COGNITIVE ANALYSIS OF SITUATION MANAGEMENT IN THE SPHERE OF TARIFF REGULATION OF REGIONAL WATER SUPPLY AND WATER REMOVAL

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In this article the author considers the usage of cognitive approach in realization of the regional pricing policy in the sphere of water supply and water removal as exemplified by Samara region.

The dissatisfaction with the pricing policy, pursued in the region, on the side of consumers, as well as on the side of municipal body organizations, is caused by the fact that the instruments, used in determining the limit of price (tariff) advance indexes, and, as a consequence, the scheduled rates, remain unclear. As many questions arise on tariff calculation because of its complexity, absence of direct contact between the federal and the regional bodies of regulation, the consumers and the producers of services in the sphere of water supply and water removal. The way out can be found in a long-term pricing policy realization, which will promote the improvement of market relations in the sphere of water supply and water removal (Ws&Wr), stable water supply of the consumers and progressive advance of the sector. The main purposes of pricing policy realization should become the purposes, specified in fig. 1.

simulated event in the technology of cognitive analysis. As a procedural framework in the realization of pricing policy, the principles of situation management are used.

Situation management is management, based on revealing problematic situations and the conversion of the collected data into managerial decisions, providing solution. The task of such management is critical situation response. For managing the pricing policy in the sphere of Ws&Wr of the region, the critical situation is water supply failure to the customers due to the lack of production allowance. This situation can cause extremely negative social and economic consequences.

The essence of situation management in pricing policy in the sphere of Ws&Wr is the following: each type of the given situation on the market of Ws&Wr services should meet its procedure of management (script) with its criteria and methods of decision-making. The method of situation management is applied in
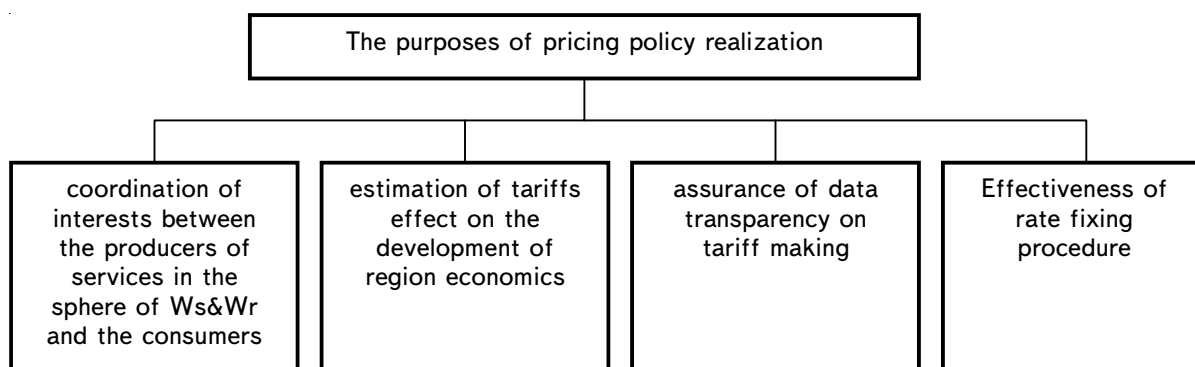

Fig. 1. **The purposes of pricing policy realization**

In such a case cognitive approach is an effective addition to the traditional instruments, when there is a need for active participation of experts in the appropriate subject domain. It is offered to include the methods of structuring, information processing and means of cognitive

such cases, when the complexity of the subject of management and the features of the current task do not allow to construct a mathematical model and to set a traditional problem.

The system of situation management should give the answer to the following questions:

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♦how the tariffs for Ws&Wr services will change the next year, if the rise in prices for resources is forecasted.

♦how this increase in tariffs for Ws&Wr services will effect compensation of shortfall in income to the municipal body organizations and the level of payment collection for public services.

To determine the manner in which the factors interact, the technology of SWOT-analysis is used.

While establishing the connection between the factors of pricing policy, it is necessary to determine the type of connection and its strength (intensity). The determination of the type of connection (positive or negative) depends on the type of external influence on the subject (opportunities and threats). The classification of effects is done with the help of SWOT-analysis on the stage of problematic situation description.

