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DECISION ANALYSIS IN PROJECTS WITH WINQSB SOFTWARE

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Abstract: *Starting with an introduction discussion about the decision process and IT systems for decision assist, this paper introduces some aspects about the advantages and disadvantages of the Decision Analysis module and of using it in a project. The case study presents a real situation of a manufacturing company, which wants to launch a new product with more possibilities. The problem was solved using WinQSB software to assist the better economic decision. I wanted the evaluation of economic consequences (both running costs of production and estimated profits) for each possible situation based on data assumptions.*

Key words: *decision system, IT systems to assist decision, decision analysis, WinQSB.*

1. INTRODUCTION

The decision process represents all the phases through which to prepare, adopt, implement and evaluate the decision. Decision statements in the company are varied and leading to heterogeneous decision-making processes in terms of constructive and functional parameters. This is why it requires an analytical approach of the main elements involved in decision-making [1].

For decision-making to be efficient, decision makers need to progress fast in order to cope with difficult situations and requirements arising from changes occurring in micro and macroeconomic environment. Depending on environmental conditions in decision-making situations occur, which may be certainty, risk, uncertainty and fuzzy [1].

The enterprise decision system means all decisions taken and applied in it have and structured according to objectives and management hierarchy. Decision system (SSD) with information system (SSI) and operating system (SSO) make up the enterprise management system (Fig. 1) [2].

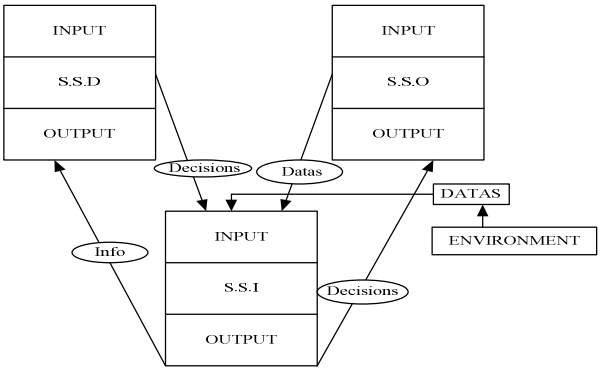

Fig. 1. Enterprise management system.

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The objectives of the article are to present the decision process of the enterprises, IT systems to assist decision and their support systems. In addition, the article originality is the presentation of *Decision Analysis* module and solving a real case with it.

Streamline decision process represents planning and operational decision-making is in terms of defining content, tools and methods, ways to implement, subordinate permanent accomplish economic, technical, human and managerial objectives, precisely defined. The advantages of efficiency decision are high capitalization of the organization resources, increase profitability.

2. INFORMATION SYSTEM FOR DECISION ASSIST

The information systems for decision support (SIAD) are intending for managers and show that efficient fundamental objective the decisions efficiency, unlike the TPS systems dealing with efficiency and consistency of data. A SIAD is extensible and able to support instant analysis and managerial decision modeling, used on a unknown and irregular period and mainly oriented processes and future events [3, 4 and 7].

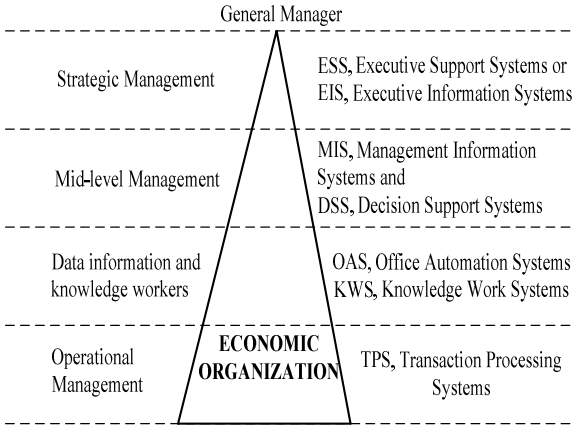

Fig. 2. Information systems according to management levels.

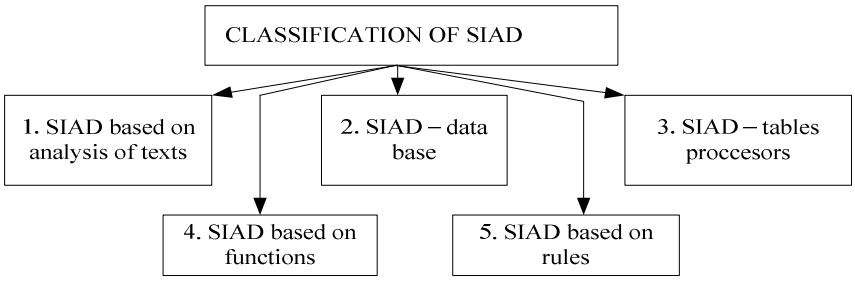

Fig. 3. Classification of information systems to assist decision.

