Situational management: review of the results relevant to the development of online services for e-government and e-business

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Abstract. The review describes the results of studies of situational management for economic activity and public administration, relevant to the development of online services for e-government and business. The system of public administration and the economic mechanism are considered as closely related systems of situational management of status rivalry. Situational informatization (informatization of situational management) is studied as a means of stage-by-stage organizational and technological improvement of situational management systems through planned transitions from the starting situations to the target ones. Situations are represented by formalized descriptions of a set of state spaces ("Resource Support", "Production of Real Goods", etc.), which characterize the country's potential. The objects monitoring is carried out on the basis of situation portraits analysis using the objects' digital twins, functioning in a special human-machine environment for solving problems (s-environment). Information technologies based on situational informatization methodology are implemented in the s-environment, which serves as an infrastructure platform for online services (banking, trading, etc.). The results of the first stage of implementation include a set of Resource Planning Online Services (www.res-plan.com) for solving problems of budgeting and resource allocation in accordance with mandatory and orienting rules.

Keywords: situational informatization, portrait of situation, e-business, e-government, state spaces, country's potential, Resource Planning Online Services

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Introduction

In methodology of situational management of large systems [1], the functioning of the object is determined by a decision table, in which the description of the situation serves as an input line, and the output column is the solution. Managing the object model using the decision table is as follows. For the current situation, a solution is selected, with the help of which the object model is transferred to a new state. The process continues until a situation is obtained that satisfies the given conditions. The sequence of solutions, obtained as a result of extrapolation of situations on the model of the object, plays the role of the law of the object functioning at a given time interval. In general case, using the decision table, several laws can be obtained for a given situation. A choice of appropriate law is carried out on the basis of quality assessment for the object functioning. The implementation of the principle of situational management is related to the solution of the problem of partitioning a set of micro-situations into classes according to the number of decisions taken.

In the D. A. Pospelov's monograph [2], knowledge about the object of management is represented by logical-linguistic models. Training and generalization are used to build management procedures for current situations.

In monographs [3, 4], situational informatization is considered as a means of organizational and technological improvement of the object through sequent transitions from the starting situations to the target ones. The situations are represented by formalized descriptions of the predefined set of spaces. The objects monitoring is carried out on the basis of situation portraits analysis. Based on comparative analysis of portraits of the current and target situations, systems of mandatory and orienting rules are developed to find a solution. A key role in assessing portraits of situations, the formation of systems of rules, finding solutions and assessing their effectiveness belongs to the expert.

In our days of intensive development of cloud computing and *online services*[1] for various purposes (navigation, education, etc.) [5-8], the attention of researchers and IT developers is attracted to the idea of integrated service-based automation of various activities. Since the mid-1990s, the importance of successful implementation of this idea (called the "digital economy» [9])[2] has been steadily growing and associated with the competitiveness of corporations and countries[3].

Internet of things (IoT) is changing the environment of economic activity [10]. The development of IoT creates not only new opportunities for increasing the efficiency of economic activity, but also new problems [11]. 3D printing technology has a great potential to change everything from our daily lives to the global economy [12, 13]. Social networks are increasing the influence on the economical behaviour of buyers and manufacturers of goods [14]. The role of information assets is increasing [15].

The G20 community has determined its position on the digital economy in 2016[4]. In 2017, Russia has approved the state program "Digital Economy of the Russian Federation»[5].

«In particular, e-government can be an engine of development for the people. Progress in online service delivery continues in most countries around the world. The United Nations E-Government Survey 2012 finds that many have put in place e-government initiatives and information and communication technologies applications for the people to further enhance public sector efficiencies and streamline governance systems to support sustainable development. Among the e-government leaders, innovative technology solutions have gained special recognition as the means to revitalize lagging economic and social sectors.»[6] For example, the problem of providing electronic services to the population of the capital of Russia has been quite successfully solved.[7] The complex of electronic services implements some ideas that were proposed by D. Holmes.[8]

Development of digital economy is accompanied by aggressive attempts to transform the state and economic mechanisms of different countries into instruments for international economic elites. Among computer technology enthusiasts, an idea is becoming very popular: to create digital cryptocurrencies and payment systems that would be beyond the control of states. These “enthusiasts” and “reformers” are the supporters of globalization and

[1] Trumba Corporation. 2007. Five benefits of Software as a Service. Available at: http://www.trumba.com/connect/knowledgecenter/pdf/Saas_paper_WP-001.pdf (accessed August 25, 2018).

