






## An Information Algorithm: Advancing Financial Intelligence Management for Economic Security



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### ABSTRACT

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This research aims to establish an optimized information foundation to bolster the effectiveness of financial intelligence management within the system of economic security. The chief scientific objective is to introduce an information algorithm, specifically designed for the management of financial intelligence, to fortify the economic security framework. The focal point of the research is the information support system pertaining to financial intelligence management. The research methodology is anchored in the application of contemporary information modeling methods, supplemented by functional algorithmization of processes. A modern graphic method is employed to enhance comprehensibility and accessibility. As an outcome of the study, a model of an information algorithm is presented, tailored to manage financial intelligence within the economic security system. However, the study acknowledges its limitations and does not incorporate all the elements of economic security assurance. Future research is recommended to delve into the specifics of information security within the financial intelligence management system. A distinct advantage of the proposed information algorithm lies in its graphic representation, enhancing the accessibility of the financial intelligence management system. The research scope is regional, indicating a limitation in the study. Future work should aim to expand the geographic applicability of these findings, enhancing the generalizability and relevance of the study.

## 1. INTRODUCTION

The effective operation of state and local self-government bodies is imperative in the pursuit of preventing and prosecuting corruption, particularly 'grand corruption' involving public authorities vested with substantial power. Corruption invariably leads to a divergence between intended and actual outcomes of public authority activities, impediments to legitimate entrepreneurial ventures, reductions in direct investment, misuse of international aid, strengthening of criminal gangs, and a general decline in the societal virtue, among other critical crisis phenomena.

The shadow economy and illicit financial flows pose considerable threats to state security. Global practices in combating these phenomena highlight the efficacy of financial intelligence units. In an era characterized by globalization, rising separatist and terrorist activities, and high levels of corruption, the role of financial intelligence in counteracting illicit financial transactions is of particular relevance.

Illicit financial transactions have substantial impacts on socio-economic and political processes, burdening the legal economy and hampering socio-economic reforms, public welfare improvements, financial stability, and state

development. Illegal business entities infiltrate numerous economic sectors, accumulating illicitly obtained income, which subsequently strengthens the material and technical base of criminal groups and fosters the emergence of organized state and transnational crime.

Moreover, the infiltration of criminal groups into legal economic transactions through bribery, blackmail, and lobbying furthers their selfish interests, saturating diverse socio-economic relations with strong criminogenic potentials. This creates an unfavorable investment climate and negatively impacts the development and security of a country's national economy.

It is worth noting that uncertainties are an inherent feature of the financial intelligence decision-making process. These uncertainties are typically classified into three categories: those related to incomplete knowledge of input data (situations), imprecise understanding of the situation and the decision-maker's role within it, and the uncertainty of external environment influences and the development of the situation at the time of decision implementation. The quest to reduce such uncertainties to zero underscores the relevance of this study.

Both public and private organizations conduct financial

intelligence, which is utilized by anti-money laundering authorities and other competent bodies to investigate money laundering related to predicate crimes and terrorist financing. A primary goal of international anti-money laundering and terrorist financing measures is to ensure these authorities have the capacity to collect, evaluate, analyze, and provide reliable, accurate, relevant, and timely information.

Despite the progress, significant scientific gaps remain in the field of financial intelligence development. The most prominent challenge lies in determining the optimum informational form for presenting improvements. This study poses a key question: how can the financial intelligence management system be improved through informatization? Here, the information algorithm is a sequential representation of information on how to enhance the control system.

The principal objective of this study is to establish an appropriate informational foundation for effective financial intelligence management within the system of economic security. The main scientific challenge is to develop an informational algorithm for managing financial intelligence in the system of economic security. The article's structure entails an examination of literature, a description of the foundational methods of the methodology, a presentation of the primary research findings, their discussion, and conclusions.

