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EXACT METHODS IN MANAGERIAL DECISION

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Abstract. Decision making is one of the fundamental management activities that by its quality significantly affect the results and efficiency of economic units. Managers at various management levels should therefore put into their daily practice a set of exact methods which are important to ensure the required quality of decision-making solutions of problems. Using the exact methods in managerial decision-making will gradually supplement and replace intuitive methods of decision-objective methods that allow more variants of problem solving and have a mechanism that ensures the optimal selection of a variant on the basis of established criteria or a set of criteria.

Keywords: exact methods; operational research; managerial decision, managers, criteria.

Jel classification: M10

1. Introduction

Decision making represents one of basic managerial activities, what is in a significant extent influencing results and effectively of operations of business units operations by its quality level. Managers on respective managerial levels therefore should adopt certain group of exact methods, which are important for ensuring of required quality level of solving of decision making problems. The article describes importance of managerial decision making through use of exact methods what is proved by survey (Szabo *et al.* 2008).

2. Managerial decision

One of the most important activities delivered by managers at organizations (in certain cases it is understood even as a kind of core management), is decision making. Nowadays, we have to do decisions in all kind of activities we make, should it be routine or single activity. If companies want to survive within current turbulent environment, then their managers have to make decisions in time and accurately, too. It is not sufficient when managers do react on current situation of company/environment only. It is important to have managers which not only predict the future, but also influence it by their decisions.

Decision related problems can have various form, structure, importance or difficulty level for solving. Different approaches, different procedures might be suitable for respective problems. There are certain types as of decision making corresponding to these approaches and procedures. To make it more simple, we can diverse them by certain features or criteria, e.g. by way of deciding, by taking part of more persons in decision making, by complexity, by extent of information given about future values of factors which significantly influence results of decision making etc.

Decision is the result of solving a decision problem (Hudymáčová, Benková 2011), i.e. it is determining of most suitable possible variant of action on object of decision making with regard on target, criteria and options. Decision will always respect most acceptable combination of own interest and estimation of probable state (motion, change, development) of other relevant conditions. Each decision must have its goal (what purpose it is serving), each decision is usually one of possible variants of how to achieve the target. (Rozhodovacie procesy 2011).

There are unlimited options of partial targets or expectations. An effort to ensure them will strongly influence the quality of deciding. Monitored target in decision making process will be usually (Rozhodovacie procesy 2011):

- a set of respective preferences
- compromise between them
- result of evaluation of expected state or development of external conditions.

From this we can assume that the content of decisions will be influenced by (Rozhodovacie procesy 2011):

- factors which are controllable, markedly, influenced (e.g. value of own property, loan conditions),
- factors which are not thoroughly controllable (e.g. price),factors which are unknown, non controllable (weather, new invention etc.).

Most serious mistakes in decision making (Decision making in crisis management):

- not correct recognition/knowledge and assessment – this whole group of mistakes arises:
- as a result of ignorance, when suitable and needed information are not available,
- by a mistake, when information are known and available, consequences of variants are also known, despite these least suitable variant is chosen,
- mistaken assumptions, mistaken formulations – they are closely related to defining of information needs:
    - what information are essential, decision making without them is not possible,
    - what information are usable, in case essential information are not available, but it is not possible to ensure quality of decision,
    - what information are sought after, with their help we try to decrease risk factors in decision making,
- information are substituted by suppositions – missing rules for working with information and missing communication rules, information discipline is missing,
- difficulties are not realized, what is also related with information discipline,
- mistakes arising from forgetting – usually things which are not worth attention are forgotten, therefore information priorities needs to be classified (what is and is not essential),
- language mistakes – all management is based on principle of language/action. However, language carries also half truths and verbal prefers, verbal communication is not always unambiguous and can be uncertain.
- choosing of one options only and neglecting of further variants of solution,
- mistakes in selecting non correct/ not suitable method in decision making,
- insufficient knowledge and experience with use of exact methods in decision making etc.

