

The Role of Knowledge Management in Developing the State's Financial Policy in Light of Economic Fluctuations

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Abstract: A systematic approach to the issue of public financial policy development requires consideration of the role of knowledge management in this process. The purpose of this article is a system analysis of tasks, methods (models), knowledge management technologies to ensure financial flows, organizational resources. Classical methods of system analysis are used, as well as non-classical methods - cognitive schemes, end-to-end analytics, taking into account Big Data, Data Mining, etc. The main tasks investigated in the article include a causal analysis of the role of knowledge management in a crisis economy and the imbalance of the state's financial policy to reduce structural risks, such as unemployment. The new results of the study are a system-methodological analysis focused on the crisis economy: 1) state financial policy in conjunction with knowledge management methods and technologies in economic crises; 2) key factors in the evolution of personnel and intellectual capital in the anti-crisis economy; 3) capabilities and models for knowledge and financial management, in particular cognitive schemes. Also considered are for support 1)–3) evolutionary demonstration mathematical models that are suitable for practical application and training.

Keywords: knowledge management, state financial policy, economy, crisis, system analysis.

Introduction

The basis of the systemic evolutionary process of society, economy and market is sustainable and managed financial policy. It adapts to internal and external environmental factors, risks. The financial policy of the developing state in crisis conditions is based on the study of the sources of risks and the forms of their implementation.

Fluctuations, crises are provoked by external reasons (for example, super-profits, financial bubbles, as in 2008), internal reasons (for example, a continuous increase in rates and a decrease in the availability of credit resources, as in 2014) or mixed causes (for example, a pandemic, a decline in production and inflation, as in 2020). Figure 1 shows the dynamics of the share of unprofitable organizations in the Russian Federation. At the same time, the share of unprofitable production is maximum in manufacturing, and anti-crisis measures finance the state budget.

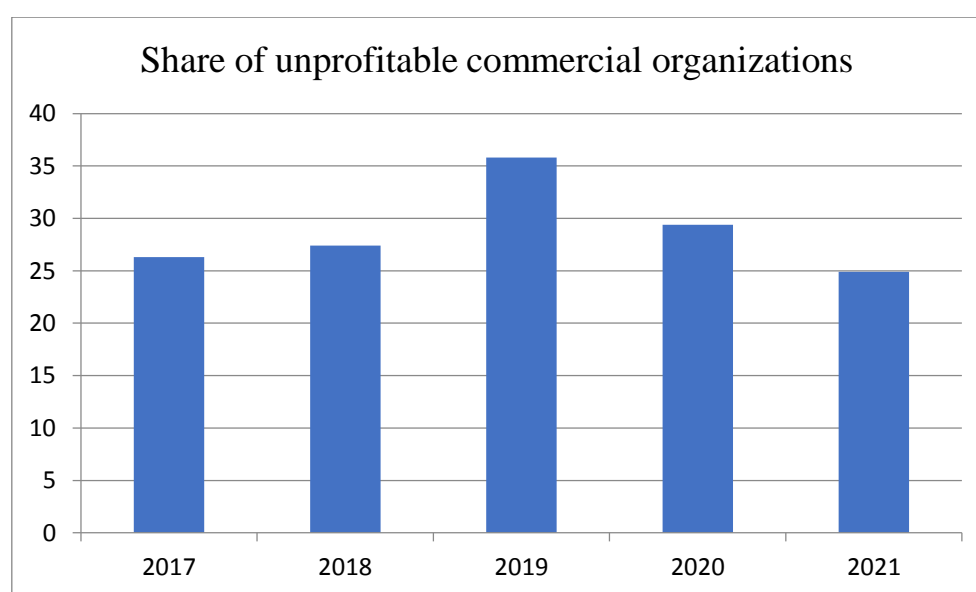


Fig. 1. Share of unprofitable commercial organizations in Russia (compiled by the author according to Rosetta)

The key causal dependencies of the crisis economy are, for example:

- 1) "reduction of budget expenditures - reduction of the money supply";
- 2) "decrease in demand - decrease in production";
- 3) "decrease in income - decrease in demand";
- 4) "oil and gas revenues - to stabilizer funds";
- 5) "the budget deficit is offset by internal (often external) borrowing";
- 6) "an increase in the debt budget burden - an increase in debt service costs";
- 7) "with the help of a fiscal mechanism, excess money is withdrawn from the economy";
- 8) "financial flows are managed by both organizational resources and information and logical, intellectual, knowledge", etc.

