INTEGRATED DSS FOR STRATEGIC PLANNING IN PUBLIC INSTITUTIONS

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Abstract. The paper deals with a problem of support to the strategic planning decision-making in public institutions. In special literature there are various approaches proposed to what decision support system (DSS) is rational to use in management area. This diversity is determined by the nature of management problems, goals and the chosen approaches for achieving the goals. In order to prepare the approaches which are necessary to carry out the strategic planning in the institutions, the role of the DSS was revealed, the structure of the system was defined, and the variety of the DSS was systematized. Besides, the factors which predetermine the requirements for the DSS of strategic planning in the institutions were defined. According to these factors and the results of the research on theoretical potential of decision support, it is rational to apply a complex character of intelligent support to prepare alternatives and to make decisions of strategic planning in public institutions. The authors have based a solution with regard to the integrated DSS for the strategic planning.

Keywords: public institution, strategic planning, DSS, integrated approach.

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1. Introduction

Strategic planning in public institutions as a system for developing the possibilities of the compatibility of the institutions' activity with their environment creates preconditions to stimulate the processes of development of the country's economy as well as to ensure their purposefulness by permanently revealing, efficiently distributing and rationally using the potential of the institutions' activity. Strategic planning which is perceived in such a way is a means of harmonious development of the institutions as well as of the state (Butkevičius and Bivainis 2009; Bivainis and Tunčikienė 2009; Karnitis and Kucinskis 2009). However, its application is still problematic. Methodological issues were solved in principle (Bivainis and Tunčikienė 2009). The offered strategic planning model for public institutions expresses a conception of the strategic planning on

the basis of which it is possible to create better conditions for implementing the objectives of the in future-oriented activity of the institutions. But the information provision for the strategic planning of public institution is still an open problem. Improving the information provision for the fulfilment of the different management decisions is a frequent subject of scientific research (Dzemydienė *et al.* 2008; Mickaitytė *et al.* 2008; Azadeh *et al.* 2009; Ginevičius and Podvezko 2009; Gudas 2009; Kaklauskas *et al.* 2009; Urbanavičienė 2009a, b; Kanapeckienė *et al.* 2010). In order to use the strategic planning model for public institutions, existing results of the research (Goul *et al.* 1986; Koutsoukis *et al.* 2000; Mabin *et al.* 2001) are inadequate. The essential factor which predetermines the possibilities of effective information provision is the approaches of the DSS for strategic planning in the institutions.

The subject of the research is the decision support for the strategic planning in public institutions. The main goal of the research was defining the principal approaches of the DSS for the strategic planning of the institutions, according to them created the DSS would help analysts to prepare and to adopt the rational strategic planning decisions. The following tasks were raised: to reveal the role of the DSS; to define the standard structure of the system; to systematize the qualities of the varieties of the DSS; to define the factors which predetermine the requirements for the DSS of the strategic planning in public institutions; according to them and results of the investigation of the DSS theoretical potential to provide the intelligent support to the strategic planning decisions in public institutions. Methods of systematic analysis, logic and synthesis were used in this research.

2. Conception of the DSS

Usually the DSS is interpreted as a computer based information system which is intended to form the information needed for making the decisions, in this way to help the user or their group to solve the problem. The DSS provides the information necessary to generate the alternatives, to analyze and evaluate them, to choose the best alternative for achieving the goals set (French and Turoff 2007; Kaklauskas *et al.* 2007; Mickaitytė *et al.* 2007; Adekola *et al.* 2008; Banaitienė *et al.* 2008; Power 2008). The standard purpose of the system is specified by characterizing the object in terms of certainty of a problem. The DSS is perceived as a system for accumulating and processing the various sources of data and knowledge which helps managers to adopt the decisions of specific or unstructured and/or partially structured problems. In special literature it is usually pointed out that the DSS is interactive computer-based information system which helps a decision-maker to use the data and models to solve unstructured problems.

A concept of the DSS presented by Alekseev and Borisov is mixed (Dzemydienė 2006). According to them the DSS can be understood not only as a system for helping to choose the decisions, but also as the system which selects the best or acceptable way from its own formed alternatives or from alternatives produced to it. This conception of the DSS is criticized by Adla *et al.* (2007) who argue that such DSS doesn't integrate the user into decision creation and it is suitable for solving simple problems.