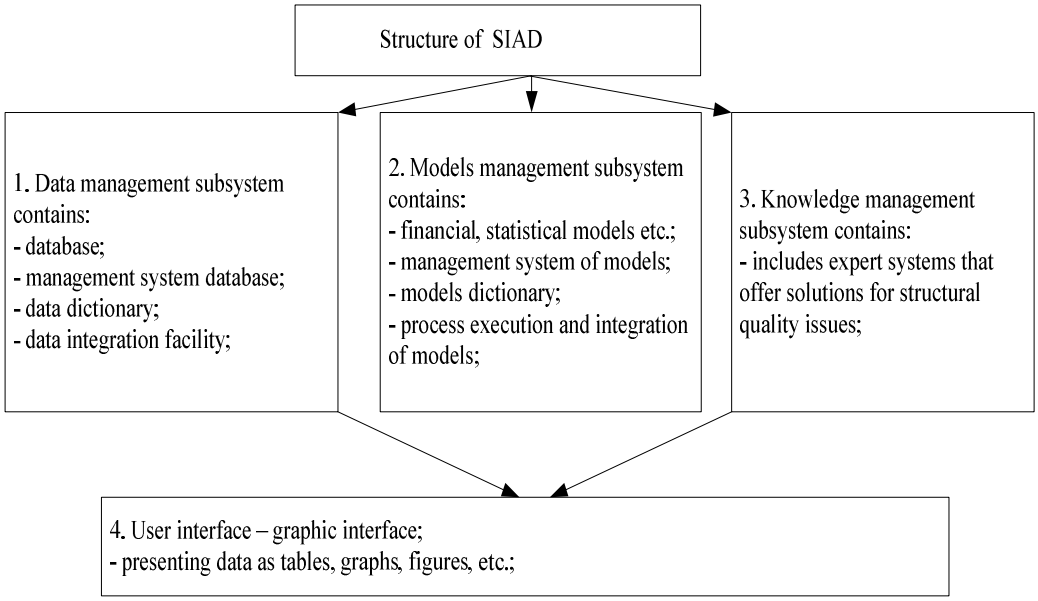

Fig. 4. The information systems architecture.

Economic integrated information systems have in their composition, according to management levels of economic organization dedicated information systems (integrated horizontally), as in (Fig. 2).

A system for assisting the decision is an architecture seen together, which requires a permanent dialogue with the user, but the final decision is adopted by the user not by the system.

The main features of SIAD (DSS) are: solving those problems which can't be solved with systems for quantifying quantitative; role to assist decision makers (managers) on an individual or group level at all stages of decision-making process; solutions are obtained through manipulation of data, information searches, models, calculations; response time to obtain an acceptable solution is limited [5].

In making SIAD systems (and beyond), is considered a set of features. Among these features, the most important are [5, 7]:

- To be flexible and provide more options for managing their data and interim and final evaluation;
- To be capable of handling a wide variety of styles, skills and classifications;
- To be based on more intuitive analytical models and evaluate data and have the ability to track multiple alternatives and consequences;
- To reflect the understanding of groups and organizational decision-making processes;
- To reflect and recognize the limits of computer systems.

3. SUPORT SYSTEMS FOR DECISION ASSISTS

Like other types of information systems, the SIAD is base on software support environment that provides maintenance, development and function; they operated in an environment created by the support systems for decision assists (SSAD) [5, 8].

Functions of SIAD are data management, management models, management of knowledge and communication between user and system management and between data and models, knowledge [5, 9]. Support systems for SIAD (SSAD) have the following subsystems in it architecture (Fig. 4).

4. CASE STUDY SOLVED WITH WINQSB

Decision Analysis module solves the problem of decision in two cases [6, 8 and 9]:

a. Decisions Table;

b. Decision Tree.

a. Decisions Table. Identification of multiple-choice decision of state objectives of "nature" and defining decision criteria, leading to, describe the proposed

situation using a decision model under uncertainty conditions. To determine the best decision will consider the following reasoning:

1. Identify the states of nature;
2. Identify the decision choices;
3. Identify the expected economic consequences for each combination: costs type and profit type consequences.

For treatment decisions under uncertainty, we recommend using one of the following decision criterions:

- *Wald* criterion (pessimistic criterion): It recommend choosing the variant which bring the highest profit (the smallest possible loss, in case of costs consequences) in the worst state of nature.
- *Laplace criterion*: It recommend choosing the variant which bring highest average profits (the lowest average loss), assuming that all states of nature are equally likely to occur.
- *Savage criterion*: It recommend choosing the variant which bring the smallest possible regret, regret understood by the utility lost due to selection of a decision other than the optimal choice in terms of complete information.
- *Hurwicz criterion* (optimistic criterion): It recommend choosing the variant which bring maximum profit (for the most favorable state of nature). It use a optimistic coefficient $\alpha \in [0,1]$.

b. Decision Tree. Decision trees includes in a logical sequence all combinations supported a decision alternatives and states of nature.