One of the often used methods of SWOT-analysis is the method of the 4-margined table 1.

is found, their type and strength specified, it is suggested to use impulse approach.

Impulse approach is the approach when the peak value *v* changes at the moment when it is *t + 1*, influenced by a lot of factors of cognitive model, under such a condition that in the preceding point of time its value was *v(t)*.

Let us examine how different factors influence the change in prices (tariffs). We may point out the following main factors of tariff advance in Ws&Wr services.

Let us examine the following situation: the external impulse is the increase in energy tariff and MBO services in the sphere of Ws&Wr in the next regulated period should maintain break-even operation of MBO. Break-even operation means economically feasible rate fixing, determined on the basis of production programs and financial requirements of MBO, necessary for production program realization on the regulated types of activity.

Figure 3 illustrates the dynamics of fixed, economically feasible rates in the urban area of Samara region.

Table 1

Matrix of the 4-margined SWOT-analysis

Strong points of Ws&Wr sphere	Opportunities of Ws&Wr sphere
1. Relatively stable demand for services. 2. Legislated responsibility of consumers to pay for consumed services. 3. Qualified personnel.	1. Updating of the main fund by means of introducing extra charge for consumers. 2. Localized-exclusive position of organizations. 3. Consumers' impossibility to substitute one service for another or refuse using services
Weak points of Ws&Wr sphere	Threats of Ws&Wr sphere
1. High levels of fixed costs. 2. High levels of the main funds' wear. 3. Low coverage of consumers with services accounting meters.	1. Reduction of payments collection from consumers (mainly population) amid the financial and economic crisis. 2. Reduction of services' sales. 3. Making decision by the regulating authority of «price freezing» amid the crisis.

The next level is to carry out quantitative analysis, using the point-based system. This matrix is recommended to be used by experts in order to reduce the negative influence of weak points and to make the best use of the strong points of the regulated business segment.

The tests carried out demonstrate that with the existing structure of production costs and Ws services realization in Samara region, the increase in energy prices will lead to the incremental price on raw materials and supplies, works and services, fuel in return. Thus, it will change the price of other elements of the costs, the components of total costs. When connectivity between the elements of production costs

The dynamics of Ws&Wr services realization in the urban area of Samara region is specified in fig. 4.

Table 2 depicts the index of tariff changes on goods and services of MOB in the sphere of water supply in the urban area, depending on energy price change.

Figure 5 gives the graphic representation of energy and water tariff increase ratio.

