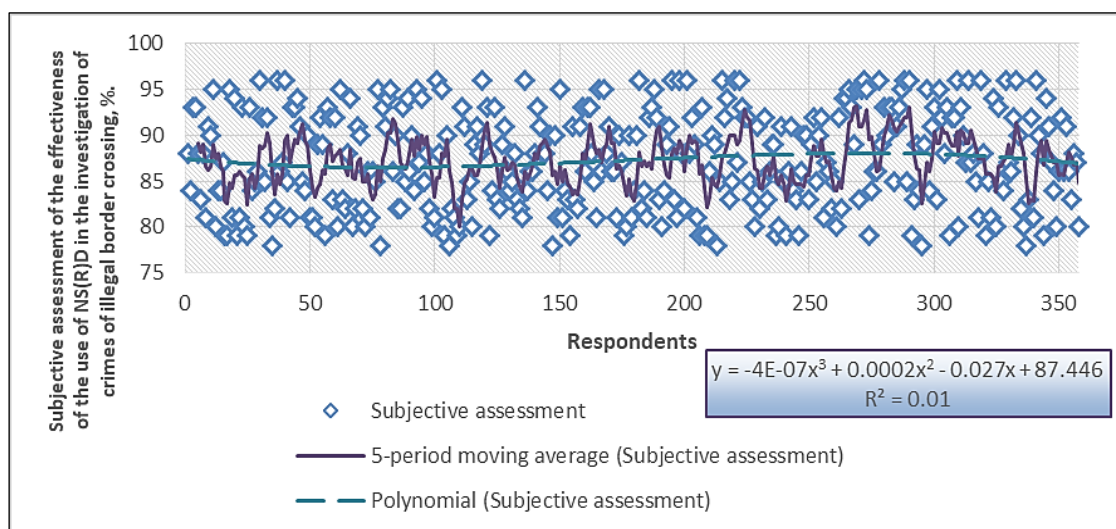


Figure 7: Results of the Subjective Assessment of the Effectiveness of CI(S)A Methods in Investigating Crimes Related to Illegal Border Crossing, % (Second Iteration of the Survey, Based on the Optimized Algorithm)

Thus, due to optimization, an improvement in the procedure for investigating crimes related to illegal cross-border migration using the CI(S)A

methodology is expected by $87.1\% - 65.8\% = 21.3\%$, meaning an increase in efficiency (while maintaining the legitimacy of operational

investigative actions) by $87.1\% / 65.8\% = 1.323$ times. Considering the above, we believe that the results of the empirical part of the study indicate that the initial goals were not fully achieved. It was established that CI(S)A methods play a central role in ensuring the operational efficiency of investigating crimes related to illegal cross-border migration.

Let's consider the research results in the context of similar publications that were chosen as relevant in the review section of the article.

The authors examined the importance of borders in the modern world, particularly in the context of migration crises, security, and populist sentiments (23). The authors take into account events of the past decade, such as Brexit, migration waves, security technologies, and changes in international relations that affect border policies. We agree with the findings of this study; however, we emphasize that this study lacks recommendations on combating illegal migration.

The UK government, in an attempt to protect its borders at the legislative level, is initiating norms that contradict the 1951 UN Convention (24). The findings of this study correlate with the results of the current research, but author does not offer effective recommendations on harmonizing migration legislation and measures to limit illegal migration (24).

It was also identified a strict approach to migration policy in the Japanese government (25). The author also observed a shift in government measures from border protection to local security interests, rather than adherence to international law as outlined in the 1951 UN Convention. Ito proposes a balanced approach to migration legislation that also integrates the adherence to social standards for asylum seekers (25). We agree with the author regarding the need for a balanced approach to migration legislative initiatives; however, the procedural aspect of the issue, which Ito does not address, also needs to be considered (25).

In contrast, it was argued for the necessity of strict migration legislation at China's borders (26). The author notes that uncontrolled migration flows are a crisis phenomenon negatively impacting the country's security and economy, and thus measures must be implemented to ensure the integrity of the borders. We partially agree with this study, but we aim for optimization and

harmonization of migration legislation as opposed to implementing strict migration control norms.

In contrast, the researchers found no significant improvement in the effectiveness of Italy's government measures aimed at controlling illegal migration, in terms of reducing smuggling (27). Instead, the introduction of more stringent migration policies led to an increase in the adaptability of criminal organizations involved in crimes related to illegal cross-border migration. The trends identified by these authors correlate with the conclusions of the current study.

It was found that the work of the International Organization for Migration (IOM) in South Sudan from 2013–2015 provided emergency assistance, promoted peace, reintegration, and capacity development, reducing the suffering of displaced persons and contributing to stability (28). The results of this study correlate with the conclusions of the current study regarding multi-level integration interaction but do not contain recommendations for addressing procedural issues related to investigating illegal migration crimes.

A group of authors also studied the impact of international cooperation in the fight against illegal migration, using an international legislative act that provides constructive solutions to reduce criminal border crossings via maritime routes (29). However, the authors highlight the difficulty of conducting investigations into this criminal activity and propose the use of measures such as controlled delivery, surveillance, and undercover operations (29). We fully agree with the findings of this study and observe a significant correlation with the empirical conclusions obtained, both in terms of harmonizing migration legislation, enhancing international cooperation, and applying effective investigative methods.