## 2. LITERATURE REVIEW

Contemporary literature [1, 2] underscores that a key survival component in an intensely competitive milieu is the efficient organization of financial intelligence. The term "financial intelligence" is relatively new to the scientific domain, thus the novelty of the research topic under consideration in this article. In a previous era [3], where state ownership reigned, all risks were born by a single entity - the government. Consequently, economic entities did not encounter issues necessitating financial intelligence. However, with the evolution of property's nature and essence and the need to appraise its value, money emerged as the universal value equivalent. Today, money is predominant, leading to the coining of the term "money fetishism", denoting the influence of money on human psyche, psychology, and behavior, which regrettably, often transcends universal human values. Ultimately, any economic, political, and ideological challenges in any country are reduced to financial concerns.

Knedlik et al. correctly identifies the need for information support due to the inadequate capacity of remote servers hosting controlled organizations' personal accounts, leading to frequent system failures [4, 5]. The proposed software, to be installed directly on the organization specialists' workstations, could potentially reduce these failures. In light of the continual improvement of money laundering schemes, the regular creation and implementation of software to keep audits concurrent with the evolving situation is obligatory.

Drawing from scientific and practical literature, it is highlighted that financial intelligence is intricately linked with cash flows and illicit financial transactions. This necessitates an effective information system to facilitate the decision-making process and its subsequent implementation.

Agarwalla et al. [6, 7] noted that economically developed nations have earmarked anti-legalization activities as a primary strategy to combat crime proliferation, shadow economy, terrorism, and separatism. Financial intelligence serves as an effective countermeasure against legalization

processes. National financial intelligence units are being established and operationalized in various countries to combat anti-legalization. Global practices of financial intelligence units have given rise to four primary models - administrative, law enforcement, prosecutorial, and mixed.

Kryshtanovych et al. [8-10] emphasized that a nation's economic security is integral to its national security and is closely tied to all societal economic processes. Criminal acts in the realm of laundering criminal proceeds are carried out not merely for further economic activity or personal enrichment, but also for financing terrorism, illegal arms trade, contract killings, separatist group funding, and other crimes.

The referenced research sources highlight that effective intelligence gathering is impossible without a robust management system, with information support playing a critical role.

Financial intelligence involves establishing close collaboration with international organizations and foreign partners directly responsible for organizing effective countermeasures against the legalization (laundering) of proceeds from crime, terrorism financing, and the financing of weapons of mass destruction proliferation.

While recognizing the contributions of leading scientists to the development of professional literature on this topic, the novelty of our study lies in presenting an information algorithm for the financial intelligence management system.

## 3. METHODOLOGY

Known today not only in narrow circles, the abbreviation IDEF0 is the first methodology that standardizes work on business processes. It was developed in the middle of the last century as part of an aerospace project in the United States and proved to be effective, becoming a federal standard. In our country, in 2000, the document "Methodology of functional modeling IDEF0. Guiding document", but as a standard it has not been approved. Although this did not prevent this methodology from becoming one of the most popular tools for graphical modeling of business processes in our country. In this article, I propose to consider the IDEF0 model and evaluate the relevance of this methodological approach for improving the efficiency of financial intelligence management in the region.

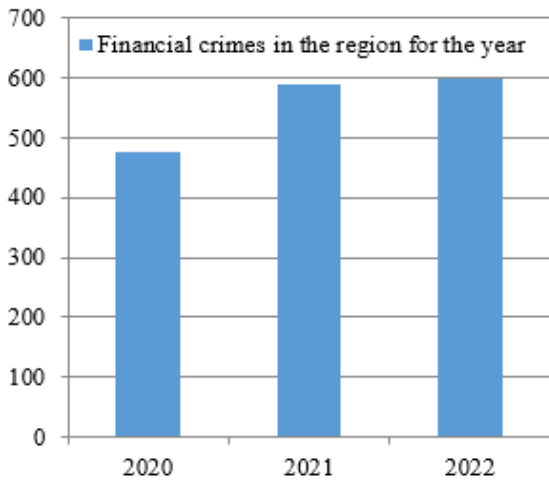
IDEF0 is a functional model, which is the information core for building all other structures, it links together information flows, organizational structure, control actions and the very activity of the enterprise. A graphical standard for modeling processes is also called a notation. The IDEF0 notation is a fairly rigorous technique that was originally developed, like engineering design standards, for manual modeling.