According to the tests carried out, 25% increase in energy tariff, in the conditions of economically feasible rate fixing, leads to a 21% and 34% cost increase of 1 m^3 in the urban area and rural zone accordingly. With an increase in tariff on Ws&Wr services by 1 rbl/
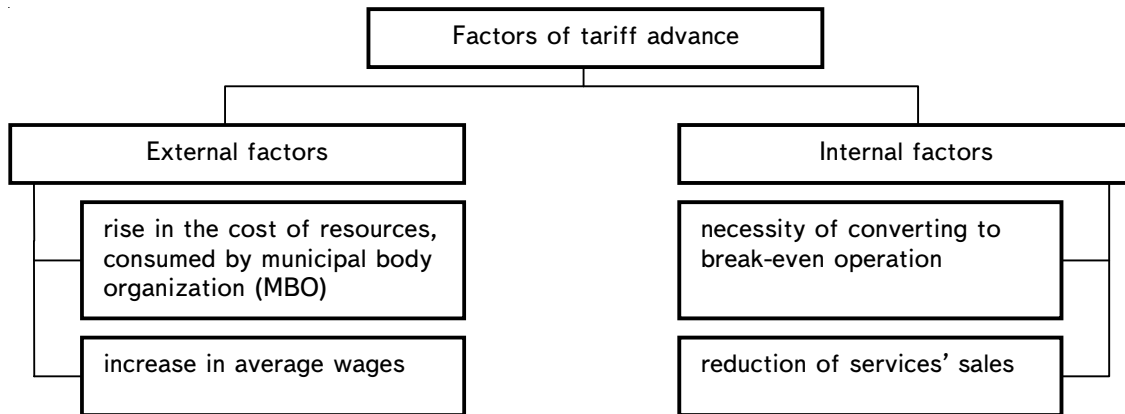
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                    ┌─────────────────────────────┐
                    │   Factors of tariff advance  │
                    └─────────────────────────────┘
          ┌──────────────────────────┐   ┌──────────────────────────┐
          │     External factors     │   │     Internal factors     │
          └──────────────────────────┘   └──────────────────────────┘
     ┌─────────────────────────────┐   ┌─────────────────────────────┐
     │ rise in the cost of resources,│   │ necessity of converting to   │
     │ consumed by municipal body    │   │ break-even operation         │
     │ organization (MBO)            │   │                              │
     └─────────────────────────────┘   └─────────────────────────────┘
     ┌─────────────────────────────┐   ┌─────────────────────────────┐
     │ increase in average wages    │   │ reduction of services' sales │
     └─────────────────────────────┘   └─────────────────────────────┘
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Fig. 2. **Factors of tariff advance on Ws&Wr services**
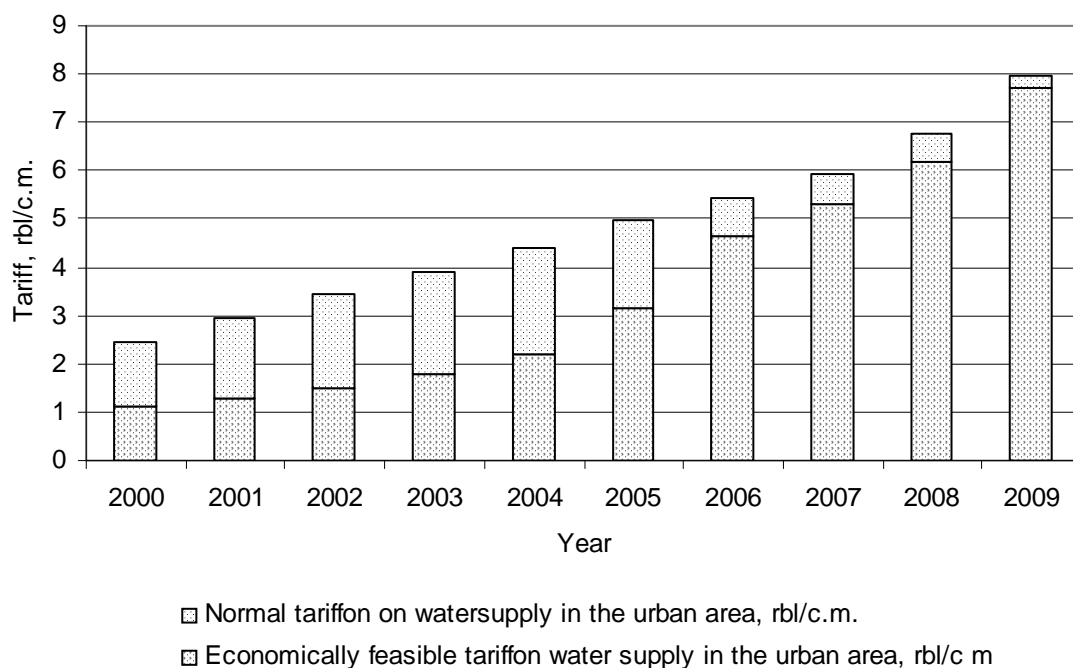
☐ Normal tariffon on watersupply in the urban area, rbl/c.m.

☐ Economically feasible tariffon water supply in the urban area, rbl/c m

Fig. 3. **Dynamics of fixed, economically feasible rates in the urban area of Samara region**

☐ Volume of watersales in the urban area, total of thousands of c.m.