In addition to the basic help for managers to make decisions by providing the information reports, there are other components of the purpose of the DSS pointed out. The DSS allows: 1) to develop the solution to the problems; 2) to increase the efficiency of the decision-making. Many researchers accept the mentioned functions of the DSS. For example, Turban and Aronson (2001) approved such conception of the destination of the DSS. According to them the main functions of the DSS are: 1) interaction with the decision-maker; 2) problem identification; 3) offering the decisions on the problem; 4) substantiation of the decisions. The main qualities of the DSS offered by Turban and Aronson (2001) allow discovering the analogy of the DSS functions with Kaklauskas *et al.* (2007, 2009), Banaitienė *et al.* (2008) treatment. Summarizing the opinions of these researchers in this respect, it can be concluded that the purpose of the DSS is to rationalize preparing and making the decisions, in this way to assist analysts in reasonably adopting the decisions. Such essential requirements for the DSS were distinguished by Urbanavičienė *et al.* (2009b) and Kanapeckienė *et al.* (2010). In special literature different treatments of the DSS's functions are presented. Therefore it can be concluded that the DSS is a lot of functions from which the necessary set of the functions needed to solve a concrete problem is made.

The diversity of the approaches to and the definitions of the DSS proposed in special literature are determined by the nature of the problems, the goals set as well as the chosen approaches to achieve the goals. Summarizing the results of the analysis of the factors which determine the role of the DSS, the DSS as an information computerized system provides thorough information necessary to set, analyze, evaluate alternatives and make the right choice. It also provides the possibility to make the purposeful development of prepared information reports in order to choose the most rational means of neutralizing specific problems.

In order to create better conditions for the rational strategic planning, the DSS should meet the requirement of universality of helping managers of public institutions to prepare alternatives and make the planning decisions.

3. Structuring the DSS

There are different opinions in terms of the structure of the DSS. The typical DSS consists of such three subsystems as the data management, model management, user's interface (Kaklauskas *et al.* 2007; Naimavičienė *et al.* 2007; Urbanavičienė *et al.* 2009b). Besides these components, the DSS may possess a system of e-mail management (Kaklauskas *et al.* 2007, 2009; Naimavičienė *et al.* 2007; Urbanavičienė *et al.* 2009b). Turban and Aronson (2001) configured the DSS with the four subsystems: 1) the dialog generation and management system (DGMS); 2) the database management system (DBMS); 3) the model base management system (MBMS); 4) the knowledge base management system (KBMS). A significant component of the DSS is the decision-maker or user and his tasks (Adla *et al.* 2007; Naimavičienė *et al.* 2007). Therefore it can be concluded that such composition of the DSS is the most rational (Fig. 1).
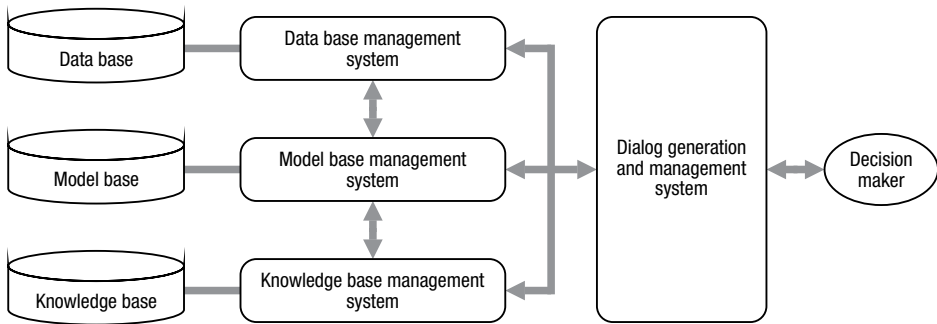
Fig. 1. The standard structure of the DSS

Most of the researchers (Turban and Aronson 2001; Kaklauskas *et al.* 2007; Banaitienė *et al.* 2008) had the similar perception on the role of the DGMS. The essential function of the DSS is transforming the input from the user into languages that can be read by the DBMS, MBMS and KBMS and into a form that can be understood by the user. The DBMS supports the dialogue between the user and the other constituents of the DSS. Being the one component of the DSS with which the user directly interacts, the user views the DGMS subsystem as the entire DSS. As a result, the DSS is the system of interaction between the user and data, also models (Adla *et al.* 2007). Various interface modes exist: menu-type, command-line, questions and answers, input and output, language, graphic, mixed (Kaklauskas *et al.* 2007; Naimavičienė *et al.* 2007).