Regardless of the scale of actions, all functions are displayed in the same way and necessarily contain 4 key flows that are rigidly assigned to the sides of the functional block: on the left – inputs or resources for executing the function; on the right – outputs or results of the function execution; from above – control actions that determine how and how many results need to be produced; below – mechanisms that reflect who and with what should do the work.

After processing the flows of the context diagram, we can move on to decomposition. Going one level down, as if opening a black box, we first see a blank sheet with arrows that have been attached to the functional block. This is where information modeling comes in handy. We need to understand

what set of actions can connect these flows and ensure that all requirements are met.

The model has a good visualization potential, but, in my opinion, its greater value is in the disciplining effect. The rules and restrictions laid down in the methodology make it necessary to develop a systematic and strict attitude to the models, which has a very good effect on the quality of the final result.



**Figure 1.** The dynamics of committing financial crimes in the region we have chosen for the study

Some of these arguments lead one to think that this approach is the best and only one for full activity modeling. But we must not forget that the functional model is designed only for the upper level of modeling. Using the IDEF0 notation for designing work at the level of performers leads to the fact that the schemes are purely informative and illustrative, and it is impossible to build an intelligent regulation on the basis.

The proposed method should be applied to the most corrupt region in Europe, which needs effective management of financial intelligence - the Lviv region.

It is necessary to present the dynamics of committing financial crimes in the region we have chosen for the study (Figure 1).

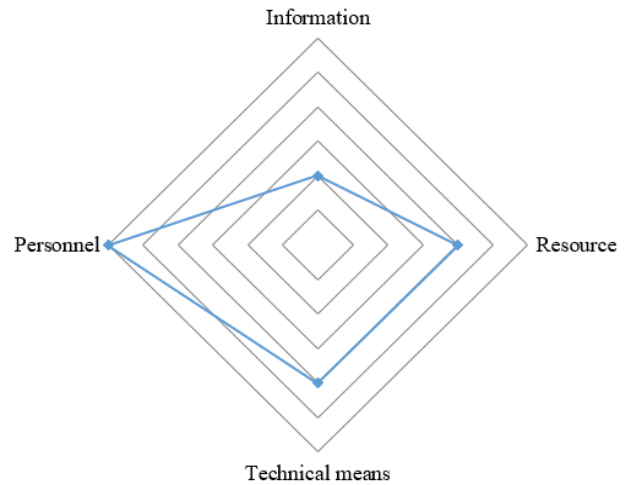
The chosen method of constructing the model has a number of advantages in our case. The fact is that in the framework of our study, we are dealing with the financial intelligence management system in the region. And when certain managerial decisions are made and implemented, a clear information algorithm in graphical form is needed.

The top level is top management and the top of the management system. The model is designed to transfer management information for its implementation. The performers themselves should not build such a model, but only execute the specified blocks according to the presented algorithm.

#### 4. RESULTS OF RESEARCH

Before presenting the algorithm through simulation, we would like to note that the Lviv region is characterized by a high level of financial crime. In addition, according to statistics, little attention is paid to the information aspect in the

region. Information for intelligence in the Lviv region comes to other components (Figure 2).



