Designing a Regional Economic Security System

V V Smirnov¹, D G Osipov¹, A A Babaeva¹
¹Federal State Educational Establishment of Higher Education “Chuvash State University named after I. N. Ulyanov” Cheboksary, Russia

E-mail: walera712006@mail.ru, denps@mail.ru, any9196@yandex.ru

Abstract. The need for design of a regional economic security system is determined by high external dependence of the Russian economy and by absence of firm levers influencing international means of interaction. Low social and economic indexes of Russia in relation to extreme critical values indicate unsatisfactory state of its economic security. In accordance with the Strategy of economic security of the Russian Federation until 2030 determination of national security threats and identification of the key indicators becomes a necessary attribute of the Russian economics. The present article reveals the mechanism of a regional economic security system development including stages of economic indexes dynamics analysis and building an IDF0 model. Design is based on the international standards of quality management for design (ISO 10006:2017 Quality management systems – Guidelines for quality management in projects) and on requirements to a quality management system (ISO 9001:2015 Quality management systems – Requirements). Complex analysis is associated with assessment of accession rates normalized importance including building of a neural network and carrying out cluster analysis. Complex analysis of accession rates of the Russian region economic indexes using SPSS Statistics software resulted in identification of the determining factors for clustering. In order to improve stability of a regional economic security system all the processes are synchronized in the optimal mode, verified and validated to provide consistency of output data and input parameters. There are options to change significant relations with processes and stages of a regional economic security system design in order to adjust IDF0 model of a regional economic security system.

1. Introduction

High degree of the Russian economy external dependence and absence of firm levers influencing international means of interaction (financial, information, diplomatic) pose threats to national security [1]. Results of assessment of social and economic situation in Russia in relation to extreme critical values indicate unsatisfactory state of its economic security [2].

Determination of threats to national security and identification of key indicators (classification by various criteria) are becoming necessary attributes of the Russian economics. In accordance with the Strategy of economic security of the Russian Federation till 2030, with the major trends in development of modern economics that influence the state and dynamics of economic security, the system of its enforcement, taking into account the challenges, threats and approaches to development of a National system of risks management there originates the need to design a Regional Economic Security System (RESS).

Designing of a RESS includes: complex analysis (construction of a neural network and cluster analysis) of economic indexes accession rates; development of an IDF0 model of RESS.
2. Methodology

Main processes and stages of RESS designing are based on the international standards of quality management for design (ISO 10006:2017 Quality management systems – Guidelines for quality management in projects (IDT) (GOST R ISO 10006 – 2017: Quality management systems. Guidelines for quality management in design) [3] (Fig. 1)).

![Figure 1. Processes and design stages.](image-url)

Processes and stages of design are implemented in compliance with requirements of the international standard ISO 9001:2015 Quality management systems – Requirements (IDT) (GOST R ISO 9001–2015: Quality management systems) [4].

Application of a QMS is a strategic decision (stages – 1, 4, 7, 10) for regional economy that improves its efficiency (stages – 5, 6, 8, 9) and providing solid basis for initiatives (stages – 11, 12) focused on RESS stability.

Management of interrelated processes as a QMS (stages – 2, 3) contributes to efficiency of economy. Process approach allows to manage interrelations (stages – 13-15) between RESS elements.

Process approach includes systematic determination and management of processes and their interactions in accordance with quality policy and strategic direction of RESS [5]. RESS processes management is achieved in the PDCA (Plan-Do-Check-Act) cycle (stages – 19-21): Plan – development of system objectives and processes, identification of resources required for achievement of results, determination and consideration of risks and opportunities; Do – doing what's planned; Check – monitoring and assessment of processes compared to policy, objectives, requirements and planned actions, reporting on results; Act – taking measures to improve results to the extent as necessary.