[2] Christensen, C. M. 1997. The innovator`s dilemma: when new technologies cause great firms to fail. Boston: Harvard Business School Press. Available at: http://www.hbs.edu/faculty/Pages/item.aspx?num=46 (accessed August 25, 2018).

[3] Oxford Economics. 2015. The new digital economy: how it will transform business. Available at: http://www.pwc.com/mt/en/publications/assets/the-new-digital-economy.pdf (accessed August 25, 2018).

[4] G20 Summit. 2016. G20 digital economy development and cooperation initiative. Available at: http://en.kremlin.ru/supplement/5111 (accessed August 25, 2018).

[5] Pravitel'stvo Rossiyskoy Federatsii. 2017. Programma «Tsifrovaya Ekonomika Rossiyskoy Federatsii» [The program «Digital Economy of the Russian Federation»]. Available at: http://d-russia.ru/wp-content/uploads/2017/07/programma-tsifrov-econ.pdf (accessed August 25, 2018).

[6] Department of Economic and Social Affairs of United Nations. 2018. E-Government Survey 2012: E-Government for the People. Available at: http://ifap.ru/library/book515.pdf (accessed August 25, 2018).

[7] Ofitsial'niy sayt mera Moskvy [Official site of the Mayor of Moscow]. 2018. O gorodskikh elektronnykh uslugakh [About city electronic services]. Available at: https://www.mos.ru/pgu/ru/about/ (accessed August 25, 2018).

[8] Holmes, D. 2007. e-Gov: e-Bussiness strategies for Government. London: Nocholas Bredley Publishing. 340 p.

economic model of extraterritorial benefits. Especially popular (not only among "the supporters") are stories about wonderful crypto-currencies and growing number of "mining farms" for the "digital gold" seekers. Here is the quote from such a story: "The notion of a new currency, maintained by the computers of users around the world, has been the butt of many jokes, but that has not stopped it from growing into a technology worth billions of dollars, supported by the hordes of followers who have come to view it as the most important new idea since the creation of the Internet. Believers from Beijing to Buenos Aires see the potential for a financial system free from banks and governments. More than just a tech industry fad, Bitcoin has threatened to decentralize some of society's most basic institutions"[9].

Exchange of national currencies for the current crypto-currencies and use of the latter as a means of payment are the actions aimed at degrading the systems of commodity-money circulation established by law. On the wave of "digitizating the economy", such actions are not immediately recognized as criminal even by responsible state officials.

In the authors' approach, situations are described by a formal specification of economic, educational and other spaces of conditions which define the country's potential [16, 17]. The infrastructural basis of situational informatization ((hereinafter "informatization" for brevity) is *the human-machine environment for problem solving* (*s-environment*) [18], which includes computer and robotic devices and networks, online services (including resource planning services [19, 20]) and other software. At each stage of improvement, a set of mutually connected informatization projects is carried out for public administration, economic, scientific, educational and other activities.

Country's potential [3, 17], informatization of the economic mechanism, commodity-money circulation technology in *the normalized economic mechanism* (NEM) [21], and other entities are investigated in the framework of scientific project devoted to creation of the NEM informatization methodology and implementation of the resource planning online services. The project is carried out at the Federal Research Center «Computer Science and Control» of the Russian Academy of Sciences as a part of the project «Fundamental Scientific Research in accordance with the Program of Fundamental Scientific Research in the State Academies of Sciences for 2013-2020».

The concept of situational informatization of economic mechanism and public administration is considered as contribution to the methodological support of the «Digital Economy of the Russian Federation» program implementation. This concept is a generalization of the methodology of situational informatization of public administration in Russia, created in [3].