**Figure 2.** Data on the activity of certain elements of financial intelligence management in the region

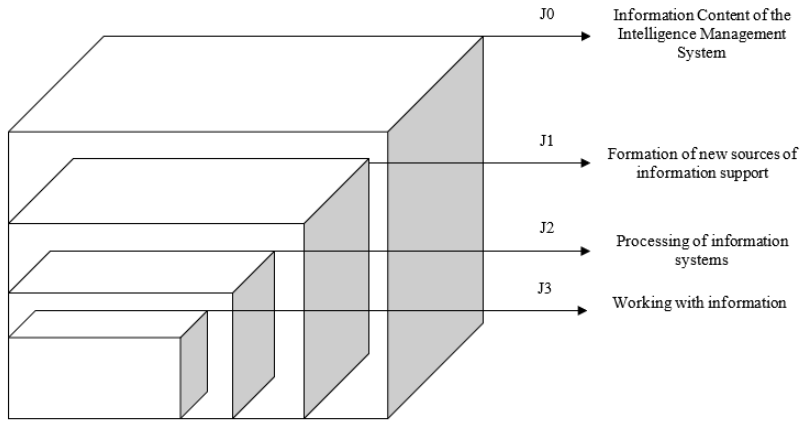
First of all, you need to decide on the main goal, and then model the algorithm for achieving it. Thus, according to the subject of the study and its main aspects, we mathematically denote our goal in the form of the symbol J0. This is done for better identification and simplification of graphic perception. Thus, J0 is the "Information Content of the Intelligence Management System". Its achievement involves the algorithm for performing the stages (Figure 3).

In general, the algorithm of action is clear, however, it should be clearly defined what should be the result of achieving the modeling goal. It is necessary to form a general view of the algorithm for obtaining the result from achieving the modeling goal (Figure 4). The model of the algorithm for the stages of reaching J0 is presented in Figure 5.

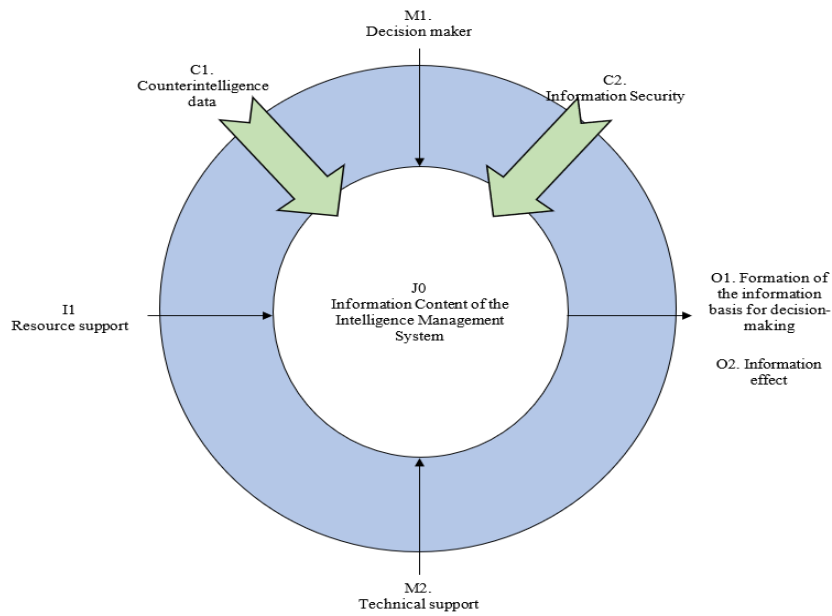
To achieve process J1 "Formation of new sources of information support" it is necessary to propose an algorithm for performing the following steps:

J11. Formation of internal sources of information. Internal sources include sources whose information is circulated through internal formal communications. These include primarily data from accounting, statistical, operational accounting and information from sample observations. These are different invoices, checks, invoices. In economic information recorded with the help of accounting.