Standard ISO 9001:2015 Quality management systems – Requirements (IDT) (GOST R ISO 9001–2015: Quality management systems) combines PDCA cycle and risk-based thinking (stages – 16-18) that allows to increase stability of RESS to external factors. The concept of risk-based thinking is related to committing preventive measures aimed at elimination of possible inconsistencies, analysis of any occurring inconsistencies and at taking measures to prevent their repeated occurrence complying with inconsistency consequences. It is necessary to plan and implement actions related to risks and opportunities in order to comply with the standard requirements. Efforts to eliminate risks would create a basis for increase of RESS stability, for achievement of improved results and for avoidance of adverse consequences.

The following should be considered for identification of stages and means of RESS designing management: nature, duration and complexity of processes; required stages of process including carrying out of all the applicable analyses of designing and development; actions required in terms of verification and validation of designing and development; duties, responsibility and authorities; internal and external resources; demand for inter-process interactions management; demand for involvement of employees and project users; management level; documented information required for illustration of
meeting the requirements to designing and development. Changes made during or after RESS designing should be identified, analyzed and managed to the extent required to prevent negative impact.

3. Analysis

Let's take one of the Regions of Russia – the Chuvash Republic – as an object of research. To pick the Chuvash Republic RESS element base let's assess normalized importance and clustering of economic indexes accession rate using SPSS Statistics software and the data of the Federal service of state statistics of the Russian Federation [6] (Table 1 and 2).

**Table 1. Normalized importance.**

| Value                                                                 | Normalized importance > 50% |
|-----------------------------------------------------------------------|-----------------------------|
| Children covered by pre-school education                              | 100,0%                      |
| Life expectancy at birth: whole population                            | 85,0%                       |
| Population size: women                                                | 75,8%                       |
| Students enrolled in elementary, secondary basic and general secondary education | 69,3%                       |
| Production of farms of all categories: sugar beet                     | 68,6%                       |
| Connected mobile radiotelephone network devices                       | 61,0%                       |
| Births                                                                | 60,9%                       |
| Production of farms of all categories: sunflower seeds                | 60,0%                       |
| Productivity index by type of activity: manufacturing                 | 59,2%                       |
| Food consumption per capita: potato                                   | 57,1%                       |
| Freight turnaround for roadway transport of enterprises of all industries | 54,1%                       |
| Working age population                                                | 53,7%                       |
| Return of taxes, duties and other mandatory payments to the budget of the Russian Federation | 53,1%                       |
| Enterprises and companies                                             | 52,1%                       |
| Consolidated budget expenditures                                      | 51,2%                       |
| Children waiting enrollment to pre-school educational institution, total | 50,3%                       |

**Table 2. Clustering.**

| United cluster                                                                 | Square of Euclidean distance < 10 |
|-----------------------------------------------------------------------------|-----------------------------------|
| Population size                                                             |                                   |
| Life expectancy at birth: whole population                                  | 8,227                             |
| Population size: men                                                        | 0,141                             |
| Population size: women                                                     | 0,048                             |
| Working age population                                                      |                                   |
| Number of hospital beds                                                     | 6,964                             |
| Organizations involved in educational activities providing elementary, basic and general secondary education | 2,173                             |
| Life expectancy at birth: whole population                                  | 4,917                             |
| Doctors                                                                     |                                   |
| Life expectancy at birth: women                                            | 3,855                             |
| Life expectancy at birth: men                                              | 0,699                             |
| Life expectancy at birth: women                                            |                                   |
| Food consumption per capita: milk and dairy products                        | 1,664                             |
| Average consumer spending per capita                                        |                                   |
| Commissioning of capacities, total                                         | 6,265                             |
| Retired people registered in the Pension Fund of the Russian Federation     | 7,549                             |
| Capacity of polyclinic institutions, visits per shift                       |                                   |
Total area of housing, average per inhabitant, total

Total area of housing, average per urban inhabitant

Industrial production index
Productivity index by type of activity: manufacturing

Commissioning of capacities, total
Commissioning of capacities, per capita

Identified factors of the Chuvash Republic economy clustering are as follows: commissioning of capacities; manufacturing industry production index; working age population; life expectancy at birth; female population.

4. Design

While building an IDF0 model of RESS of the Chuvash Republic it is important to take into account the normalized importance of economic indexes accession rates and the significant clusters (Fig. 2).