Managers use group of methods and techniques (Horňák 2007), standardized as well routine procedures for delivering their decisions. Selection and use of these tools depends among other things on feature of decision related problem, feature of situation and especially on targets, on main heading of organization.

Decision methods and techniques can be diverged by various criteria. Depending on part of empirical and theoretical approaches in respective methods, and depending on level of creativity we can divide them as follows (Rozhodovacie procesy 2011):

- empirical methods – intuitive, analytical, expert (finding: survey, Delphi method, devil's advocate method, methods of creating variants, brainstorming, method 635 etc.) (Čambál *et al.* 2011). Many of them use advantages of brainstorming and respect its principles: freedom of ideas (dividing of phase of its arising of creative idea from phase of its evaluation), preferring quantity to quality, loss of author rights, prohibition of critics (Čambál 2007). Brainstorming, however is grouped in empirical methods, but idea generating process includes also parts of heuristics (sudden inventing) (Bestvinová *et al.* 2008; Gyurák, Babeľová 2010)
- exact methods – statistical methods, radial coordinates, simulation methods, mathematical programming (linear, nonlinear, stochastic, dynamic, parametric, theory of games, theory of queuing and other methods of operational research (Jablonský 2007; Hrablik Chovanová 2007; 2009),
- heuristic methods – „inventing" - methods which use manager's experience and creative abilities, often they are a combination of methods: e.g.: decision table, decision tree, decision analysis (it is most common and most revised decision model) and others (Hudymáčová, Benková 2010; Hrablik Chovanová *et al.* 2010).

3. Exact methods

Exact methods are in practice often successfully used especially in repeated situations (Hrablik Chovanová, Sakál 2011), where is the possibility of advantageous use of computers; in case of single actions they can be advantageously used mainly for their planning.

Exact methods used in decision making are based both on knowledge form classical mathematics and statistics and on knowledge from system and operational research (Kuncová, Lagová 2007).

Exact methods in decision making could be divided into three groups:

- methods of mathematical statistics theory of probability, correlation analysis, time series analysis) (Urdziková *et al.* 2011),
- methods of mathematical analysis and linear algebra (differential calculus, extrapolation, matrix calculus) (Gros 2003),
- methods of operational research (mathematical programming, structural analysis, network analysis, queuing models etc.) (Fiala 2004).

4. Survey of managerial decision

Within the project VEGA (1/2601/05) "Development of plant management and decision processes in conditions of integration" (project leader doc. Ing. Ľuboslav Szabo, CSc.) a questionnaire survey was made by Szabo *et al.* (2008) survey team (author was not team member) in Slovakia with main target to describe factors which influence managerial decision and to identify most frequent mistakes which are done by managers in decision making.

Survey sample consisted of 264 managers active in Slovakia at various levels at organizations and within various specializations. The survey focused on fields as follows: sources of information needed for decision making and their form, ways of acquiring information and use of respective types of information systems for support of decision making processes. A brief characteristic of survey, which was processed by (Szabo *et al.* 2008), is described further in article.

Decision making does not depend on available information only (Saniuk, Saniuk 2009), it also depends on knowledge, skills and experience (Majtán *et al.* 2007) of "decision maker", which enable smaller information need in problem solving in cases they met similar problem already and their decision that time was correct, or in case of an incorrect decision feedback was afterwards successfully used.

During the survey most important features of information (Fig.1) were being ascertained, which are:

- timeliness (16.67 %),
- completeness (16.12 %),
- availability (12.93 %),
- reliability (11.16 %),
- clarity (10.06 %),
- controllability (8.68 %),
- truthfulness (6.20 %),
- relevance (5.65 %),
- flexibility (4.27 %),
  - accuracy (4.27 %),
  - exactness (2.34 %),
  - low costs (1.65 %).

