

ABSTRACT
of the dissertation research by Gulmira Zhabayevna Ospanova
on Information and Analytical Control System
of the Regulatory Base Integrity,
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6D075100 - Informatics, Computer Engineering and Control

The modern world has a vast number of laws, rules, and standards that regulate different spheres of human activity. However, these norms may become outdated or irrelevant over time due to changes in society or technology. The system for maintaining the integrity of the regulatory framework allows tracking all changes in the regulatory base and timely updating relevant documents, helping organizations comply with legal requirements and avoid potential fines or other negative consequences.

Additionally, such a system can significantly simplify working with regulatory documents for company employees by providing quick access to necessary information and increasing the efficiency of managing business processes. Overall, developing a system for maintaining the integrity of the regulatory framework is essential to ensure the effective functioning of organizations and their compliance with all requirements related to organization and business process management.

Thus, the relevance of the research can be determined by the following parameters and indicators of business process management and support:

- Contradictory values of process management parameters established by different documents;
- Lack of a strategy for maintaining the integrity of the regulatory document base;
- Absence of a clearly regulated process approach to managing the regulatory document base and business processes;
- No feedback between objects and subjects of the regulatory document base in business process management;
- Determinism of processes regulated by the regulatory document base and the absence of resource reserves.

The research aims to develop models and methods for controlling the integrity and managing processes of introducing changes to the regulatory document base to ensure its integrity and systematize regulatory documents by imparting integrity property to the regulatory document base.

To achieve the research goal, the following research objectives are set:

- Develop models for ensuring the control of the regulatory document base integrity.
- Develop methods to ensure immutability, determine the subjects of the information system, and verify the composition, content, and interaction of regulatory documents.

- Develop sufficient conditions for the feasibility of requirements of methods for ensuring immutability, determining the subjects of the information system, and verifying the composition, content, and interaction of regulatory documents.

- Develop algorithms for implementing methods for ensuring immutability, determining the subjects of the information system, and verifying the composition, content, and interaction of regulatory documents.

- Develop models of the information-analytical system for controlling the integrity of the regulatory document base by one-to-one (bijective) mapping frame models representing the regulatory document base into elements of the designed system.

The object of the research is the regulatory document base as a component of the business process support system, implementing and generating controlling and regulatory impacts and signals on business processes.

The research subject is the provision of integrity to the regulatory document base by imparting the integrity property to the regulatory document base that regulates various business processes and acts as representatives of both subjects and objects in the regulatory document base.

The scientific novelty lies in the application of a formalized approach to solving the problem of ensuring the integrity of the regulatory document base; it is considered as an object and subject of management in business processes and can be specified by the following aspects:

- Applying predicate algebra to formulate the problem and form an aggregated model to ensure the regulatory document base's integrity.

- Developing declarative frame models and methods for ensuring integrity.

- Using semantic models to formalize the representation of the regulatory document base.

The practical significance can be determined by the effects of implementing the developed models and methods:

- Ensuring consistency among documents in the regulatory document base will enhance process manageability by providing stricter and more unequivocal regulation of business processes in regulatory documents.

- Clearness of authorized users and services will enable the formation of a strategy for controlling the integrity of the regulatory document base, which will help ensure cascading document updates.

- Formalizing connections between regulatory documents will enable the implementation of document interactions to establish feedback in business process management.

- Reducing variability in process management parameters will decrease the entropy of the regulatory document base, thereby increasing the rigidity and determinism of processes regulated by the regulatory document base.

The following outcomes of the dissertation research are proposed for defense:

- Predicate model of ensuring the regulatory document base integrity, further formalized by a frame model of the regulatory document and the regulatory document base.

— Methods for determining subjects of the information system authorized to modify the regulatory document base; ensuring the immutability of the composition, content, and interaction of the regulatory document with other regulatory documents in the regulatory document base; determining the reliability of the composition, content, and interaction of the regulatory document with other regulatory documents in the regulatory document base.

— Models of the information and analytical system for controlling the regulatory document base integrity.

The work was tested at the International Conference "Global Science and Innovations 2019: Central Asia" (2019) and the International Scientific and Practical Conference "Standardization as a Tool for Enhancing Competitiveness and Integration of Kazakhstani Products into the Global Economy" (2019).

Regarding the research topic, six works were published, including three articles in scientific publications specified in the List of Scientific Publications recommended for publishing the main results of scientific activity, approved by the authorized body. One article was published in an international peer-reviewed scientific journal with a non-zero impact factor (indexed in the Scopus database), and the others were presented in the proceedings of two international conferences. As a result of the research, the author received an intellectual property certificate.

The author's contribution lies in developing the dissertation research's leading theoretical and applied provisions. The author's participation in joint publications involves formalizing problem statements, models, and methods for ensuring the regulatory document base integrity and models for the functioning of the information and analytical system for ensuring the regulatory document base integrity.

Dissertation Structure. The dissertation follows a classical structure: Introduction, Main Part (three chapters), Conclusion, and List of References. It is presented in 103 pages of computer text, including 18 figures, 3 tables, and references to 109 bibliographic sources.

The Introduction outlines and justifies the dissertation research's relevance, objectives, object, and subject and presents scientific novelty and practical significance.

The First Chapter analyses the current state of the problem of ensuring data integrity in the enterprise's information system, focusing on regulatory documents as a subset of all documents in the regulatory document database. It also considers the characteristics of the regulatory document base, the main approaches to ensuring data integrity, and theoretical and applied research in data integrity assurance.

The Second Chapter formulates the task of ensuring the regulatory document base integrity, develops frame models of the regulatory document and the regulatory document base, presents models and methods, and justifies the sufficiency of frame models for use in solving tasks using the methods proposed in this chapter – methods for determining subjects of the information system authorized to modify the regulatory document base, methods for ensuring the immutability of content, and methods for determining the credibility of the regulatory document base. Frame models are objects for which a copyright certificate has been obtained (Appendix A).

The Third Chapter presents an information technology model for ensuring the integrity of the regulatory document base. According to the methods, algorithms, and solution models for subtasks, such as determining the subjects of the information system authorized to modify the regulatory document base, ensuring immutability and content, and determining the credibility of the regulatory document base, are developed.

The Conclusion summarizes the dissertation research results and includes the work's main conclusions.