☐ Volume of removed drain in the urban area, total of thousands of c.m.
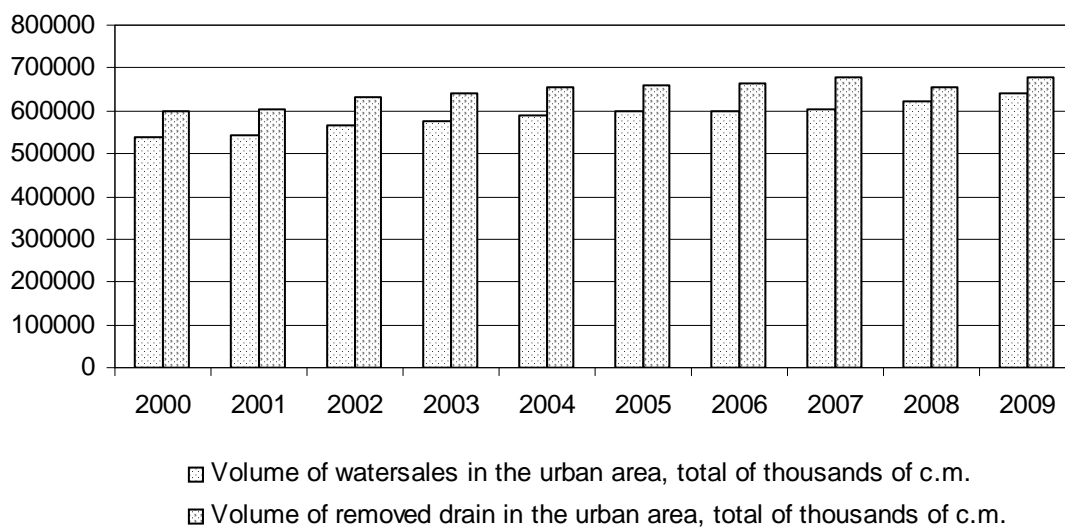
Fig. 4. **Dynamics of effective sales of Ws&Wr services in the urban area of Samara region**

Alternatives of changes for resource cost

| Parameters	Alternatives of changes for resource cost					
	1	2	3	4	5	6
Increase in energy tariff	0,0%	10,0%	15,0%	20,0%	25,0%	30,0%
Increase in charges of the elements of production cost						
Labor costs	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Fringe benefit expenses	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Repair and maintenance	0,0%	4,0%	6,0%	8,0%	10,0%	12,0%
Depreciation	0,0%	0,0%	0,0%	0,0%	0,0%	0,0%
Shop costs	0,0%	4,8%	7,2%	9,6%	12,0%	14,4%
Other direct costs	0,0%	3,2%	4,8%	6,4%	8,0%	9,6%
Maintenance cost	0,0%	4,0%	6,0%	8,0%	10,0%	12,0%
Index of tariff changes on goods and services of MOB in the sphere of water supply	107,8%	113,0%	115,6%	118,2%	120,8%	123,4%

Increase in tariff on energy

Index of tariff changes on services of MOB in the sphere of water supply
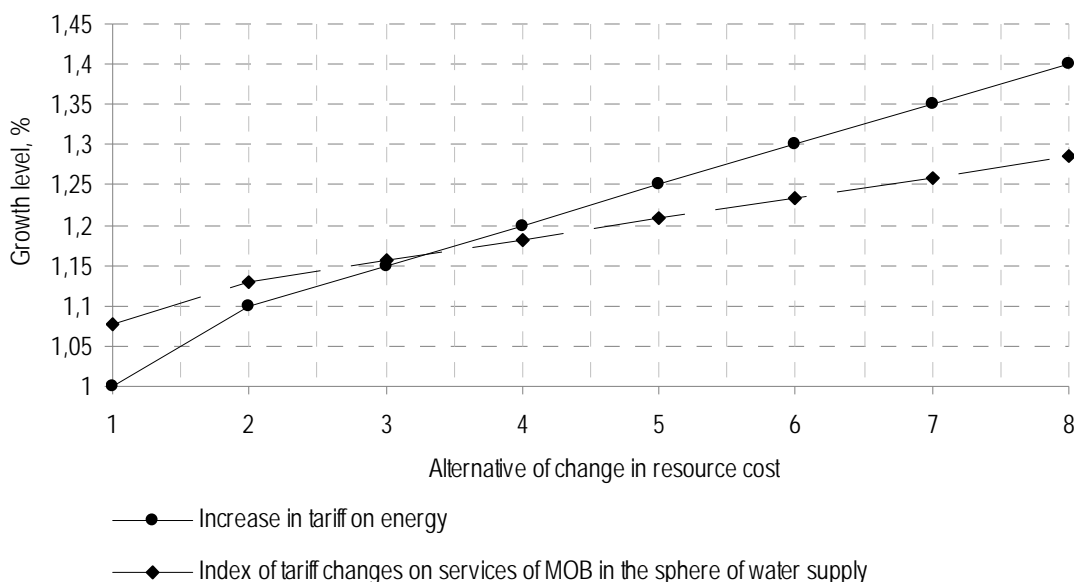
Fig. 5. **Relation between water in the urban area tariff and energy tariff increase**