In this work, we are mainly interested in the last aspect, the last key connection.

Literature review

Knowledge management allows you to intensify the competitive advantages of financial policy and the evolution of the state. Abroad, scientific research on knowledge management was first launched by Wiig [1, p. 23]. Further significant studies were conducted by L. Prusak and T. Davenport, I. Nonaka and H. Takeuchi, D. Stapleton, Ch. Despres and D. Chauvel, T. Stewart и др.

In Russia, this problem is also relevant, for example, we note the research of B.Z. Milner. Research in Russia is carried out in several areas (aspects): production (neoclassical), transaction (resource costs), evolutionary (financial and innovative), etc. Given the uncertainties, fuzziness and asymmetry of information and the increasing role of the knowledge economy.

Financial regulators of economic relations influence public policy as a whole [2, p.117]. There is a redistribution of finance, the knowledge of society is activated, its intellectual capital for the transition from a speculative financial model dependent on external investments to a stable balance sheet model of demand.

Financial policy strongly affects the global evolutionary potential of the country and the achievement of a sustainable balance of the material interests of society and each member [3, p.8]. The impact of the financial crisis in the world on the standard of living [4, p.163] and their consequences [5, p.123] on the expanded reproduction of intellectual competencies is being investigated.

For the effectiveness of public financial policy, not only relevant knowledge management policies are needed, but also promising approaches that support them. Unfortunately, this is confirmed by only 24% of enterprise managers [6, p.125].

Supporters of the importance of the knowledge management system and intellectual capital of companies consider the availability of financial and innovative resources to be the main condition [7, p.156]. The degree of application of innovative technologies by companies does not correspond to the level sufficient for development in a crisis economy. There is not enough scientific and methodological support for strategic, innovative development managed by knowledge. It's necessary to systematize approaches, including taking into account structural changes [8, p.60] and the principles of mass formation of the bureaucratic apparatus [9, p.58].

Based on knowledge management, it's possible to reduce the imbalance in the financial policy of the state [10, p.760]. In particular, it's possible to reduce structural risks (unemployment, the cycle of professions in the labor and education markets, robotization and others). The possibilities of knowledge economics standards for the evolution of quality management are also being investigated [11, p.93].

Methodology

The development of the paradigm of intellectual evolutionary economics - the determinants of cognitive competencies (meta-competencies - "competencies about competencies") is based on increasing the role of knowledge management in economics.

We highlight the methodological problems of public financial policy that are most closely dependent on knowledge management in economic crises:

1) adaptive coordination of budgets of three levels – state, extra-budgetary funds and regional (municipal);

- 2) optimization of the management and load of the tax system;
- 3) optimization of the state structure and spending mechanism;
- 4) transition to a transparent, with a budget "digital profile";
- 5) improvement of investment financing;
- 6) the unity of monetary, financial and educational policies;
- 7) effective application of intellectual capital, advantages of knowledge economics in planning, budget execution, decision-making, etc.

The priority of solving these problems changes with the development of the financial ecosystem, financial competencies. The article uses methods of systemic analysis-synthesis (composition-decomposition, regulation, etc.), heuristic approaches, modeling and forecasting.

Results

Knowledge is the systemic intellectual asset of the state in anti-crisis financing. Knowledge is updated by patents, know-how, employee competencies, customer databases, data, processes, stakeholders, etc. Cognitive competencies are reproducible. Their intellectual quality is determined by the ability to reproduce creative, constructive competencies for the development of the individual, state, society.

Knowledge economics should form professionals, the conditions for their development and work. Knowledge is a source of sustainable competitive advantage. Knowledge turnover can lead to innovation turnover, access to knowledge can generate ideas and solutions.