Generally the DBMS is defined as a software kit for organizing data in database. The primary tasks of the DBMS are the capture and storage of internal and external data which are needed to make decisions (Adla *et al.* 2007). In scientific literature (Dzemydienė 2006) a broader approach to the purpose of DBMS is found. Authors of many works (Kaklauskas *et al.* 2007; Banaitienė *et al.* 2008; Urbanavičienė *et al.* 2009b) signed that database (specially created for the DSS, personal, external) can possess both quantitative and qualitative data which describe the object. The DBMS allows to link data from the different sources.

The primary functions of the MBMS are the creation, storage and update of models that enable the problem solving inside the DSS. The much broader list of the MBMS functions possesses the functions of MBMS which correspond to the DBMS functions. According to Kaklauskas *et al.* (2007) the MBMS performs a similar role with models as well as the database management system with data. The MBMS assists the user to choose a desirable model, to adapt it to the situation.

In order to choose the suitable model it is rational to use the knowledge and experience of which the user of the DSS or expert system possesses (Dzemydienė 2006; Kaklauskas *et al.* 2007). According to Turban and Aronson (2001) the KBMS is the necessary component of the effective DSS. Adla *et al.* (2007) cited the statement by Holsapple and Whinston that the KBMS as well as the problem processing system are as key DSS components. The KBMS allows generating, collecting, managing, disseminating and using knowledge needed to solve problems.

The above components (DGMS, DBMS, MBMS, KBMS) are considered to constitute the software portion of the DSS. The final part is being the decision-maker himself. A significant element of conceptual structure of the DSS is the decision-maker usually understood as an analyst who analyses the situation, takes into account the rules, however, makes his own conclusions.

According to the results of structuring the DSS the following conclusion can be made that application of the standard composition DSS is an important condition for effective provision of strategic planning decisions.

4. Variety of the DSS

Special literature proposes different approaches to analyze the diversity of DSSs. There is suggested analyzing the variety of DSSs in conceptual, user-based, technical terms. Generally the most acceptable approach is the essential or conceptual approach whose application allows differentiating the DSSs according to the object. According to Kaklauskas *et al.* (2007) the DSSs were distinguished into the DSS, group DSS, expert system and artificial neural networks. Banaitienė *et al.* (2008) did not separate the group DSS, their proposed set of DSSs from the standpoint of intelligent support is more aggregated. According to Mickaitytė *et al.* (2008) the DSS, expert system, neural networks and multimedia form a network of distributed systems each facing and solving a specific problem. The DSS as a separate group of systems consists of the individual and collective decision-making systems. The latter system includes the group and negotiation support systems (Oprean *et al.* 2009; Istudor and Duță 2010).

Summarizing DSSs presented in special literature, the most rational list of DSSs from the standpoint of intelligent support specification consists of the: 1) individual decision support system (IDSS); 2) group decision support system (GDSS); 3) negotiation support system (NSS); 4) expert system (ES).

The IDSS is defined as the software based on traditional algorithmic search. It assists to solve a problem by providing reasoned, usually quantitative arguments by applying the information and other resources. The essential functions of IDSS are: 1) capture of data and knowledge from various sources; 2) algorithmic data manipulation; 3) presentation, storage of the information reports necessary to analyze a problem, to make a decision. Examples of the IDSS can be found in a paper by Banaitienė *et al.* (2008).

The GDSS is an interactive computer- based system which allows a group of decision-makers to accept effective decisions of unstructured problems. In special literature the specifics of GDSS is pointed out in terms of the support for: 1) decision process; 2) content of problem (Matsatsinis and Samaras 2001). The GDSS structurises the process of problem decision, in this way helps to concentrate on the important issues, to avoid the irregularities and inefficient actions. Typical GSPS purpose is to improve the preparation and adoption of group decisions. In order to systematize the GDSS variety, different features of classification are applied. The most popular is the influence on group's activity.

The NSS are often regarded as a certain specialized variety of GSPS which is oriented to provide assistance for people involved in the negotiations in order to get the acceptable decision for each. The NSS provides information on opportunities of compromise which helps to reach mutually acceptable decisions. In such systems the negotiation component helps to purify the objectives of participants and integrate their vague, subjective priorities and the objective data. The main functions of NSS are: 1) provision of information on actual object necessary to negotiate, 2) support of electronic negotiation (Kersten and Lai 2007; Urbanavičienė *et al.* 2009a, b). The examples of the NSS: NEGOPLAN, NegocIAD (Kaklauskas *et al.* 2007; Butkevičius and Bivainis 2009). The outcome of the negotiation depends also on intellectual support measures.

