THE APPLICATION OF AUTOMATED EXPERT INFORMATION IN SOLVING THE UNSTRUCTURED PROBLEMS OF DEVELOPMENT

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Abstract. *The concise report deals with the conception, the basic structure and the way of use of the ASPRON software product. It focuses on the automation of expert information retrieval for anticipation and planning. ASPRON is universal and adaptive for multi-purpose tasks of anticipation and planning. This work presents its concrete applicability in anticipation and planning of scientific and research work. The use of the developed methodology and software is interactive. Some ways of further research and development of ASPRON are pointed out, too.*

1. INTRODUCTION

Anticipation and planning are, according to contemporary conceptions, the subfunctions of management. Management can, generally speaking, be considered as a continuous process of providing information, the alternative solutions of actual and research problems and decision-making, the choice between the alternative solutions. An exceptional great diversity of possible states and behaviours is typical of complex systems and the objective of management is to limit this diversity to those behaviours, which lead it to the determined aim by a corresponding way.

The fundamental task of management functions is to transform inputs in the organisational system into an effective and efficient way with a view of search of the organisation. Management realises this task through its basic subfunctions, among which are: anticipation, planning, organisation, communication, management and control.

The subject of this report is the automation (effective and efficient software solution) of the developed methodology for anticipation and planning as the subfunctions of management. The methodology for anticipation and planning is a combination of

methods of expert information and some others (method of extrapolation, method of modelling and so on). The applicability and evaluation of the developed methodology and the software package were performed on the task of planning of science research and the planning of scientific and research work. However, both methodology and software package are significantly universal and adaptive for every task of anticipation and planning.

2. LOGICAL AND METHODOLOGICAL ELEMENTS OF ANTICIPATION AND PLANNING

Anticipation can be considered, as it is mostly considered is the contemporary philosophy of science, as a logical, as well as a psychological, process of drawing a conclusion about the phenomenon which is not known to us in the moment of making the statement on it; from the premises containing the statements on scientific generalisations (by laws and hypotheses) and the statements on the scientific established "beginning conditions". Then it is logically unimportant, but pragmatically important, if this phenomenon occurs simultaneously with making the statement on it (it is "circumdiction") on it will occur (then we talk about "prediction" or prognosis"). Every planning includes anticipation. When we talk on planning we usually think about the rational selection of objectives, strategies, policies, programmes and actions for their attaining. The basic purpose of planning is to facilitate the realisation of objectives of the organisation. Planning contributes to it by the neutralisation of uncertainty of changes in future, focusing the attention to the objective of the organisation, minimisation of costs (attaining the objectives) by the choice of consistent, instrumental and efficient operations, as well the facilitation of control. Without a rational anticipation and planning there is not any effective and efficient attaining of the objectives of the organisation, that is an efficient functioning of the organisation. That's why the improvement of the process of anticipation and planning represents an important condition for improving the efficacy of functioning the organisation.

Anticipation and planning could be considered as a process of providing frequently refreshed and modernised framework of information for decisionmaking with a view of advancing, developing and an adequate resource commitment.

In literature, concerning with this field, we can differentiate three groups of methods of anticipation and planning: (a) intuitive methods, (b) causal methods, and (c) extrapolative methods. The method of expert information, the basis of our methodology, belongs to the group of intuitive methods of the normative approach of anticipation and planning.

3. METHOD OF EXPERT INFORMATION

In the past, and nowadays, too, we pin our hopes on the intuitive opinion as a means for solving the so-called "nonformated" problems as the anticipation and planning of developmental tasks. For a complex and system anticipation and planning of developmental tasks, the method of expert information is considered as a key method.

The method of expert information is in fact a procedure (treatment) of rational organisation of an expert analysis of the given problem with a quantitative appraisal of

the participant in expert analysis and the processing and analysis of the obtained results. Experts' opinions are used as a basic source of information for solving the given problem of anticipation and planning.

In various procedures the application of this method leads down to the solving of three groups of tasks:

- Choice of potential experts, the choice of competent expert and expert group formation;
- Carrying out of testing and collecting of expert information;
- Processing, appraisal and analysis and use of expert information.

4. CONCEPTION AND STRUCTURE OF ASPRON

The methodology for anticipation and planning of developmental problems by the method of expert information enables the solving of the following tasks :

- Choice of scientific and other organisations and competent experts in the field which is the subject of anticipation and planning;
- Carrying out of expert opinion and information important for solving the problem;
- Systematisation and mathematical and statistical processing of experts' appraisal and opinions on the problem;
- Analysis of the obtained information and the work out of the corresponding document.

The manual realisation of methodology requires a relatively long period of performing the preparatory phase (choice of scientific organisation and competent experts), and a significant commitment of personnel, material and time resources, in the phase of the expert opinion and mathematical and statistical processing and the analysis of expert information. The solving of these problems is, to our opinion, the automation of some methodological treatments - procedures, as it was done. The effects are evident, the results of the performed tasks are of a higher-quality and more reliable, the operationalization of parts and methodology on the whole is simplified, and it is significantly shortened time for its realisation, costs for experts and carrying out of expert opinion are reduced.