Meanwhile, based on the experience of investigating migrant smuggling crimes along the Western Balkans route through Serbia, it was proved the effectiveness of modern methods and technical means to combat the illegal movement of migrants to the EU (30). The authors state that effectiveness is achieved by implementing an adequate forensic strategy, coordinating police units, and centralized management. We fully agree with the findings of this study and note a significant correlation with the results achieved.

The researchers studied migration routes through Libya to Malta, which involved the use of illegal border crossing methods (31). The authors proposed the use of a graph of compounded scenarios to help identify problem areas and reduce the negative consequences for migrants and political interventions. This study only partially correlates with the conclusions of the current publication and does not contain recommendations for optimizing procedural processes in investigating crimes related to illegal cross-border migration.

Another method of investigating illegal migration crimes was proposed (32). Based on the experience of the immigration service at Soekarno-Hatta Airport (Indonesia), proved the effectiveness of immigration intelligence in combating human trafficking (32). We agree with the results of this study, as it demonstrates the effectiveness of optimization measures in procedural actions related to investigating illegal migration crimes.

It has been established that the results of the research correlate with previous work, and the proposed solutions can be included in the optimization program for investigating illegal migration crimes. Unlike other studies, this research has an empirical foundation and deserves further development.

Limitation

The ethical dimension of covert investigative (search) actions is not fully addressed in this study, particularly with regard to the potential risks of disproportionate interference with the right to privacy and procedural fairness. While the legal framework governing such measures is outlined, the inherent tension between investigative efficiency and fundamental rights protection remains insufficiently explored at the normative-ethical level. Additionally, the study does not fully account for the logistical and operational limitations of conducting covert actions in remote or hard-to-reach border regions, which are essential for assessing the practical feasibility of such measures.

Recommendations

It is recommended to incorporate a structured ethical assessment into the evaluation of covert actions, focusing on criteria such as legality, necessity, proportionality, and independent oversight. This would align the application of such measures with international human rights

obligations, particularly under the European Convention on Human Rights and relevant case law of the European Court of Human Rights. In addition, it is advisable to consider the geographic and infrastructural constraints of remote border regions when designing and implementing covert measures, in order to ensure their operational feasibility and effectiveness in real-world conditions.

Conclusion

The study results highlight the following points.

The first iteration of the anonymous survey showed an average effectiveness of the illegal border crossing investigation system at 65.8%;

The survey results revealed the main reasons for the reduced effectiveness of using CI(S)A in investigating illegal border crossings: procedural complexity (29.05%), corruption (20.95%), adaptability of criminals (14.25%), low technical provision (12.01%), weak interstate (10.89%) and interdepartmental interaction (8.94%);

The analysis showed that delays in investigations due to bureaucratic procedures affect operational speed, while legitimacy remains high. A balance between these parameters is achieved during the CI(S)A phase, indicating the limitations of current criminal investigation procedures for illegal migration crimes;

Based on the analysis, it is recommended to optimize the CI(S)A algorithm by standardizing documents, implementing digital systems for filing and reviewing petitions, automating control and simplifying the archiving procedure;

The optimized algorithm outperforms the current CI(S)A procedure in terms of operational speed (16 units vs. -9 units) and legitimacy (22 units vs. 19 units), especially during execution and completion stages. Automation, simplification of documentation procedures, and organization of CI(S)A achieve a balance between efficiency and legal norms. Further optimization is needed in the preparatory stage, archiving, and working with confidential sources;

A follow-up assessment of the illegal migration crime investigation procedure using CI(S)A and optimization measures showed an increase in the average effectiveness rating to 87.1% (a 21.3% increase, or 1.32 times). Respondents highly evaluated the proposed solutions for rationalizing

procedures and implementing modern technologies while adhering to legislative norms. The study results confirm that CI(S)A is a key element in ensuring operational speed in investigating illegal transborder migration crimes. However, procedural complexity and the involvement of many actors, such as prosecutors and judges, significantly complicate the process and reduce operational effectiveness, despite a high level of legal compliance.

At the same time, the application of modern technologies and an optimization-integration approach aimed at reducing procedural time and harmonizing them with legal requirements creates prospects for increasing CI(S)A efficiency. This approach allows balancing operational speed and adherence to legal norms, which is critically important for successfully investigating crimes in this area.

The scientific novelty of this research lies in the first application of an approach to modeling procedural processes that ensure effective investigation of crimes related to illegal transborder migration. This includes the development of new models that allow optimizing the organization of investigations and enhancing their effectiveness in combating such crimes.

The practical value of this study lies in the development of new methods and approaches for investigating illegal transborder migration crimes, contributing to improved law enforcement effectiveness. The proposed optimization solutions significantly improve investigation processes, reduce time for preparatory stages, and ensure more efficient detection and prevention of such crimes.

Abbreviation

(CI(S)A): Covert investigative (search) actions.

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Author Contributions

Pavlo Bielyu: conceptualization, formal analysis, original draft, data normalization, restructuring, Alla Zinevych and Olha Lytvynenko: methodology, validation, Maryna Derevyanko and Tymur Loskutov: reviewing, editing manuscript.

Conflict of Interest

The authors declare no conflict of interest.

Ethics Approval

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