1. Informatization of public administration

The country's population activities are realized in the processes of status rivalry between individuals and between legal entities. The purpose of public administration is to protect the country's potential and its development by means of the legal regulation of the status rivalry processes[10]. Changes in the country's potential allow assessing a state of the object of public administration. The priority list of indicators of the country's potential and their interpretation (including ways of assessing and stimulation of changes) form the basis for planning management of the population activities.

1.1. Country's potential

The country's potential is determined by characteristics of the population, the natural habitat and the systems of life organization and life-support [3, 17].

Characteristics of the population (the symbol Δ means poor controllability or unmanageability through the public administration; the symbol ○ means potential manageability):

Δ number, gender and age structure, fertility and mortality, the population density;

Δ level of health;

Δ level of culture that characterizes the population

[9] Popper, N. 2015. Digital gold: the untold story of bitcoin. Allen Lane. 416 p.

[10] Ilyin V. D. 2013. What should be the main objectives of state regulation of economic activity in countries with developed market economies? ResearchGate. Available at: https://www.researchgate.net/post/What_should_be_the_main_objectives_of_state_regulation_of_economic_activity_in_countries_with_developed_market_economies (accessed 25 August, 2018).

attitude to the gene pools of the family, the nation and the biosphere; attitude to work, education, creation (in particular, to art), to traditions which strengthen the family and the nation;
Δ level of inventiveness (determined by the number and significance of discoveries, inventions, rationalizations, the number and level of the tools and technologies that are being created and used);
○ professional and qualification structures of the able-bodied part of the population.
Characteristics of the habitat:
Δ size and geographical location of the country; flora and fauna (their suitability for agriculture and fishery); relief, climat, susceptibility to natural disasters;
○ stocks of drinking and technical water;
○ size and fertility of agricultural lands;
Δ minerals (especially sources of raw materials for production of energy and necessary products);
Δ rivers, lakes and seas (their suitability for fishery and navigation).
Systems of life organization and life-support, including the public administration system and the economic mechanism of the country, are characterized by:
○ level of satisfaction of demand for water, energy, food, housing, clothing; education and health care, social security;
○ level of satisfaction of demand for industrial raw materials;
○ level of adequacy of the economic mechanism;
○ level of environmental protection;
○ level of information support [determined by the prevalence and perfection of electronic services available to the population in educational, scientific, industrial and other processes related to the construction and application models of concept systems and knowledge systems];
○ level of communication facilities (including transport);
○ level of protection of the population and the environment from epidemics, natural disasters and man-made disasters;
○ size of the created national wealth:

- the quantity and quality of energy, water and food supply systems;
- agricultural fund of seeds;
- reserve of precious minerals and metals;
- national (represented in the state language) arsenal of knowledge systems;
- the quantity and quality of housing;
- the quantity and quality of agricultural, industrial, educational, scientific, health, defense and cultural facilities;
- renewable stocks of necessary means of life-support;

○ level of legislation, determined by the composition and quality of laws (quality of the law is determined by degree of compliance with a part of status rivalry processes regulated by this law);
○ level of law enforcement;
○ level of defense capability;
○ level of national security (readiness to detect and suppress encroachments on the freedoms and rights of citizens, the potential and state institutions of the country).

A number of the country's potential components have a difficultly predictable change in time. This primarily applies to the characteristics of the population and the habitat. The reasons for the difficult predictability are substantial nonstationarity, weak observability, difficultly estimated inertia.

The country's potential is changing mainly as a result of the economic population activities. Key component of the country's potential is the able-bodied population. Well-being and security of the country depend on the population inventiveness, diligence, willingness to defend the country, on the population attitude towards the family and the state (including its resources). For an efficient state control directing the population activities to the development of the country's potential, it is necessary to have operational information about changes in the controlled components of the potential. Inconsistency between the population activities and the tasks of protecting and developing the country's potential leads to one of two outcomes:

- some changes are planned and implemented in the systems of organization and management of population activities and in the rules of participants behaviour (citizens, corporations, state agencies);
- no changes are made, and the country's potential is steadily degrades.