Knowledge differs in the depth of analysis and pragmatism, complexity and connectivity, manufacturability, "carrier" (human, automaton) and medium of exchange. Management relations, information exchanges, educational processes of the class "now, here, for what" are based on knowledge, intellectual capital. The "spiral of knowledge" expands competencies, gives knowledge the best consumer qualities, and expands the target audience.

Knowledge management aims to add significant value to intellectual capital, the information system, and back links. This will allow you to apply the best experience, change the range of products, master new market niches, improve jobs and social conditions.

Not only traditional management structures (board of directors, managers, committees, etc.) are developing, but also structures using neuro-networks, multi-agent systems, etc. All these opportunities are taken into account when forming and supporting anti-crisis financial policy of all levels.

Knowledge management ensures continuous system connections of goals and processes of education, self-education, team (project) activities, critical analysis, search and formation of new ideas and solutions [12, p. 55]. The goal is to analyze the impact of knowledge management on system, digital transformations. The result of our research in this part of the work is a SMART analysis of the factors that most affect the evolution of personnel in the digital economy and anti-crisis policy.

The following structure of key evolutionary factors is proposed (Figure 2).

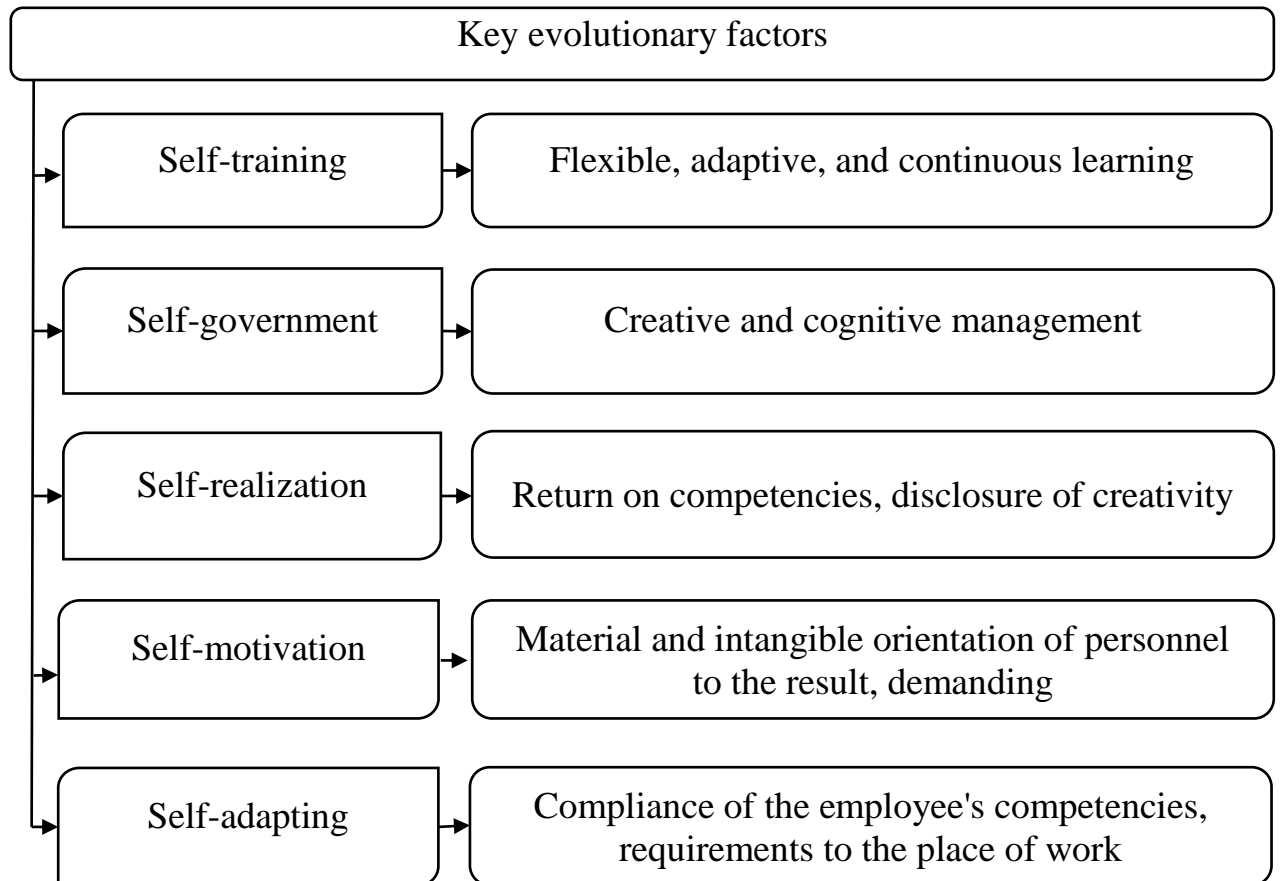


Fig. 2. The main factors of personnel evolution in the anti-crisis economy