The typical purpose of the ES, which consists of the knowledge base, conclusions generator and user interface, is to do the work of a professional in the relevant field. ES recognizes a situation, makes a diagnosis, formulates a decision, and recommends choosing the actions. ES performs many secondary functions as formulating the questions, substantiation of the conclusions (Kaklauskas *et al.* 2007, 2009; Mickaitytė *et al.* 2007; Fazlollahtabar *et al.* 2010). The variety of ES is distinguished according to type of tasks. Each is specialized in certain cognitive areas. For example, the project quality management ES QM-XPS whose knowledge base contains information on implemented projects, compares the planned project with realized, identifies potential problems and provides possible decisions to improve the project quality (Banaitienė *et al.* 2008).

The investigation into the varieties of the DSS allowed noticing that the authors of various papers highlight different qualities of the varieties of DSS. Research enabled to systematize the essential qualities of the varieties of DSS (Table 1) and to treat them as preconditions which in case of applying the certain variety of DSS are favorable for helping managers of institutions to make the decisions under the conditions of different uncertainty.

Table 1. The main qualities of the varieties of DSSs

Feature	DSS			
	IDSS	GDSS	NSS	ES
Purpose	Help decision-maker to solve a problem by providing reasoned, usually quantitative arguments	Help decision-makers to solve the problem by providing the results of synthesis of various decisions of problem	Help customers to achieve an acceptable decision by providing information on opportunities of compromise	Help to accept the decision of the problem according to a defined decision path
Initiative of proposals	Decision-maker and/or system	Decision-makers and/or system	Users and/or system	System
Reference direction	Individual decision-making	Group decision-making	Collective decision making	Formation of proposals, based on expert judgments

End of Table 1

Feature	DSS			
	IDSS	GDSS	NSS	ES
The main direction of dialogue	User → system	User → system	User → system	System → user
Nature of support	Personal	Group	Institutional	Personal and group
Nature of data manipulation	Usually algorithmic manipulation	Algorithmic, heuristic manipulation	Algorithmic, heuristic manipulation	Usually heuristic manipulation
Characteristic of subject area	Extended	Extended	Extended	Narrow
Type of appeals to system	Unique	Unique	Unique	Repetitive
Content of database	Facts (actual knowledge)	Facts (actual knowledge)	Facts (actual knowledge)	Procedures and facts
Possibilities of logical conclusions	Large	Large	Large	Limited
Possibilities of interpretation, substantiation of decision	Large	Large	Large	Limited

Considering the defined characteristics of the DSSs, it is rational to integrate systems thereby increasing their expedience. According to the results of analyzing the experience of DSSs integration, generating intelligent DSS, a frequent practice is to take traditional DSS as the basis and supplement them with advanced artificial intelligence elements (Goul *et al.* 1986; Koutsoukis *et al.* 2000; Urbanavičienė *et al.* 2005; Mickaitytė *et al.* 2007, 2008; Banaitienė *et al.* 2008; Butkevičius and Bivainis 2009; Huang *et al.* 2009; Kaklauskas *et al.* 2009, 2010; Secrieru 2009). Application of intelligent DSS generated following this principle preconditions for making a rational decision by providing comprehensive, real-time information, creating conditions to integrate and interpret information.

5. Factors predetermining the requirements for integrated DSS of strategic planning in public institutions

In order to create an effective DSS for the strategic planning in public institutions, it is expedient to apply the system integration principle. The factors determining the requirements for the strategic planning DSS are as follows: 1) principle model of the strategic planning (the suggested model based on the principle of integrated methodology (Bivainis and Tunčikienė 2009)); 2) the methods for implementation of its components (the

rational composition sets of methods were compiled for each component of the strategic planning model (Bivainis and Tunčikienė 2007, 2009)); 3) type of relation between the implementers (staff works independently or in collaboration with others). These factors are presented in Table 2. The offered model possesses such components as the strategic analysis, setting of target orientation, strategic decision-making, preparation of an action plan for implementation as well as monitoring of the implementation of the plan, where joining of the components into a whole is based on the results of the analysis of the link between the environment and the internal factors of the institutions. Each of them is intended for solving the complex planning tasks. Basically, all strategic planning tasks are solved on a few institutional levels. The essence of the proposed methods and models for solution of the strategic planning tasks determines a complex character of intelligent support. Therefore, the characteristics of the strategic planning tasks with emphasis on the type of relation between the actions of individuals participating in the process allowed revealing the specifics of the need for intelligent support for the strategic planning tasks in DSS.