The second outcome makes the final (in historical perspective) disappearance of such state system highly probable.

1.2. About the methodology of situational informatization of the population activities

Proposals for the improvement of online services of public administration, economic mechanism and other systems of population activities, their reasoning and ways of implementation are reflected in the methodology of situational informatization of the population activities, which includes:

- complex of the object improvement tasks (representing the goal of the methodology);
- the concept systems for targeting, implementation and formalization;
- formulations and methods for solving problems that determine the relationship between the concepts.

Model of the concept system is represented by the pair {*mem*, *rel* (*mem*)}, where *mem* is the set of concepts, and *rel* (*mem*) is the family of relations defined on *mem*.

Definition of the concept system is given in the form of its model description, accompanied by an indication of the application area.

Application area of the model is defined by description of

- correspondent type (for whom the model is intended);
- classes of problems, in the study of which the model can be useful;
- the stage of research, on which the use of the model is appropriate.

Representation of relations between concepts in the form of solvable problems is the necessary condition for constructing quantitative models of the concept systems in the methodology.

For example, for robotic crop farming, robots need to autonomously navigate their environment and perform actions at set locations (planting a seed, spraying a pesticide, etc.). In the case of outdoor farming, the robots work by receiving a plan with a set of locations to visit on the field. When the robot trajectories are known, the robot can use GPS or GLONASS positioning and a closed-loop control to make sure it remains on track. When the task is to follow an unknown trajectory vision is used to allow the robot to find its way. Robots are wirelessly connected to a central operator to both receive updated instructions regarding the mission, and report status and data[11]. The set *mem* of the concept system "robotic crop farming" include the concepts “planting a seed”, “watering”, “trajectory”, etc. The family of relations *rel* (*mem*) is represented by the problems of optimal seed allocation, optimal watering, etc.

The main tasks are formation of the situation portraits (on the basis of monitoring the State spaces), analysis of the situations, design of the resource-based controlling impacts, decision-making and control over decisions execution. The controlling impacts are designed so that it is possible to move from the starting situation to a given neighborhood of the target situation under the resource constraints.

State authorities – organizational and technical complexes designed to form and protect the *legal space*; to regulate a part of the competitive population activities (*status rivalry* [3, 16]) established by law; to plan protection and development of the country's potential and organize the implementation of the developed plans; to plan and implement interaction with other countries, aimed at increasing the competitiveness of the own country. At each stage the goal of state regulation of the population activities is represented by the complex of tasks for planning the development of the country's potential (represented by the specifications of its starting and target states).

Regulation is carried out on the basis that for successful protection and development of the country's potential it is necessary that

- the educational institutions of the country prepare the required number of specialists, primarily for the production of vital goods (food, electricity, clothing, housing; educational, health, medical and other services) and protection of the country's potential
- educational and economic systems are in time adapted to the needs of the vital goods production and ensuring the protection of the country's potential.

Model of the public administration object is a formalized representation of the of status rivalry processes that affect the country's potential and are regulated by legal means.

[11] SPARC. 2016. Farming with robots. Available at: http://robohub.org/farming-with-robots/ (accessed August 25, 2018).

The public administration system, as an object of situational informatization, is a stochastic nonstationary organizational and technical complex characterized by:

- complex human-machine environment for special purpose, where the rules for the application of a significant part of electronic services are strictly regulated;
- significant interdependence of authorities and the object of management [the object has (at least) information impact on the authorities, influencing their behavior]
- weak identifiability.

State situation is a fragment of the states (conditions) of public administration system, represented by a temporal series of portraits of this situation, intended for analysis of the situation and design of controlling impacts. *Target situation* is the situation that is planned to be created as a result of the controlling impact. *Starting situation* is the situation, in relation to which the impact is being designed. *Achieved situation* is the situation that has actually arisen as a result of the controlling impact.