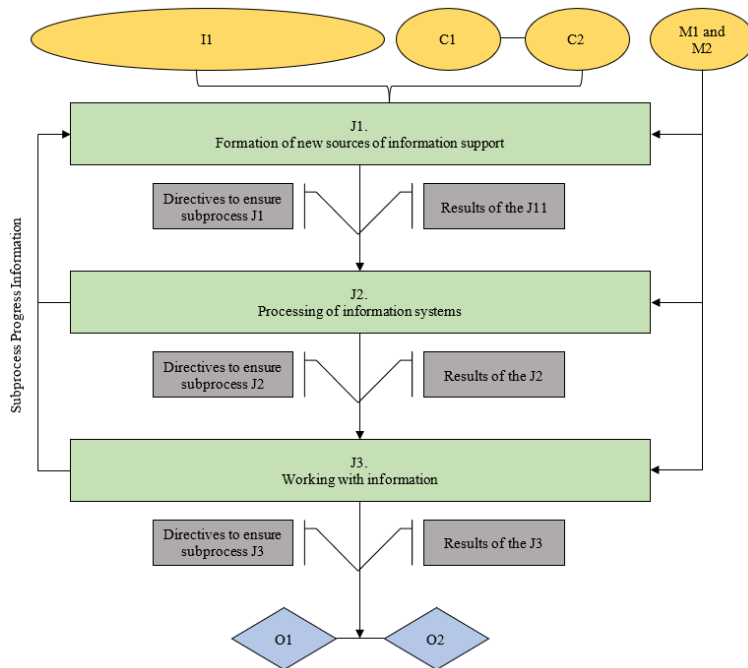
J12. Formation of external sources of information. Internal sources of information also include non-accounting information, namely: materials of audits and internal audits, minutes of the meeting of the labor collective, meetings of the board of the corporation, orders and instructions, materials of intra-company mass media, analytical reports, programs, plans, development projects of the company, patents, know-how, licenses, as well as the workers themselves. Many information about the enterprise contains communication channels of the external environment. Allocate information from the environment of direct links and independent environment. The first one includes: suppliers of capital, materials, labor resources, energy resources, information, consumers of products, government bodies, transport organizations, exchanges, associations and associations, personnel.



**Figure 3.** Stages of the algorithm for reaching J0



**Figure 4.** Algorithm for achieving results from modeling



**Figure 5.** The model of the algorithm for the stages of reaching J0

J13. Formation of independent information flows. The independent environment of information flows is represented by institutions of economic, social, political, and cultural infrastructure that have episodic connections. These include exhibitions, fairs, trade agencies, consulting and audit firms, and technical periodicals. Like any activity, reconnaissance is carried out with the help of means, the set of which is determined by the methods of searching for and obtaining the necessary information, which ultimately determines the effectiveness of reconnaissance work (Figure 6).

To achieve stage J2 "Processing of information systems", it is necessary to algorithmize the execution of the following processes:

J21. Systematization of information. Most of the exploration objects are complex systems, including production, marketing and financial subsystems. Since they are inseparable and interdependent by departments, their indicators must be mutually confirmed. Yes, if in the course of exploration information was obtained about the good financial condition of a competitor, this does not mean that he has a strong competitive position. It is possible that this financial position is based on obsolete technology, when the life cycle of manufactured goods and technologies has passed the stage of maturity and goes into decline, and the company does not invest capital in the resumption of production. The entry of this firm into the market with the latest technology can quickly set it back.

J22. Formation of information subsystems. Economic intelligence information should be interconnected by component subsystems. Only in this case it is possible to draw unmistakable conclusions. Financial indicators must be confirmed by marketing ones, and marketing ones, in turn, by production and technological ones. At the same time, evaluations of competitors' management occupy a special place.

J23. Providing reliable and reliable information. Timely provision of management with reliable and reliable information about the external environment with the identification of financial security risk factors. Organization of

the most effective information work, excluding duplication by structural divisions of each other (Figure 7).

To achieve stage J3 "Working with information", the following processes should be algorithmized:

J31. Evaluation of information. All methods of collecting information can be divided into legal, semi-legal and illegal. If the method of obtaining information is illegal, this may entail legal liability. When selecting information, various measures are used to check the co-dependence and interdependence of the information received, its completeness. In the course of information processing, methods for evaluating technologies, resources, the effectiveness of the functioning of capital, financial stability, and solvency are used.