Input parameter of the Chuvash Republic RESS is population size (A1) that is adequate to the RESS objective and is complete and consistent. Output parameter (A18) – natural growth, decline in population that corresponds to input parameter and is adequate for the processes (A3, A4, A6, A12, A16, A17) and includes requirements to their monitoring (A2, A5, A7, A8-A11, A13-A15). RESS of the Chuvash Republic should be provided with the financial (A7) and infrastructural (A2, A5, A15). To synchronize processes of the Chuvash Republic RESS it is required to determine the order of internal and external information exchange.

Resulting indexes of the Chuvash Republic RESS stability shall be the corresponding data and information obtained during monitoring and assessment including information on the status of actions, changes in external and internal factors, results of activity and the system efficiency including tendencies, inconsistencies and efficiency of corrective actions.

Input parameter of the Chuvash Republic RESS IDF0 model – the population size (A1) that is adequate to the RESS objective and is complete and consistent. Output parameter (A18) – natural growth, decline in population that corresponds to input parameter and is adequate for the processes (A3, A4, A6, A12, A16, A17) and includes requirements to their monitoring (A2, A5, A7, A8-A11, A13-A15).

To improve stability of the Chuvash Republic RESS all the processes should be synchronized in the optimal mode. For this purpose there should be taken actions for verification including those to ensure consistency of output data with input parameters, and actions for validation in order to ensure meeting the requirements to RESS stability.

For correction of the Chuvash Republic RESS IDF0 model it is allowed to change significant relations with processes and stages of RESS designing (ISO 10006:2017 Quality management systems –
Guidelines for quality management in projects (IDT) and ISO 9001:2015 Quality management systems – Requirements (IDT) (GOST R ISO 9001~2015: Quality management systems) (Table 3).

Table 3. Table captions should be placed above the tables.

| Parameters          | IDF0 model          | Designing processes and stages |
|---------------------|---------------------|--------------------------------|
| Input               | A1                  | 1                              |
| Changes of processes| A3, A4, A6 - A8, A10, A13, A13 | 8, 9, 11, 13 - 21              |
| Changes of stages   | A2, A5, A9, A11, A14, A15 - A17 | 2 - 7, 10, 12                 |
| Output              | A18                 | 19                             |

Correction of the Chuvash Republic RESS IDF0 model with designing processes and stages would allow to support RESS stability.

5. Conclusion
High degree of economy external dependence and low social and economic indexes of Russia in relation to extreme critical values indicate unsatisfactory state of its economic security. To solve this problem it is required to build an economic security system at the level of regions of Russia.

The offered process of RESS designing based on complex analysis of economic indexes accession rates and IDF0 model allows to identify problems, capacity for their elimination and measures for their correction.

6. References
[1] Glazyev S 2015 Yu On external and internal threats to Russia's economic security in the conditions of American aggression *Management and business administration* 1 4–20
[2] Glazyev S Yr 2015 Creation of a system for ensuring economic security and managing the development of Russia *Management and business administration* 4 12–26
[3] Zhang Z, Song T, Song J 2014 Analysis of Relationship between Quality Management System and Design Assurance System *Procedia Engineering* vol 80 565–572 https://doi.org/10.1016/j.proeng.2014.09.112
[4] Grudzień Ł, Hamrol A 2016 Information quality in design process documentation of quality management systems *International Journal of Information Management* vol 36 4 599-606 https://doi.org/10.1016/j.ijinfomgt.2016.03.011
[5] Gorbunova P G,Perfilova E F, Babaeva A A 2019 Methodical problems of classification of regions on the level of social and economic development *ADVANCES IN ECONOMICS, BUSINESS AND MANAGEMENT RESEARCH (AEBMR) International Scientific Conference "Far East Con" (ISCFEC 2018)* 1098-1100 https://doi.org/10.2991/ispcfec-18.2019.251
[6] 2018 Regions of Russia Socio-economic indicators Statistical collection Rosstat 1162