

Decision Support Systems in Management

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Abstract: In the paper the use of Decision Support System in management is analysed. At the part 1 we dealt with the problems of real word perception. The direction of decios making are analysed in the part 2. In the part 3 some problem solution methods are summarised.

Keywords: Management Science, Decision Support System, perception of problems, models

1 Introduction

The analysis of the Decision Support System, (DSS) begins with the evaluation of the problem perception.

The problems appear when the situation we dos not correspond to the ideal situation which we want to reach (see Kindler [5]). In the reality the problem is more complicated. In Figure 1 a real problem is shown which is not equal to the realized situation because of the human observation is not proper. The observed situation is different from our observation because our intellectual power is limited. Several times the perception of the real problem is affected by the characteristics of our personality.

When the real situation is not equal to the observed one, the solution of the problem is not proper because the mapping is different. If the directions of the solutions belong to the sets are characterised by a vector as shown in figure 1, than these directions between the two vectors are approximatly 60°. This is only a quasi demonstration, not a quantitative measurement, but it demonstrates the possible problem.

The solution of the problem could be given in other way too. According to the cognitive dissonance which is known in the psychology – the directions of our actions and our norms could not be different for a longer time periods. If the ideal situation could not be reached the problem could be solved in other way around. In this case it is explained, that the sensed actual situation is ideal.

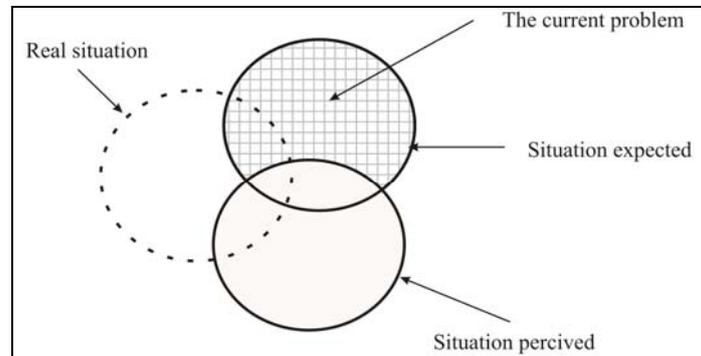


Figure 1
 Problem perception

Some other solutions and semi-solutions are existed, where we reach the ideal situation with our actions (decisions), and at the same time our opinion is modified. That is, we can state that this semi-solution is ideal. After the sensitivity of the problem and the composition of the solution we make the decision. In the course the solution algorithm the above mentioned questions are arised.

The process of the problem-solution is shown is Figure 2.

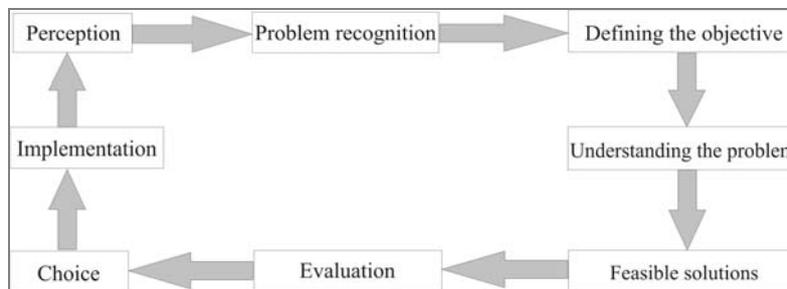


Figure 2
 Problem solution flow

2 Main Approaches in Decision Making

The psychological approach of the decision making deals with the categories of ‘truth’, ‘good’, ‘uncertain’, ‘risk’. It considers what is truth, good, and also, that the given development is positive or negative. Application in practice does not serve reliable result, Recently the societies do not utilise the natural resources properly and it is coming to an end.

The classical economy theories present such models under certainty where the conditions are all given, all information are known, the results are measurable, and the profit could be maximised. Unfortunately, the conditions never or rarely are known in practice, and the decisions are limited to the operative level. In the case of long range decisions different circumstances could occur, because in this planning horizon the information are not exact, the results are not measurable in all dimensions and the maximal benefit could not be reached.

The administrative models approach the reality. The information is also not exact. There are no alternative solutions. The decision makers only realise the actual problem(s). Getting information needs a lot of many, however these are not unambiguous. That is why the decision makers could only decrease the uncertainty of their decision using a limited time horizon and apply the most possible quantitative tools. In order to decrease the cost, simple information are used, and the objective is not maximising the benefit, only a realistic, usable solution which could solve the problem effectively.

It is interesting to mention the Skinner model, which was used firstly in the area of education. The reward is at its major point of view. This model serves good results for a short time horizon. The positive reinforcement is much more powerful than the negative one.

3 Integrated Information Systems

The managers need such information which help them in their decision making process. The integrated information systems have two main tasks:

- Fast and valuable information processing in the firm in the field of transactions (On or Offline Transaction Processing)
- Help the decision making process with valuable information, these are available in the Decision Support Systems, in the Management Information Systems and in the Online Analytical Processing Systems.

4 Management Information Systems

The Information Systems are special integrated systems. Definition of that is the following. (Lucey [6]):

‘... it is a system that is capable of converting information from both external and internal sources, communicating; that is, it forwards the information to managers being on different levels and to all decision functions, where time-oriented

(dependent), effective and responsible decisions should be made for planning, and control'.

The information systems theory, organization and practice are based on different fundamentals

- characterization of information, events, facts
- persons who handle these information
- establishment the theory of complex systems
- research of general decision making processes.