Workers should prepare for potential challenges of financial policies and digital transformations. The personnel potential of Russia (according to the passport "Personnel for the digital economy") does not yet allow this to be done in full, massively, for example, Figure 3 (2023 data - forecast). A systematic approach to state and corporate financing of the development of digital competencies of employees is needed.

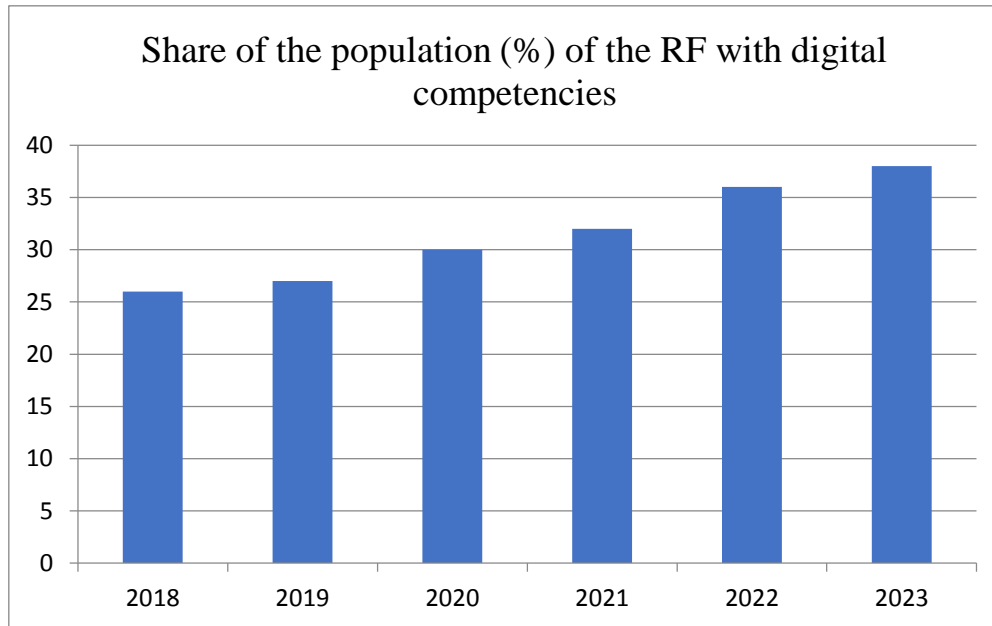


Рис. 3. Share of the population of the Russia with digital competencies (% , author's histogram according to [12, p.60])

The pandemic and the global economic crisis have reduced global output at an almost constant rate of decline. For example, in Russia it was necessary to introduce a "moratorium on bankruptcy" so that enterprises could relatively successfully overcome the crisis.

System analysis allows you to highlight trends:

- 1) the evolution of financial policy in the context of economic fluctuations, for example, in Russia this concerns the category of "financial independence";
- 2) modular, adaptive improvement of business models, for example, based on knowledge management, strengthening information-logical and digital support for transformation (new conditions, relationships, services, models, etc.);
- 3) situational, preventive testing and prediction of the sustainability and survival of the company, enterprise, cluster, for example, using indicator analysis, stakeholder involvement in management, Real Time Data Mining, etc.;
- 4) strengthening the capitalization of intellectual capital, which affects not only profits, but also financing in a crisis, dynamic risks.