J32. Information decoding. The method of collecting information, as a rule, determines the transmission channel. Semi-legal and illegal methods of obtaining information require special channels. It should be borne in mind that the technical channels for transmitting information are more controlled by competitors' counterintelligence. Today, decoding methods involve not only the decryption of cryptograms, but also the confirmation of the information received.

J33. Information encoding. Encoding is understood as the choice of the form of information transfer. Yes, if the information is obtained legally, it is transmitted in the form of a letter, an open message, etc. If illegal methods were used, such information must be encoded in the form of a cryptogram before transmission (Figure 8).

In general, we tried to present a clear algorithm of how to achieve the set goals through modeling. Modeling has made it possible, through functional and graphical aspects, to present the main elements of this process.

We used mathematical models of the vector direction to build the algorithm.

The limitations relate to the fact that we considered the financial intelligence management system of only one region. The information field should be expanded in future results with new systems and regions.

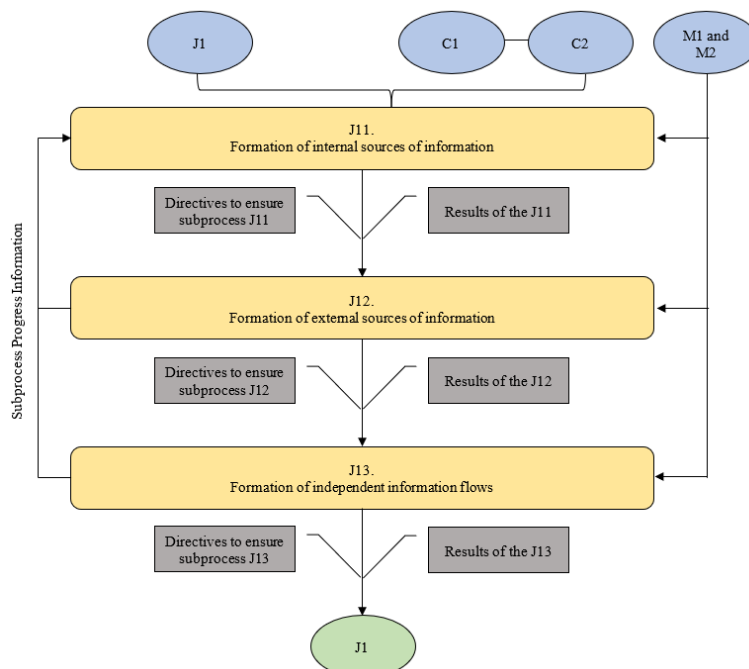
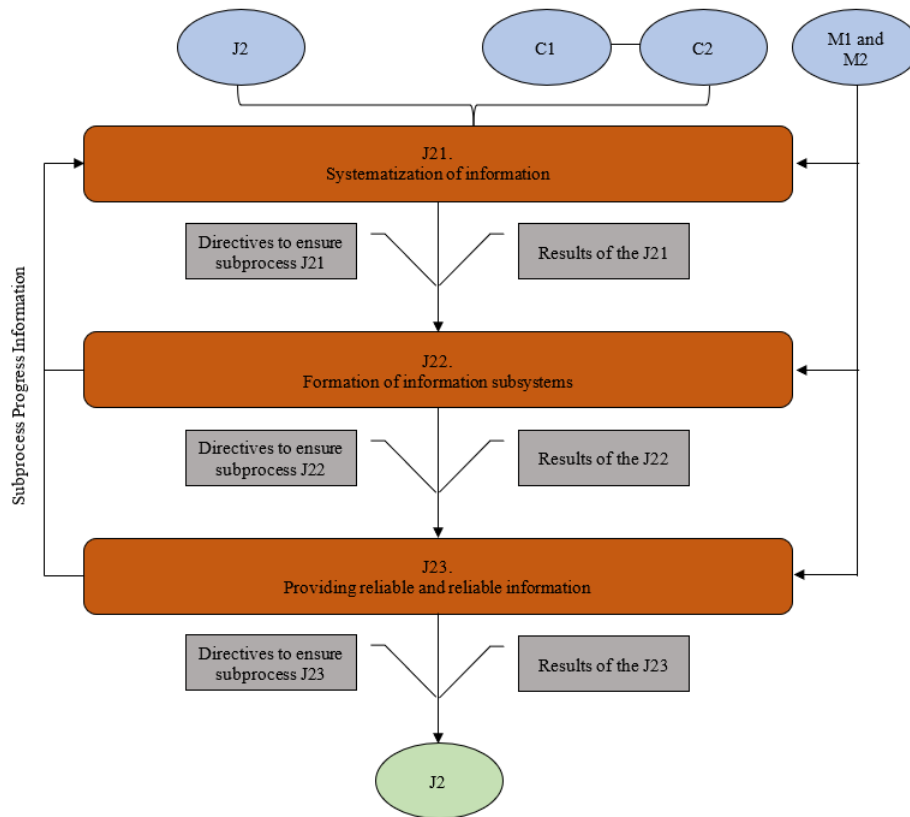
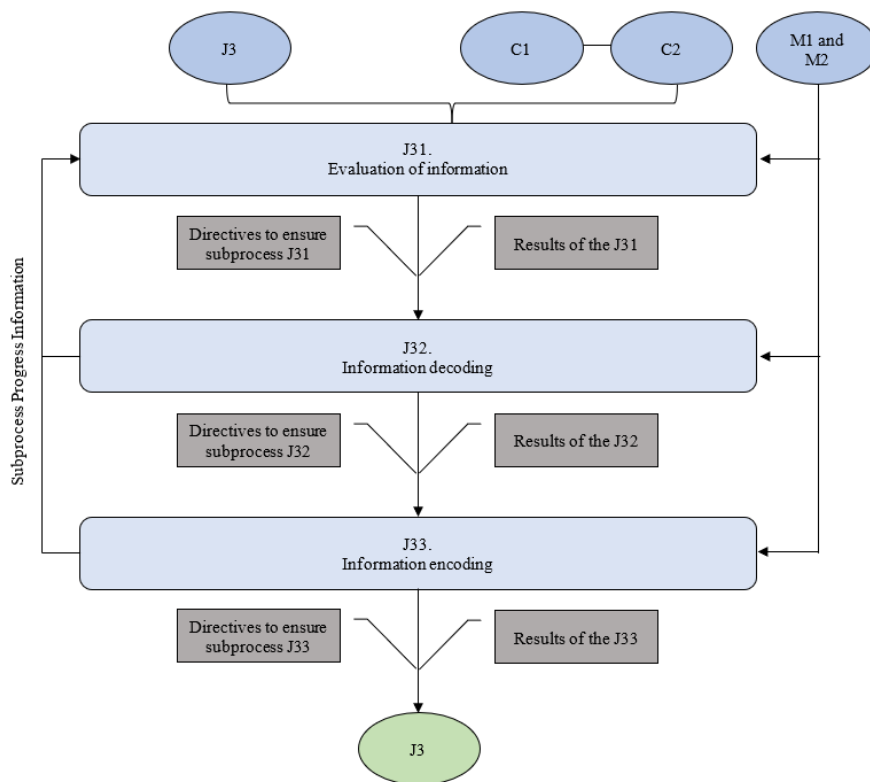


Figure 6. J1 Process execution algorithm



**Figure 7.** J2 Process execution algorithm



**Figure 8.** J3 Process execution algorithm

## 5. DISCUSSIONS

In general, I would like to devote a discussion section to comparing the results of the study with similar ones. In our

opinion, the best discussion is highlighting the best results of our study.