Designing, building and implementation of ASPRON is established according to the following premises:

1. Man plays a leading role, as an expert who is competent for the subject field, but who can know the computer or he needn't know it and the way of its use. The procedure of automation is realised in the interactive dialogue between the expert and the computer system, by the Language accessible to the nature of human communication;

2. Dialogue between the man and the computer system is simple, understandable and natural, because of a dominant expression of the creative spirit of an expert's fancy;

3. Mathematical and statistical processing of expert information is realised in real time;

4. Built software solution enable the organiser of expert-opinion to choose flexibly and unconditionally the available program modules depending on the nature and necessity of solving the tasks;

5. ASPRON always has the support of the corresponding data base where it gathers

necessary data and information about scientific and/or other organisations, experts, the subject of anticipation, i.e. planning and similar.

Consider in short the basic modules of ASPRON.

4.1. MODULE 1 - The choice of scientific and other organisation

The criterion choice of scientific and other organisations as potential participants of the process of expert opinion is done by the module. The module call is realised by the organiser of expert opinion. ASPRON is linked, as it has already been said, with the data base of a corresponding information system, in our experimental application with the IS of science, and it enables us to be informed from the data base about all scientific organisations which in their elementary activity research the scientific problems in the field of the given problem of anticipation and planning.

4.2. MODULE 2 - The choice of experts

Important and exceptionally sensitive tasks are solved by this module: the creation of a wider circle of experts, the choice of competent experts and expert group formation.

The creation of a wider circle of experts also means the review of important data from the database for experts with scientific determination for the field, which is the subject of anticipation and planning.

The choice of competent experts is done from a wider circle of program routines.

The expert groups are formed, depending on inclination and affinity, from competent experts and these groups take part in some phases of expert opinion and solve some program tasks.

4.3. MODULE 3 - The anticipation of the parts of development

In relation to the existing hierarchical structures of the subject problems, the experts are required to determine the paths of development, in the concrete case of science development in the anticipated period. The collected expert information are given to the new group of experts for appraisal, and then a mathematical and statistical processing of the obtained results in the real time is done. The obtained results are the foundation to experts for the anticipation of development, say the scientific paths in the future. The task is completely solved by the dialogue between the expert and the computer.

4.4. MODULE 4 - The anticipation and planning of concrete developmental problems

The concrete developmental, i.e. scientific and scientific and technical problems are identified by the interactive communication between the expert and the computer system. New expert teams validate, by adequate sets of program routines, scientific and scientific and technical problems from the standpoint: actuality, the importance for the development of scientific field and economic branches, socio-ecological consequence and solving time. The obtained appraisals and opinions are processed by the corresponding mathematical and statistical procedures, which immediately give the indicators on the problems which are significant for decision-making in the anticipated period. The results of these decisions are analysed by other automated procedures of

expert opinion, and then the conclusions are drawn about the title and summary of the projects which are to be realised in the future and for which it is necessary to supply personnel, technical, financial and other resources.

4.5. MODULE 5 - The reciprocity of developmental problems and the paths of development

The experts bring in intercorrelative link the prognostic information obtained from previous procedures and classify it in the matrix in order to derive new expert information about the paths of development for solving the anticipated, i.e. scientific and scientific and technical problems. The given opinion about this problem is appraised by the new expert team, and then a computer and statistical processing follows supported by this module. The final results will be used by experts for suggesting the conclusions in determining the priority of paths of development, i.e. what dynamics of development of events can be expected in the anticipated period.

4.6. MODULE 6 - The way of use of ASPRON

The dialogue between the organiser of expert opinion, or the expert, and ASPRON is realised by means of a menu and maps transactions. A multi-level hierarchical structure was built by these types of transactions, which enable the user to "move" in both directions.

Every menu gives information about further course of work and offers the user (the organiser of expert opinion, the experts and etc) to handle and use ASPRON choosing some of the possible activities. Maps ask the inquiries to the user by ASPRON routines and suggest answers. ASPRON determines further course of work, depending on the user's answer.

5. CONCLUSION

Anticipation and planning are the first, the most complex and probably the most significant subfunctions of management. To anticipate and plan is to reduce uncertainty in decision-making. Now when it is very difficult to anticipate and plan by causal and extrapolative methods for "nonformated" problems, as the defining of strategic developmental objectives, directions, projects, research problems and similar, the intuitive methods, expert information and appraisals are the only support. The - methodology of anticipation and planning is therefore developed on the basis of a great number of technique and procedures of the method of expert information. We think that with the designed, built and implemented software package ASPRON we shall give at least a more effective, reliable and productive solution for this complex and for science a very interesting problem.

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PRIMENA AUTOMATIZOVANIH EKSPERTNIH INFORMACIJA U REŠAVANJU NESTRUKTURIRANIH PROBLEMA RAZVOJA

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U radu se analizira koncepcija, osnovna struktura i način primene ASPRON Softverskog proizvoda. Fokus je stavljen na automatizaciju uskladištenja ekspertnih informacija u cilju njihovog predviđanja i planiranja. ASPRON je univerzalan i primenjiv način realizovanja višeciljnih zadataka predviđanja i planiranja. U radu se prezentira konkretna primena ASPRON-a u predviđanju i planiranju naučnog i istraživačkog rada. Korišćenje razvijene metodologije i softvera je interaktivnog karaktera. Takođe su naglašeni i pravci daljeg (budućeg) istraživanja i razvoja ASPRON.