Knowledge of trends is the success of diagnosing the state, "growth points", optimizing personnel "for an anti-crisis strategy", increasing competencies and retraining workers.

We highlight the forms of increasing intellectual capital and the manageability of knowledge demanded by the state and business:

- 1) mobile and blogs (for example, gaming, API);
- 2) outsourcing, consulting, coaching (for example, comprehensive);
- 3) content management (for example, copywriting, SEO);
- 4) Customer Service Representative (for example, accounting for consumer value, loyalty, risks);
- 5) increasing the diversity of data and its sources (for example, Big Data [13, p. 883], Data Mining, Elastic Data);

6) application of end-to-end analytics (for example, predictive, ontologies);

7) infrastructure development (for example, clouds, fogs, blockchain, CRM, SCRUM, GR).

The employer, like the state, needs a competent professional who understands strategy, competitive opportunities and is motivated to do so, needs process manageability and financial success.

Under the conditions of Industry 4.0 and Society 5.0, it's important to systematically and rationally build a strategic plan (map) of intellectual knowledge management for the practical implementation of the knowledge management strategy [14, p. 2235], [15, p. 915]. Intelligent management technologies help you make an intelligent decision. For example, based on the knowledge base of the production type, the procedure for outputting solutions and the intelligent interface.

Uncertainties can complicate management and require careful analysis-synthesis. Key uncertainties are parametric (by model parameters), functional (by functional links) and structural (by interactions with the environment). We believe that implementing the tasks of the state financial policy in the context of economic fluctuations, it's necessary to situationally analyze the situation, identify its profile, and build a sequence of relevant control actions.

Cognitive maps or charts (graphs) of cognitive type are used as an effective analysis tool [16, p. 8]. They map the associations of key factors (or their clusters) and expected, simulated outcomes. Typically, links to the external environment are dynamically reordered.

The key factor is the set of concepts that characterizes (according to the researcher) the system and environment. Relationships of the type: "to be the cause", "to follow", "to activate", "to depend", etc. In particular, the cognitive map of knowledge management can display the situation in the system of concepts "Company", "Management", "Business Process", "Profit" and relationships "Influence", "Participate", "Manage", etc.

Cognitive map is usually depicted as an oriented graph with weights. The arrow from concept A to concept B is marked "+" if the influence of A on B is enhanced or it's desirable to increase this factor. The arrow with sign "-" corresponds to the weakening of the influence of this factor. The force of influence is the weight of the arc of the graph.

The investigated model of interactions in such a system can be a dynamic model of the form:

$$\begin{cases} a_1x'(t) + x(t) = b_{12}y(t) + b_{13}z(t) + c_1u_1, \\ a_2y'(t) + y(t) = b_{21}x(t) + b_{23}z(t) + c_2u_2, \\ a_3z'(t) + z(t) = b_{31}x(t) + b_{32}y(t) + c_3u_3, \end{cases}$$

where $x(t), y(t), z(t)$ – temporary states of the concepts "Company Profit", "State Financing", "Intellectual Capital", u_i ($i = 1, 2, 3$) – target control actions, b_{ij}, c_i ($j = 1, 2, 3$) – weight of cognitive connections or activities of concepts.

Cognitive maps (models) are effective in investigating poorly formalized problems or working out the modeling hypothesis. They allow you to take into account the dynamic connectivity of factors, their reordering, heuristics and psychological aspects. Without this, it's impossible to build a strategic management policy [17, p. 405], a security policy in many of its aspects [18, p.148], [19, p.480].

Within Risk Management Standards, we will highlight the following systemic knowledge

management problems in economic crises:

- 1) identification and investigation of potentially unacceptable risks;
- 2) analysis and evaluation (modeling and forecasting) of scenarios of state and business financing;
- 3) planning and making decisions on adaptive management and elimination of vulnerabilities taking into account "white noise" uncertainties.