6. Integrated system of support for the strategic planning in public institutions

According to the suggested model, the strategic planning in public institutions begins with the analysis and evaluation of the environment and resources of the institutions followed by the analysis and evaluation of the SWOT of the institutions, subsequently by analyzing and evaluating the strategic links of the institutions. In order to rationality, in particular to avoid the duplication, it is expedient to centralize the procedures of the strategic analysis of the institution at the strategic planning department. In order to use the suggested methods and models for strategic analysis, it is rational to apply the support of decision based on algorithmic and heuristic data manipulation, exactly, to solve such task, it is expedient to apply the individual decision and the expert support. The strategic planning department refers the results of analyzing and evaluating the environment and the recourses to all concerned structural departments. The latter departments present their comments, assessments and proposals for the strategic planning department. In analyzing evaluations of the environment and internal factors of the institutions as well as synthesizing them with the help of proposed methods it is typical to apply group work mode, therefore, it is rational to apply group decision support. The expediency of such support is strengthened with the circumstance that it is more probably the iterative exchange of information by specifying the arguments and evaluations. Such support would allow setting the SWOT and strategic links more reasonable, in accordance with the evaluations of the external and internal factors of the departments of the institutions. Besides, it is typical to apply the group work mode in discussing the final results of the strategic analysis (the participants are the authorities of the institution, the heads of the structural departments, the strategic planning department). It would be helpful to additionally apply the negotiation support mode to the latter one. To increase efficiency of the works at this stage it is most appropriate to use the group decision and the negotiation support.

Table 2. The factors predetermining the requirements for integrated strategic planning DSS

Components of model	Tasks	Proposed methods for solving the tasks	Performers
Strategic analysis of the institution	Analysis and evaluation of the environment of the institution	PEST analysis, analysis of environmental complexity and turbulence, influence and interest groups analysis, modified national diamond	Strategic planning department
	Analysis and evaluation of the resources of the institution	Modified 7 S model, modified VRIO model, product existing cycle model, modified value chain, modified BCG matrix, modified competitive model, financial analysis	Strategic planning department
	SWOT analysis of the institution	SWOT analysis based on evaluating the development preconditions, SWOT analysis based on evaluating the scenarios as well as development of resources	Strategic planning department Structural departments of the institution Authorities of the institution
	Analysis and evaluation of the strategic links of the institution	Method of structurizing problems, problem tree	Strategic planning department Structural departments of the institution Authorities of the institution
Defining target orientation of the institution	Forming the mission of the institution	Methods of warrant analysis, mission creation methods based on evaluation and creative thinking	Strategic planning department Authorities of the institution
	Creating the vision of the institution	Questionnaires on factors determining the future state, vision creation methods based on evaluation and creative thinking	Strategic planning department Authorities of the institution
	Defining the strategic goals of the institution	Goal tree method	Strategic planning department Structural departments of the institution Authorities of the institution
Making strategic decisions of the institution	Generating strategic alternatives	Methods of conformity, methods of conversion, methods of existing solution, mapping technique, benchmarking	Structural departments of the institution

Components of model	Tasks	Proposed methods for solving the tasks	Performers
Making strategic decisions of the institution	Defining the evaluation criteria of strategic alternatives and forming a combination of criteria	Criteria definition method based on converting the hierarchy of goals into a criteria system, method of defining the priorities of criteria	Strategic planning department
	Analysis and evaluation of strategic alternatives	Methods of multicriteria evaluation, ranking method	Structural departments of the institution Strategic planning department
	Strategic decisions	Methods of collective decision-making	Heads of structural departments of the institution Strategic planning department Authorities of the institution
Preparing of an action plan of implementation of strategic decisions of the institution	Generating action plan alternatives	Methods of conformity, methods of conversion, methods of existing solution, benchmarking, critical path method	Structural departments of the institution
	Defining the evaluation criteria of action plan alternatives and forming a combination of criteria	Methods based on converting the set goals into a system of criteria	Strategic planning department
	Analysis and evaluation of action plan alternatives	Method of "cutting" network technological model components, methods of multicriteria evaluation, causal analysis	Structural departments of the institution Strategic planning department
	Adoption of an action plan	Methods of collective decision-making	Heads of structural departments of the institution Strategic planning department Authorities of the institution