Portrait of the situation is a formal description of spaces of the controlled object conditions. It contains data characterizing the essential parameters of the object condition, available variants of the controlling impacts and description of the resources needed to implement these variants. Portrait of the situation is formed in accordance with a special system of rules. The input of this system is data on the spaces of conditions, data on available types of controlling impacts and available resources needed to implement the impacts. The output is data on the type of situation, prototypes of the controlling impacts and resource assessment for each type of impacts.

The public administration system, as an object of situational informatization, is represented by the model named *the aggregate of the State spaces*. The State spaces are a the experts-defined set of representations (from different aspects) of the object condition.

A State space is defined by:

- the name (for example, "*Trade space*");
- the types of violations with criticality estimations;
- the permissible controlling impacts;
- the resources needed to implement the impacts (*the providing resources*);
- the *systems of mandatory and orienting rules* [19-22], establishing a correspondence between the violations and the controlling impacts, between the controlling impacts and the providing resources;
- the rules of forming the providing resources.

The processes of development and execution of controlling impacts (hereinafter "impacts" for brevity) are represented by complexes of target and auxiliary tasks. The target tasks are those of constructing and analyzing the portraits of situations, design of resource-based impacts, planning the implementation of impacts and controlling their execution. Interaction with message sources, documenting messages, processing and archiving documents – these and similar tasks are auxiliary.

The state impact project is a documented plan for achieving the target state situation. The object is monitored by *digital twins*[12] of special *s-environment*[13] on the basis of portraits of the achieved situations.

Achieving the target situation is a step-by-step process that ends when portraits of the achieved and target situations are recognized as close enough. A comparative analysis of the differences between portraits of the target situation and the starting one gives the data for planning the process of achieving the target situation. The result of planning should be presented in the form of resource-based project of transition from the starting situation to the target one.

State impacts are implemented using the information, economic, administrative, judicial, enforcement means. The choice of means of impacts is carried out by experts using databases on types of available means and prototypes of impacts. The required set of resources depends on the chosen composition of means.

Informatization of development of the state impact projects requires methodological support for the development and application of the database of state impact prototypes; the database of

[12] General Electric. 2018. The Digital Twin. Available at: https://www.ge.com/digital/sites/default/files/The-Digital-Twin_Compressing-Time-to-Value-for-Digital-Industrial-Companies.pdf (accessed August 25, 2018).

[13] Ilyin, V. D. 2018. Simvol'noe modelirovanie [Symbolic modelling] // Bol'shaya rossiyskaya entsiklopediya – Great Russian Encyclopedia. Available at: http://dev.bigenc.ru/technology_and_technique/text/4010980 (accessed August 25, 2018).

resource support prototypes; the database of State spaces specifications; the technology of interaction with message sources; the processes of formation and analysis of portraits of the state situations, resource-based projects of state impacts; interaction with the decision makers.

2. Informatization of economic mechanism

Informatization of economic mechanism is inseparably linked with informatization of public administration and other types of the population activities. It is considered as a means of a gradual transition from the current economic mechanism to the normalized one.

NEM is the market economic mechanism, the complexes of which operate on the basis of electronic services [21]. The structure and rules of the NEM functioning stimulate citizens to conduct economic activities aimed at protecting and enhancing the economic potential of their country. This should be implemented by means of taxes, duties and other economic instruments (see the Fig. 1).

The system of property status (*PS-system*) is the system of e-documentary representation of monetary and non-monetary components that reflect property status of economic agents. Monetary components are represented in NEM-money amounts that are in the currency sections of unique unified multicurrency accounts of economic agents (EA-accounts). Non-monetary components of PS-system are represented by hyperlinks to e-documents proving ownership of land, houses, etc.

EA-account is a unified e-document consisting of currency sections (which are activated by the central bank), each of which has the following basic items: «I own», «Designated payments», «Lending», «Investment», «Taxes and duties», «Gifting», «Donation». The set of permissible operations for amounts recorded to EA-account is determined by subsections to which they belong (e.g. an amount from the "Received" subsection of a section "Investment" can be used only to pay for goods whose types are listed in investment contracts). As far as an EA-account has a multicurrency structure, it can be applied to record the results of internal and overseas economic activities. The application of EA-accounts assumes that every economic agent has his own globally unique identifier.