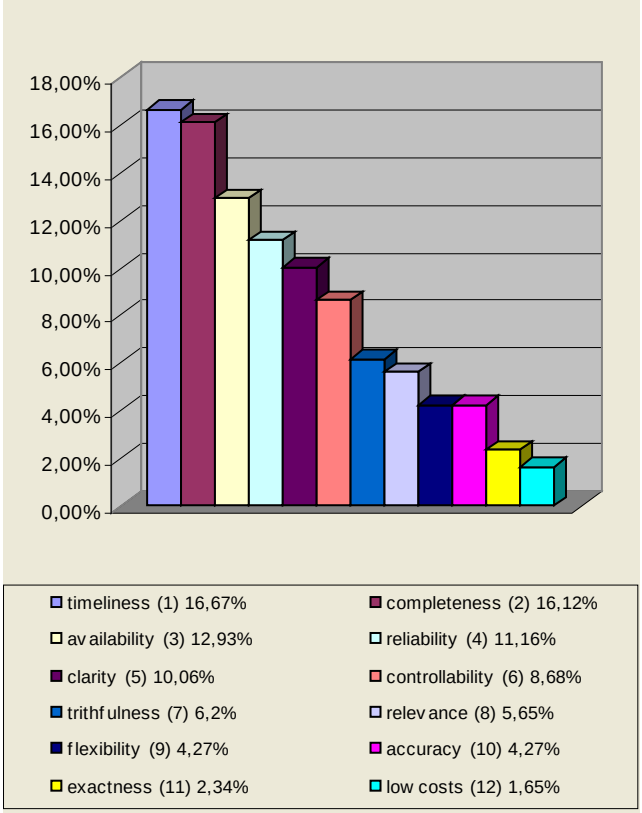

Fig.1. Most important features of information in % (Szabo *et al.* 2008)

From mentioned it follows, that managers consider in time delivery its timeliness of information as most important aspect of information, which however cannot be at cost neither of its reliability nor truthfulness. Low cost spent on acquiring information is not considered especially noticeable requirement by managers (Vidová 2010), whilst majority of companies has their information systems (IS). IS help in decision making and expenses for its acquiring and consequent maintenance are not negligible (Szabo, Jankelova 2007).

Most important sources of information considered by managers are shown in Fig.2. More than a fifth of managers said, they mostly use own knowledge and experience. From picture also follows that they use subordinates information potential in a not sufficient extent (only a one tenth). This fact is remarkable mainly thanks to tendency of filling managerial positions with generalists, which are surrounded by specialist form various fields.

From survey results it follows that managers rely in biggest extent on themselves, they prefer own experience and intuition. From their statements it also follows that they acquire more than a half of information from external environment if company independently of levels they are working in (Fig.3).

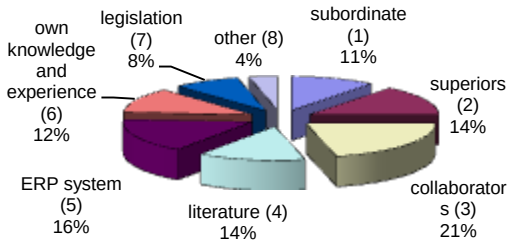

Fig. 2. Sources of information for managerial decision making (Szabo 2008)

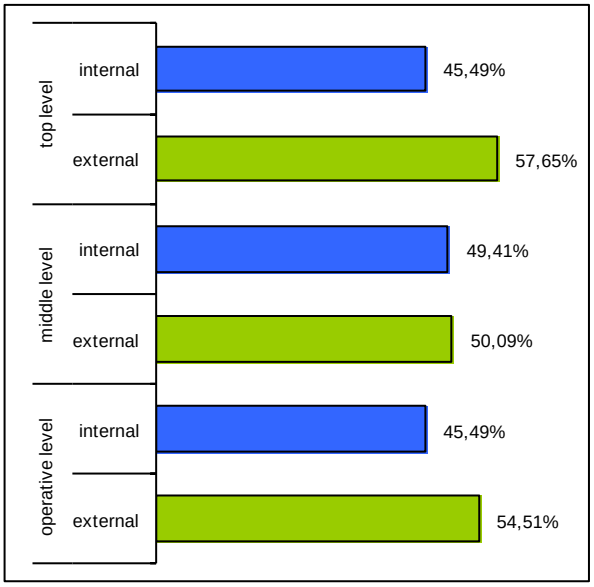

Fig.3. Ratio of internal and external sources of information for decision making process in % (Szabo *et al.* 2008)