It's important to assess the level of knowledge, competencies. To do this, we offer an asymptotic logistic model of competencies:

$$z(t) = \frac{A}{B + C e^{-\alpha t}},$$

where t – время, A, B, C, α – parameters identified at the interval under consideration, for example, under the initial condition $A = z(0)$.

Taking into account the "moral" wear and tear of competencies:

$$z(t) = a + (b - a)e^{-\beta t},$$

where parameters a – level (share) of preserved competencies, b – maximum level, k – wear rate.

The "capacity" of financial sources changes cyclically. In conditions of economic fluctuations, instability and uncertainty, fluctuations in financing $y(t)$ and adaptation to the situation are possible.

The process can develop, according to the stochastic model:

$$\dot{y}(t) = p(t)(y(t) - cy(t)) + u(t),$$

where $u(t)$ is the increase in funding (fund), $c(t)$ is the intensity of their decline under the influence of lack of knowledge, and the rate function is determined, respectively, by the dependence $p(t) = \ln(1 + r(t))$.

Under the conditions of the hypothesis of short-term controllability (modeling for a close period), $u(t)$ can be considered evenly distributed over a segment $[u_{min}; u_{max}]$. Assuming $c = 0$ (neglecting loss due to lack of knowledge), one can solve the equation:

$$y(t) = \int_{t_0}^t e^{p(t-s)} u(s) ds.$$

One can consider the option where $u(t)$ is distributed normally, then the mathematical expectation is independent of time. Dynamic dependence on the source of funding can be predicted, set with the help of experts.

Discussion

Russian companies have an intensive turnover of personnel, structural mobility. In a crisis, this is a more profitable circumstance than investing in staff (Fig. 4, compiled by the author).