Management of normalized economic activities	Resource support
	Production of real goods
	Trade
	Stockpiling of vital goods
	Investment
	State budget, reserves, taxes, duties
	Regional budgets and taxes
	Vocational education and population development
	Development of systems for life support and organization
	Restoration and development of habitat
	Social security funds
	Documenting the commodity-money circulation and the property statuses: carried out by the banking system

Fig. 1. The main complexes of NEM

No change in the EA-account sections can be made without a documented encrypted confirmation of its owner (and in non-ordinary situations - without documented ciphered confirmation of the state authority determined by law). The change in the state of EA-account can be realized only after obtaining the state confirmation of admissibility of the operation on the account. The confirmation is given by the special online service of the central bank. The basis for obtaining a confirmation is the data of the transaction (purchase or sale transaction, contractual investment, etc.). In this way, the possibility of violating the rules of commodity-money circulation established by law (unacceptable economic transactions, failure to pay statutory fees, etc.) is excluded. In the technology of *designated payments*, which is to be implemented in the s-environment of digital twins, the rules of order execution and payment are rigidly linked. Each payment is certified by the special service of the bank-regulator. A state of the payment system and the paid orders is continuously modelled by their digital twins.

The e-banking system of NEM includes *personal electronic banks* (*PEB*s), *corporate electronic banks* (*CEB*s), *banks-providers* and *central bank*.

Central bank is a state institution that manages the banking system. It performs the following functions by means of e-services:

- grants and revokes licenses to carry out banking activity;
- activates and deactivates the currency parts of EA-accounts;
- controls implementation of banking activity rules;
- analyses the financial component of the NEM-system's activity and presents the results of analysis in order set by law;
- develops, modifies and approves tested unified forms of banking documents (including EA-accounts);
- controls the efficiency of monetary state reserve funds and social protection funds allocation, etc.

The central bank possesses a network of servers located on the territory of a country under whose jurisdiction the NEM-system functions.

Bank-provider is a commercial institution established by legal entity (or by associations of legal entities and individuals) which deals with real goods production, trade or stockpiling. A bank-provider produces and sells unified e-services for:

- processing queries of EA-accounts owners, which are sent by PEBs when the deal is effected (including queries to certify the state of the EA-account, sent upon authorization of its owner);
- storing the encrypted copies of EA-accounts;
- analysis of investment inquiries of clients (prospective investors and investment recipients) (banks-providers can execute orders of investment recipients to consolidate investments in order to accumulate a desired sum);
- registering signed agreements [for permissible transactions] and maintaining the database of such agreements;
- legal support of deals.

*PEB*s and *CEB*s are portable electronic devices (like tablet PC) with advanced smartphone functions. They stores the original EA-accounts and documents on deals. Change of EA-account state can be initiated only by its owner making a transaction.

3. The first phase of implementation

The first phase of implementation includes a set of *Resource Planning Online Services* (www.res-plan.com) for solving problems of budgeting and resource allocation in accordance with *mandatory and orienting rules* [19, 20]. Computational methods take into account the actual incompleteness of information for planning and experience in creating and implementing resource planning technologies. The concept of these services is similar to the SaaS (Software as a Service) concept. The difference is that services do not store data of clients' tasks on servers and offer special client applications for Microsoft Windows®, Apple Mac OS X® and other operating systems instead of Web applications. The first thing is grounded on reasons of security and privacy; the second – on the fact that stability and performance of Web applications are highly dependent on the browsers, in which they work. A client application provides a familiar interface for data input, file operations, etc. Only when client needs computations, user clicks a button, a client application connects to a Service and sends it a request. A Service receives it, makes calculations, instantly sends back the results and closes the connection until the next request. A request contains only numbers which are necessary for computations – without semantic bindings, – that is a service do not transmit through the Internet confidential data such as names of resources, expense items, measure units, etc. Neither requests nor results are stored on servers. All the data are stored on clients' side. The only thing stored on the Service side – is the database containing registration data which is necessary for requests authorization (registration takes place when client first launch a client application)[14].