In the centre of the information system is the data base handling: collection, conversion, storing, computing, data search techniques in different levels:

- organization hierarchy of different decision level
- functional divisions horizontally (logistic, marketing, etc.)
- systems based on frequency or responding time (on line, batch processing, transaction processing, daily and weekly needed data, etc.)
- technical and end user (process control, data processing, etc.).

5 Heuristics

It should be noted, however that heuristic (problem solving) may contain several difficulties. The main problems of these approaches are described below

- Easy elicitation
- Accessibility
- Virtual association
- Neglecting prior probabilities
- Sensitivity to sample sizes
- Misunderstanding randomness
- Returning to the average levels
- Insufficient adjustment
- Wrong consequences
- Conjunctive and disjunctive event
- Too big self-confidence
- Straightening trap

6 Optimization Models

Several decision support systems use some mathematical models. These models usually make some optimization. There are some conditions and an objective function. We have to determine such a solution which fulfils the given conditions and formed an optimal solution. This solution could be a minimum or a maximum depending on the desirable goal.

The models have the following general form:

$$\begin{array}{ll} \text{condition} & 1 \\ \text{condition} & 2 \\ \dots\dots\dots & \dots\dots\dots \\ \text{condition} & n \end{array} \quad (1)$$

and the objective function

$$f(x) \rightarrow \min/\max \quad (2)$$

There exists such a model family which do not result the total optimum. Instead of these solutions yields a local optimal only. In a mathematical sense this is not an optimal solution. But in practice the managers, engineers would accept this local optimal solution as a total one.

The applied model depending on the formulation could be linear, non linear integer, stochastic and some other type. Usually the linear model and the linear programming program package is used.

These models solve only a particular decision support problem. That is why several submodels are used. Some of them could be heuristic, others optimization ones depending on the problem to be solved. It is easy to build up a model or change some parameters of them and also easy to get a series of solutions. The manager task is to choose the best solution which satisfies his need.

7 Expert Systems

The Artificial Intelligence (AI) is the activity of providing such machines as computers with the ability to display behavior that would be regarded as intelligence if it were observed in humans. (McLeod [8]). A major subset of AI is expert systems. An expert system is a computer program that function in the same manner as a human expert, advising the user how to solve a problem. The term knowledge-based system is also used. Since the expert system functions as a consultant, the act of using it is called a consultation – the user consults the expert system for advice.

In addition to expert systems, AI includes work in the following areas:

- Perception – The use of visual images and auditory signals to instruct computers or other devices, such as robots
- Learning – The ability of a computer or other device to acquire knowledge in addition to what has been entered into its memory by its manufacturer or by programmers
- Automatic programming – The ability of a computer to code a program from instructions provided by the user in a natural language that resembles everyday conversation.

Each of these areas has the potential for benefiting business, but expert systems offer promise of achievements in computer based solving that have been impossible up until now.

An expert system differs from a DSS in two major ways. First, a DSS consists of routines that reflect how the manager believes a problem should be solved. The decisions produced by the DSS therefore reflect the manager's style and capabilities. An expert system, on the other hand, offers the opportunity to make decisions that exceed the manager's capabilities. For example, a new investments officer for a small life insurance company can use an expert system designed by a top financial expert with years of experience.

The second distinction between an expert system and a DSS is the ability of the expert system to explain the line of reasoning followed in reaching a particular solution. The explanation of the reasoning is more valuable than the solution itself.

A DSS provides decision support in the form of periodic and special reports and the output from mathematical simulations. The data used by these DSS programs is primarily numerical, and the programs emphasize the use of mathematical routines. However, the data used by expert systems is more symbolic, often taking the form of a narrative text. The programs of expert systems emphasize the use of logic routines.

When confronted with a problem, you would favour an expert system over a DSS when:

- The problem involves the diagnosis of a complex situation or the drawing of conclusions from a large volume of data.
- There is a degree of uncertainty in certain aspects of the problem.
- It is possible for a human expert to solve the problem in a reasonable amount of time.

In sum, an expert system should be used when the problem solution consists of a type of reasoning that normally is provided by the user but can be defined and programmed into the computer.

8 The Value of the Information Systems

Firstly the quality and the quickness are paid: the managers get the information in time, provide the proper answer for this question, get the exact solution and most important; that the systems was reachable.

Secondly it was paid that the manager could use the unusable data mass: for the aggregation, the analysis the proper form.

The information systems serve information on the basic of manual, formalised, measurable data (piece, money, second, etc.). Their values could be increased by data analysis, but with measurable data.

We pay for which worth nothing. This contraction based on, what the digital information could be doubled, send for anybody to anywhere. What the information system can do: save his value limit his reachability, beat the system. We pay for not getting information too. The sole of the information systems are to serve more and good information. But some cases it is not desirable to get information. In the case of news, letters, and some other information a filter is desirable which do not allows posting several context. If our systems are not able to reach this, than a lot of time is needed to process the unuseless information by the user.

How the Information System could serve to the business processes?

The Information System serve as a technology and information, and the result of these two areas give more then individual separately in singular menner. The managers task is to decide what is his expect action to the system. The Information System analyst could answer what the system is able to serve, and what it can not. Alter [] gives some example to make perceptible the bounds.

Sometimes the managers are not interested in the development of the system. Theirs interests are in the business, to produce more goods, more profit. They are interested in getting the proper information in time for helping them in the decision process.

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