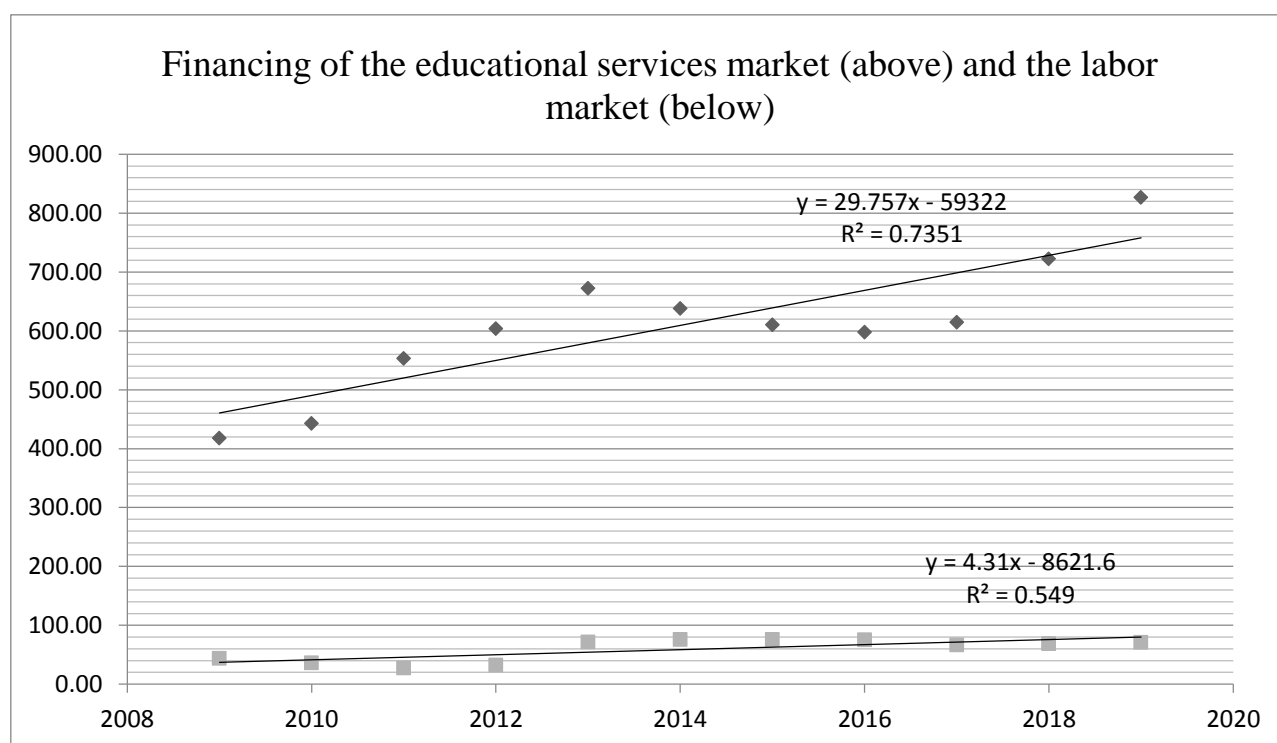


Fig. 4. Financing of educational services and labor markets (billion rubles)

For example, the state needs to constantly develop tools and systems of individual and corporate advanced training. This is reflected in the financial and digital policies of the state.

The knowledge management system in financial risk management is necessary not only to increase adaptation capabilities, but also to justify, verify the dynamics and structure of financial resources, and financial strategy. That is why the tasks of controlled growth of knowledge, personnel competencies, operational monitoring and audit, situational modeling for "returning to the trajectory of financial and economic development" in a crisis situation are put forward to the first positions.

Competencies are the potential to help predict the state and make a targeted decision on time and space. The quality of the forecast itself depends on the parameters of competencies that can be assessed and regulated. Insufficiently relevant tools can reduce the merits of process intellectualization. It's not possible to fully account for a variety of evaluation criteria, so Shannon-Weaver type estimates should be used:

$$H = - \sum_{i=1}^n \frac{p_i}{S} \log \left(\frac{p_i}{S} \right),$$

where p_i – evaluation according to the i -th criterion.

The problem of the relevance of state policy in a crisis is not only a financial or infrastructure problem. "Non-financial" actions related to inventory control, achievement of fair value are also important. It's important to allocate managed and unmanaged parameters for knowledge management, build and test different management models.

Knowledge management is complicated by noise, uncertainty and delays. In the relevant approach, consider their initial distribution, impact. Adaptation to "noise effects" is also needed in

public administration. Response time is especially important, institutional, corporate and even personal barriers are possible here. We need information and logic support for risk management, attracting the capabilities of Data Mining, Data Analytics. This is necessary to move from the quantity of data to the quality of their analysis (information quality).

The digital economy has digital requirements for personnel, competencies of managers and specialists, infrastructure and financial culture. They rely on HR (Human Resource) and Government Relations (GR), which are based on AR (Augmented Reality) and help shape the digital environment of relations with government and business stakeholders.

There was a demand in society for personnel who have higher subject competencies, but also have related competencies, for example, financiers with cryptocurrency knowledge. Demand is also growing for specialists in the field of Data Science, Machine Learning.

Conclusions

The scientific and innovative potential of the state should strengthen the financial and investment system. Therefore, it's important to form an institutional environment to increase state financial regulation and create a competitive economy. It's necessary to stimulate not only the growth of competencies, the intellectual capital of society, but also its active use to form the infrastructure of an evolutionary and self-organizing economy.

It's necessary to focus on the tasks of analyzing the financial relations of the managed economy in the context of growing risk situations and financial constraints, reengineering financial instruments, flexible integration of knowledge management tools and finance.

The analysis will allow considering the tasks of the state's financial and economic policy at various stages and waves of development. Given the multi-criteria of knowledge management and the relevance of the government's funding strategy.

Using systemic and multi-criteria analysis-synthesis, knowledge management, it's possible to improve the state financial policy and its manageability.

In the digital and crisis economy, market interest in knowledge is increasing. The role of companies, the state in the accumulation and capitalization of knowledge is growing, as is the ability to benefit from competencies and knowledge. Our research will allow us to implement effective procedures for managing innovations and intelligent infrastructure.

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