The technology of situational resource planning is based on the interaction of the expert planner with the online services for forming portraits of situations and resource planning.

A problem is considered as the aggregate {*Formul*, *Rulsys*, *Alg*, *Prog*}, where *Formul* is the problem statement (which includes the concepts ant relations between them); *Rulsys* - a set of systems of

[14] Ilyin A. V. 2018. Resource Planning Online Services. Available at: https://www.res-plan.com/home (accessed August 25, 2018).

mandatory and orienting rules for solving the problem; *Alg* is the union of sets of algorithms, where each set corresponds to one system from *Rulsys*; *Prog* is the union of sets of programs, where each set corresponds to one algorithm.

A description of applicability is given for each element of *Rulsys*, *Alg* and *Prog*. Descriptions of applicability of the *Rulsys* elements include the specification of the problem solver type (stand-alone computer, network computer cooperation, human-computer cooperation, etc.); the requirements for information security, etc. Descriptions of applicability of the *Alg* elements include data on the permissible modes of the problem solver work (automatic local, automatic distributed, interactive local, etc.), requirements for the result obtained, etc. Descriptions of the programs applicability include data on implementation languages, operating systems, etc.

The methodology for online resource allocation in accordance with mandatory and orienting rules significantly extends the traditional arsenal of facilities for solving linear problems of resource allocation. The most important new feature is the ability to perform step-by-step search for the most efficient and realizable solution of the general linear problem of resource allocation [19]. At any step an expert planner can analyze the values of resource functions and customize the system of orienting and mandatory rules, governing the search. If the value of some "objective" function is estimated as most efficient, an expert can set the mandatory rule of fixing the function value.

The advantages of the methodology for variational online budgeting taking into account the priorities of expense items:

- if user specifies the bounds for resource and requests cautiously and follows the plan prepared with the Service, then the probability of going beyond the budget is drastically reduced;
- for each expense item user beforehand sees the bounds for possible costs, and narrows them in the course of the plan implementation;
- if upper bound is less than minimum request for some item, then user can timely attract investments, or exclude the item, or correct other costs;
- if the planning results are too "tight", user can temporarily exclude any expense item from consideration: it can be done by setting a "tick" in the corresponding cell of the table;
- user can simulate any real cost: set minimum request equal to maximum, mark it as obligatory, execute the command 'Allocate', and see the changes of bounds for the rest of expense items;
- user can manually adjust the planning results.

The methodology of the variational interval budgeting in a system with hierarchical structure of expense items, where priorities may be set at any level of hierarchy, and the online service "Cost Planning", which implements this methodology, have no known analogues [20].

Conclusion

1. Portraits of target, starting and achieved situations are represented by the specifications of the spaces of conditions (Resource support, Production of real goods, etc.), which contain data characterizing the essential parameters of the object state, available variants of controlling impacts and the resources necessary to realize the impacts. The impact on the object is projected using its digital twin, which compares the portraits of the starting and target situations [3, 16]. The object improvement is aimed to increasing the country's potential [17].

2. The stage-by-stage situational informatization presupposes interconnected improvement of the online services of economic mechanism, public authorities and other systems of population activities [19-21]. Information technologies, based on the situational informatization methodology, are to be implemented in the human-machine environment for solving problems (s-environment), which serves as an infrastructural base of online services (e-banking, e-trading, etc.) [18]. Characteristics of the components of country's potential are used in forming the indicator of the effectiveness of the population activity [3, 16, 17].

3. The first phase of implementation includes a set of Resource Planning Online Services (www.res-plan.com) for solving problems of budgeting and resource allocation in accordance with mandatory and orienting rules. Computational

methods take into account the actual incompleteness of information for planning and experience in creating and implementing resource planning technologies. The methodology for online resource allocation in accordance with mandatory and orienting rules significantly extends the traditional arsenal of facilities for solving linear problems of resource allocation [19, 20].

4. Situational informatization of economic activity is considered as the means of gradual transition from the operating economic mechanism to a normalized one, which serves as infrastructural basis for the digital economy [21].

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