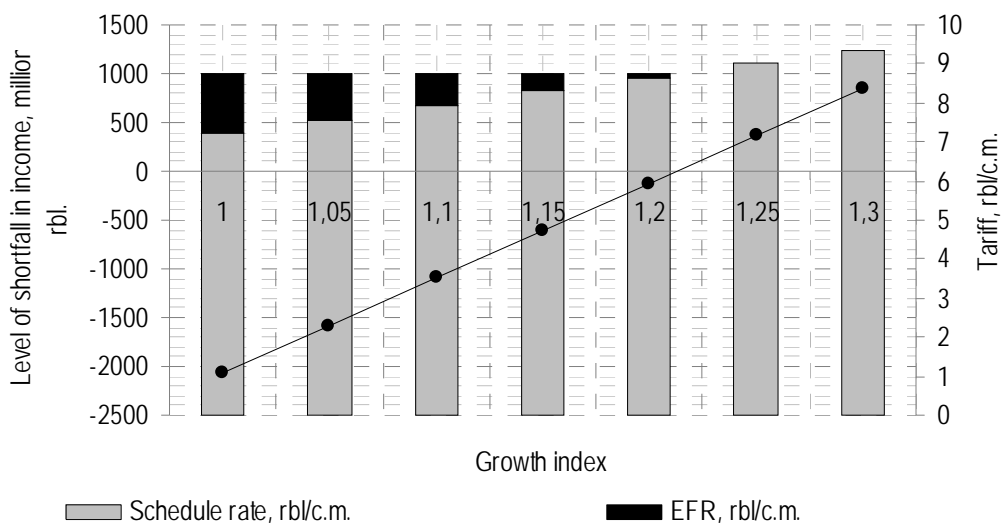
Schedule rate, rbl/c.m.   EFR, rbl/c.m.

Fig. 6. **Relation between shortfall in MOB's income on Ws&Wr services in 2010 (Samara region) and the level of increase in tariffs**

m^3, we have the reduction by 1,4 billion rbl. of the shortfall in MOB's income . Figure 6 illustrates the relation between the shortfall in MOB's income and the growth index for tariffs in the sphere of Ws&Wr.

A 21% increase in tariff on the services of MOB in the sphere of Ws&Wr amid the financial and economic crisis, for the first time in the last 5 years, leads to the reduction of the actual level of payment for Ws&Wr services. This reduction is 1,8%, according to expert judgment. At the same time, the financial solvency of the population is almost constant, whereas its reduction is compensated by budgetary aid to population.

Here we may also observe the necessity of correlation between the rate of increase in the tariff for Ws&Wr services and the rate of growth of income and budgetary aid to population.

Nowadays a lot of works of Russian scientists are devoted to theoretical and operational use of cognitive modeling toolkit. The field of research of current concern is the development of support systems for decision-making, using cognitive technology. The main trend is the development of subsystem of knowledge structuring, for the used algorithms of structuring are often difficult to formalize. These algorithms are affected by subjective factor, thus, cannot be computer-assisted. The above-stated results of cognitive technology usage for pricing policy realization in the sphere of Ws&Wr of the region once more confirm the urgency of such systems creation. Such systems will lead to the reasoned, strategically right, managerial decisions on the regional and federal levels.

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