According to Iskajyan et al. [11-13], in the modern globalization conditions of development, the problem of

legalization (laundering) of proceeds from crime and the financing of terrorism has acquired an international character.

Most countries of the world, in particular, financial intelligence units recognize this problem as a global threat to economic security.

Thus, all countries must carry out concerted and coordinated measures to combat this phenomenon, both at the national and international levels. Today, the development of international cooperation in this area continues with the aim of building a single organizational and legal space to prevent and counteract the legalization (laundering) of proceeds from crime.

In many research results, the functioning of the financial intelligence of Ukraine is based on three components: regulatory, organizational and methodological support [14-16]. At the same time, financial intelligence functions at the state level and at the level of primary financial monitoring, it provides for the verification and monitoring of financial transactions for their legality and necessity.

The main purpose of the financial intelligence system is to counter threats to the financial and economic security of the state. An important aspect of the functioning of the financial intelligence model is the assessment of its effectiveness, which allows you to quickly enhance its advantages and eliminate shortcomings in the process of functioning.

Scientists note that effective anti-legalization activities require compliance with certain rules, in particular: continuous improvement and development of the financial intelligence unit, bringing it into line with international recommendations and standards of domestic legislation, revising the methodology for assessing legalization risks, establishing interdepartmental and international cooperation [17-22].

The identification of existing problems and the development of ways to eliminate them are priority strategic goals of the anti-legalization policy of the state.

However, unlike similar studies, ours has a number of differences. Discussing our results, they consist in presenting the processes that form the information basis for improving the efficiency of financial intelligence management in the system of ensuring economic security. To this end, through simulation, it was determined which stages allow this to be achieved.

The key contradiction that our study attempts to close is that information plays an important role in the intelligence management system. Our research results open a new path to the very presentation of information within the intelligence management system.

Discussing the consequences of the study, they lie in the possibility of practical application of the proposed results at the regional level of government.

Discussing and arguing about what restrictions were set during the study, it should be noted that this is a regional character. Each intelligence management system and its information support is different and in the future, ways should be sought for a joint solution to form universality.

## 6. CONCLUSIONS

Summing up, it should be noted that in recent years the problem of rationality and efficiency of spending budget funds is at the peak of relevance, since significant amounts of funds from the budget are "laundered" and, accordingly, the result of the activity for which the funds were directed does not meet the goal. This is especially acute in the region we have chosen

for research.

The threat to the effective and rational use of budgetary funds in the region chosen for the study is their theft through the implementation of corrupt agreements and the direction of these funds through shadow channels. The result of such activities is the lag of the region in development, as well as the violation of its financial stability and independence. Firstly, this negatively affects the key indicators of the socio-economic component of the subject of the country, namely the deterioration in the standard of living of the population of the region, a decrease in life expectancy, a decrease in average per capita incomes, a pronounced polarization of incomes, an increase in unemployment, etc. this is evidenced by the growth of the state debt of the region, since the result of the irrational use of budgetary funds is their lack of financing for regional development programs and the high-quality performance of their functions by local governments and other institutions and organizations. All this is important to identify in summing up the results of our study.

It is important that the essence of monetary intelligence units is their information and analytical, and not law enforcement activities. Of course, the combination of law enforcement and information and analytical functions will rather have a negative impact on each of the components than give a synergistic effect for this activity. As a result, we can assume that the trend towards improving their performance is effective provision. As part of this, we presented a model of an information algorithm for managing financial intelligence in the system of ensuring economic security. The study has limitations and does not take into account all the components of ensuring economic security. Further research should consider in detail the issues of ensuring information security in the financial intelligence management system.

The results of our study contribute to the solution of these problems by improving the information support for the reception and implementation of management decisions in the framework of financial intelligence activities.

Regional restrictions are traditional for many studies. The results of the study were based on the intelligence management system in a particular region and information about it.

Every information algorithm faces a number of threats and therefore security must take the lead.

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