Components of model	Tasks	Proposed methods for solving the tasks	Performers
Monitoring of implementation of the action plan of the institution	Record and controlling of the implementation of the action plan	Control matrix, strategic control	Structural departments of the institution Internal audit group
	Analysis and evaluation of the results of implementation of the action plan	Situational analysis, systemic analysis	Structural departments of the institution Institution strategic planning department Internal audit group
	Use of the results of the analysis and evaluation of the action plan implementation	Decision-making methods	Structural departments of the institution Strategic planning department Authorities of the institution

In order to introduce the proposed methods of defining target orientation of the institution, different intelligent support is needed. To form the institution's mission, to create the vision it is useful to apply the group decision and expert support. To specify the mission it is enough to apply the decision support based on manipulation of data on previous and ongoing powers of the institution.

In order to introduce the proposed models, methods of defining target's orientation of the institution, different intelligent support is needed. In order to define and adjust the strategic goals of the institution, it is predicted the revision of the factors which predetermine the institution's activity development, and of their interrelation, according to results of such revision the converting of factors predetermined development into the goals set, the evaluation of the goals set in terms of the possibilities to neutralize the difficulties of the link between the environmental and the inner factors of institution. The proposals for the goals prepared by the strategic planning department are discussed in conjunction with the institution's authorities and departmental heads. The group decision support should be specially noted here which at different stage of solution to defining orientation objective is supplemented with the expert and negotiation support.

At the stage of preparing the alternatives and making the strategic decisions to implement the goals set of the institution, the managers of structural departments of the institution must provide the information on possible ways to implement the goals to the strategic planning department. For this reason the strategic alternatives within the structural departments are generated, according to the criteria the alternatives are evaluated, according to the results of evaluation the best alternatives in the form of proposals are provided. In terms of content it is a complex task that requires nonstandard thinking and creativity, however, in principle, it is characterized by the autonomous nature of the work. The specifics of the objective solution predetermine the need for the indi-

vidual decision and expert support. The strategic planning department generalizes the information on the ways of implementing the goal set of the institution received from the structural departments of institution. In order to form the rational composition sets of the strategic decisions, it is rational to revise the results of the investigation of the factors which predetermine the implementation of the strategic goals as well as the possibilities of strengthening of the factors, and if it is necessary, to specify the list of the factors and aspects of their strengthening. In order to create the rational composition set of the decisions to implement the goals, it is expedient to apply collective work mode, it is rational to apply the group decision support. Expert judgements are dominated by evaluating the elements of the decisions set in terms of compatibility with the strategic goals, compliance with the strategic situation and in other respects. In order to increase the efficiency of expert judgements, it is rational to supplement the decision support with the expert support. The consideration of the results of the multicriteria evaluation of strategic alternatives is characterized by nature of group work. The adoption of the strategic decisions is a collective work which involves various employees and managers of structural departments of institution and the authorities. Specifics of such objective solution require both negotiation and decision support in order to eliminate the potential difference between the opinions of participants with regard to the weight of foreseen means for implementing the goals set.

To solve other objective of the strategic planning in the institution – to prepare an action plan of implementation of strategic decisions − the analogous elements are applied (Table 2). The essential decision-making is a multi-step process which stages are characterized by information processing, expert judgements, modeling the alternatives, their evaluation and debates. This complex objective of the strategic planning is solved at the structural departments of the institution, on a level of specialists by participating managers of departments and analysts of strategic planning department. Modeling the alternatives of tasks to implement the goals of the action plan and alternatives of activities of implementing the tasks, defining the evaluation criteria and forming a combination of criteria, evaluation of alternatives according to the criteria are carried out in autonomous mode, so it is useful to apply individual decision and expert support. To consider the results of multicriteria evaluation of the alternatives it would be most appropriate to apply the group decision support. For example, by analyzing and evaluating the action plan alternatives the main support objects are presented in Table 3.