From Fig. 4 it follows that more than three fourths of managers consider available amount of information for decision sufficient. Some of surveyed managers feel that part of given information is not relevant for them and it unnecessarily loads them. In this relation also results of other surveys become interesting which say that not every additional information brings about a better decision (Urdziková, Molnárová 2007; Jakábová *et al.* 2010).

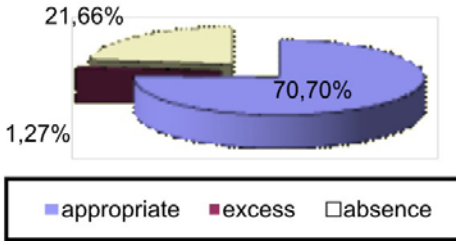

Fig. 4. Amount of information for making a decision (Szabo 2008)

The survey has been detecting also the way how managers use information systems (Table 1).

Based on answers it also followed that as many as 91.07 % of companies have IS, but they are using in small extent add-ons for support of decision making ((some managers are not using it at all).

Based on further similar surveys it follows that these are possible reasons of incorrect company decisions:

- low possibility of finding whether company uses all its opportunities in management and deciding (Saniuk, Saniuk 2010),
- not sufficient availability or abilities of suitable "decision makers",
- communication problems,

Table 1. Availability and use of IS to support decision-making processes (Szabo *et al.* 2008)

Type of information system	**IS is available (no. of managers)**	**IS is used by (no. of managers)**	**Relative use of IS (use/availability in %**
Company information system (PIS)	217	213	98,04
Managerial information system (MIS)	91	75	82,81
Decision supporting system (DSS)	45	39	87,50
Group decision supporting system (GDSS)	13	12	88,89
Expert system (ES)	18	11	61,54
Executive information system (EIS)	10	7	71,43

- in some cases still remaining not sufficient support form company management,
- lack of compelling vision/strategy,
- IT/IS are not used for supporting decision making,
- No use of "simulation environment" in decision making, simulation is still being done on real models however simulation would significantly decrease costs in incorrect decisions,
- "decision makers" are not trained enough for methods for supporting decision making, vast majority of them decides "only" based on their own experience and knowledge, etc.

5. Conclusions

Use of exact methods in managerial decision will enable continual complementing and substituting of intuitive decision methods with more objective methods which enable multi variant solving of problems and they have mechanism that ensures selection of most advantageous variant based on given criteria or criteria's.

Many universities have in their study programs subjects who teach and prepare graduates to do decisions they will face in their professional lives (Witkowski 2011; Witkowski *et al.* 2000). Students/graduates then are able to decide not only based on recommendations from their environment, but after using a suitable exact method they can confirm/contradict correctness of their decision.

Fields, where exact methods are being used, are continually extending, they are e.g.: planning and management of production, optimization of production program, optimization of transportation, management of a group of complex and each other following activities etc. Therefore, it would be suitable to create conditions for implementing/use also for companies which are not using exact methods yet, by:

- to create an environment for communication to business practice (Jacinto Assuncao, Molnárová 2006) about need and advantages of use of exact methods in their decision making (Jakábová *et al.* 2010; Urdziková *et al.* 2011),
- to extend the use of exact methods (methods of operational research) in business practice and at universities,
- to create conditions for training employees/decision makers and ensure consultancy support,
- to extend and make more detailed the preparation of qualified employees for the practice,
- to extend co-operation between universities and leading Slovak and foreign companies,
- to extend research in field of new methods and ensure fast transformation of suitable methods into conditions of business practice.

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