The strategic planning department investigates the projects of the action plan for implementing the strategic decisions prepared by the structural departments. It has to inspect the validity of the factors determining the implementation of strategic decisions, if it is necessary, to correct the list of such factors. This is done in consultation with the relevant structural departments, usually with their leaders, so it would be useful to apply group decision support. In order to complex evaluate the action plan alternatives it is necessary to supplement group decision support with the expert support. In order to adapt the best project of the action plan in terms of content as well as to use possessed resources by considering the projects of the action plan, the strategic planning department carries on negotiations with the structural departments. Therefore, it is rational to supplement group decision support for this objective with negotiation support.

The ministry of finance, government office and strategic planning committee evaluate the strategic plan of the institutions. According to their comments and proposals the institutions must specify the programs and increase effectiveness of using the resources. Of course, and substantiate the validity of their decisions. In order to evaluate the plans it is necessary to apply individual decision support, to respond to comments and proposals – negotiation support.

Table 3. The specification of intelligent support for the analysis and evaluation of action plan alternatives

Strategic planning task	Support objects	Support nature
Analysis and evaluation of action plan alternatives	Analytical calculations of expediency of action plan alternatives ($Exp_j = \sum_{i=1}^{m} v_{1ij} \cdot q_{1i}$, where: Exp_j − the value of the partially integrated criterion to evaluate the alternative's expediency, v − evaluations, 1 − the index of primary criteria group in terms of expedience, i − the index of the primary criterion, j − the index of an alternative, q − the weight of primary criteria)	Individual decision support
	Analytical calculations of relevance of action plan alternatives ($Rlv_j = \sum_{i=1}^{m} v_{2ij} \cdot q_{2i}$, where: Rlv_j − the value of the partially integrated criterion to evaluate the alternative's relevance, 2 − the index of primary criteria group in terms of relevance)	Individual decision support
	Calculations of the typical parameters of the calendar graphic and evaluations of the graphic to implement the alternative in terms of rationality of using the work resources: $$\left(\sum_{i-j \in D} R_{i-j}(t_k) \cdot \delta_{i-j}(t_k) - P(t_k) \right)^2 \to \min, \quad 0,5 \le L_1 = \frac{\sum t_{kst}}{t} \le 0,6,$$ $$L_{21} = \frac{n_{\max}}{n_{aver}} \le 1,5...1,7, \quad L_{22} = \frac{n_{aver}}{n_{\min}} \le 1,5...1,7, \text{ where } \sum R_{i-j}(t_k) -$$ the defined work resources need to implement the tasks set in the time scale, $P(t_k)$ − the possessed work resources potential to implement the tasks set in the time scale, L_1 − the coefficient of uniformity of the work resources need, t_{kst} − the duration of implementation of the tasks set, when the work resources need is stable; t − the duration of implementation of the tasks set, L_2 − the coefficient of the ratio of change of the work resources need, $n_{\max}$ − the largest work resources need, n_{aver} − the average work resources need, $n_{\min}$ − the least work resources need)	Individual decision support
	A comparative analysis of the work resources' need according to action plan alternatives	Individual decision support
	Analytical calculations of efficiency of action plan alternatives ($Eff_j = \sum_{i=1}^{m} v_{3ij} \cdot q_{3i}$, where: Eff_j − the value of the partially integrated criterion to evaluate the alternative's efficiency, 3 − the index of primary criteria group in terms of efficiency)	Individual decision support

Strategic planning task	Support objects	Support nature
Analysis and evaluation of action plan alternatives	Analytical calculations of multicriteria evaluation of action plan alternatives ($Komp_j = Exp_j \cdot q_1 + Rlv_j \cdot q_2 + Eff_j \cdot q_3$, where weight of partial integrated criteria of q_1 − expedience, q_2 − relevance and q_3 − efficiency; $\overline{a}_j^+ = \dfrac{a_j^-}{a_j^+ + a_j^-}$ (TOPSIS), where $\overline{a}_j^+$ − the relative proximity of each alternative to the ideal variant; the proximity of the alternative to the ideal positive $(\overline{a}_j^+)$ and negative variants $(\overline{a}_j^-)$; $n_j = \dfrac{q_j}{q_{\max}} \cdot 100\%$ (COPRAS), where n_j − the usefulness of the alternative; q_j − the relative weight of the alternative)	Individual decision support
	A comparative analysis of the results of multicriteria evaluation of action plan alternatives	Individual decision support
	Ranking of action plan alternatives according to the results of comparative analysis	Individual, group decision support

The complex support is necessary to monitor the implementation of the action plan. Firstly, considering the specifics of solution of monitoring tasks which consist of actual data processing and their comparison with the planned indicators, it would be helpful to apply individual decision support based on algorithmic data manipulation. It is more difficult to assess the changes that occurred due to the implementation of the action plan. The expert judgements are planned here. For expert judgements of institutional changes, that occurred due to the implementation of the action plan, expert support is undoubtedly useful. According to the results of analysis of implementing the plan and the recommendations from the internal audit, the need for specifying or changing the measures to implement the directions of activity development is considered. Group decision mode is typical here. In order to define the significance of the need for the new or improved measures, negotiation mode of decision support is also foreseen. So, both group decision and negotiation support are necessary here. According to the results of consideration, the plans are specified, in order to do that it is helpful to apply the methods of decision-making which determine the need for decision support.

The defined regularities of support in accordance with its nature allow accepting decision on integrated system of support for the strategic planning in public institutions. The latter's advantage – focus on integrated improvement to preparing and making the decision of strategic planning.

7. Conclusions

Summarizing the results of the analysis of the factors that determine the role of the DSS, the DSS as an informative computerized system provides thorough information necessary to set, analyze, evaluate alternatives and make the right choice, it also provides a possibility to make purposeful development of prepared information reports in order to choose the most rational means to neutralize the specific problems of management. In order to create the better conditions for rational strategic planning, such DSS should meet the requirements of universality for helping managers of public institutions to prepare alternatives and make planning decisions.

Summarizing DSSs presented in scientific literature, the most rational list of DSSs from the standpoint of intelligent support specification consists of individual decision support, group decision support, negotiation support and expert system. Detailed analysis of systems from the viewpoint of their ultimate goal, proposal initiative, leading direction, main dialogue direction and other viewpoints allowed defining the main characteristics of DSSs. The defined qualities are treated as preconditions which in case of applying the certain variety of the DSS are favourable for helping managers of public institutions to prepare and make the decisions under the conditions of different uncertainty of institutions. Considering the defined characteristics of DSSs, it is rational to integrate systems thereby increasing efficiency of support for their users.

The essential factors determining the requirements for the strategic planning DSS are as follows: principle model of strategic planning, implementation method of its components and type of relation between the performers. Therefore, the characteristics of strategic planning tasks with emphasis on the type of relation between the actions of individuals participating in the process allowed revealing the specifics of the need for intelligent support for strategic planning tasks. In order to carry out the strategic planning in institutions, it is necessary to apply a complex character of intelligent support: individual decision, group decision, expert and negotiation support.

The essence of the proposed methods and models for solution of strategic planning tasks determines a complex character of intelligent support. Application of the intelligent DSS generated following this principle enables public institutions to make a rational decision by providing comprehensive, real-time information, creating conditions to integrate and interpret information.

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INTEGRUOTA VIEŠOJO SEKTORIAUS INSTITUCIJŲ STRATEGINIO PLANAVIMO SPRENDIMŲ PARAMOS SISTEMA

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Santrauka

Straipsnyje nagrinėjama viešojo sektoriaus institucijų strateginio planavimo sprendimų paramos problematika. Specialiojoje literatūroje pateikiami skirtingi požiūriai į tai, kokią sprendimų paramos sistemą (toliau – SPS) racionalu taikyti valdymo problemoms spręsti. Tokią įvairovę lemia nagrinėjamų valdymo problemų, kartu keliamų tikslų ir jų įgyvendinimo nuostatų pobūdis. Siekiant parengti viešojo sektoriaus institucijų strateginiam planavimui reikalingos SPS principines nuostatas, atskleistas SPS vaidmuo, apibrėžta pagrindinėms SPS funkcijoms įgyvendinti būtina sistemos struktūra, susistemintos SPS atmainų savybės. Be to, nustatyti veiksniai, kurie lemia reikalavimus, keliamus viešojo sektoriaus institucijų strateginio planavimo SPS. Atsižvelgiant į tokius veiksnius ir sprendimų paramos teorinio potencialo nagrinėjimo rezultatus, numatyta skirtinga pagal pobūdį intelektinė parama viešojo sektoriaus institucijų strateginio planavimo sprendimams rengti ir priimti, pagrįstas sprendimas dėl integruotos strateginio planavimo SPS.

Reikšminiai žodžiai: viešojo sektoriaus institucija, strateginis planavimas, sprendimų paramos sistema, integruotas požiūris.

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