Example. It is considering the case of a production company, which wants to launch a new product. Business managers consider three possible scenarios of market acceptance of products, which can be favorable, medium favorable or unfavorable:

- The product to be easily accepted and to sell all 100,000 pieces; (S1).
- Relatively easy to sell product on the market in quantities of 75,000 pieces; (S2).
- Of product to sell only 1,000 pieces; (S3).

The management company has three product options in factories manufacturing F1, F2 and F3 (Table 1). The options differ by fixed costs and variable cost of production development unit.

It aims to assess possible economic consequences for each situation depending on the assumptions of market acceptance of product.

An estimated selling price of the product market will be 35 monetary units (u.m.).

It is required to determine the most appropriate strategy for manufacturing the new product for the company (assuming that the probability of manifestation of the state of nature is not known, the criteria will apply Wald,

Table 1

The product options in factories

Factory	Fixed costs [Thousands u.m.]	Unit variable cost [u.m. / piece]
F_1	2000	13
F_2	2100	10
F_3	2300	7

Laplace and Savage and Hurwicz criterion will be considered for $\alpha = 0.8$) .

Solution: Data entry is achieved by using the interface shown in Fig. 5.

Consequences of **costs** type: Assuming rapid market acceptance of products and the selection of a subsidiary to manufacture the product, the total costs (*CT*) are calculated: $CT = CF + CV$; $CV = Cv * Np$, where, *CT* represents the total costs, *CF* – fixed costs, *CV* – variable costs, *Cv* – variable unit cost, *Np* – number of products (Figs. 6 and 7):

$$CT(O1,S1) = 2000 + 13 * 100 = 3300 \text{ u.m.}; \quad (1)$$
$$CT(O2,S1) = 2100 + 10 * 100 = 3100 \text{ u.m.}; \quad (2)$$
$$CT(O3,S1) = 2300 + 7 * 100 = 3000 \text{ u.m.}; \quad (3)$$
$$CT(O1,S2) = 2000 + 13 * 75 = 2975 \text{ u.m.}; \quad (4)$$
$$CT(O2,S2) = 2100 + 10 * 75 = 2850 \text{ u.m.}; \quad (5)$$
$$CT(O3,S2) = 2300 + 7 * 75 = 2825 \text{ u.m.}; \quad (6)$$
$$CT(O1,S3) = 2000 + 13 * 1 = 2013 \text{ u.m.}; \quad (7)$$
$$CT(O2,S3) = 2100 + 10 * 1 = 2110 \text{ u.m.}; \quad (8)$$
$$CT(O3,S3) = 2300 + 7 * 1 = 2307 \text{ u.m.}; \quad (9)$$

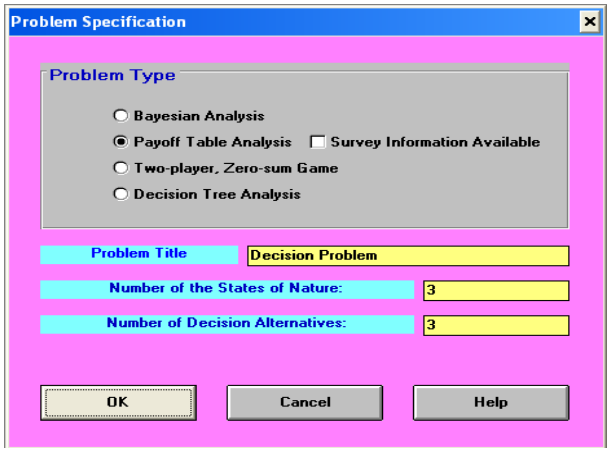

Fig. 5. Interface for data input.

Decision \ State	Scenario 1	Scenario 2	Scenario 3
Prior Probability	0,1	0	0
Option 1	3300	2975	2013
Option 2	3100	2850	2110
Option 3	3000	2825	2307

Fig. 6. Calculation of costs.

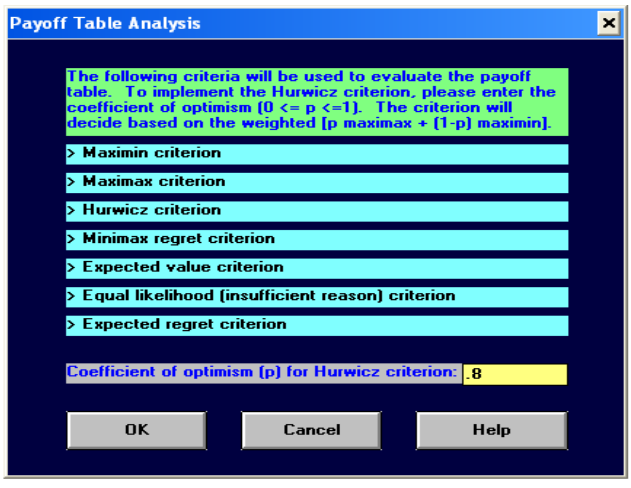

Fig. 7. Analysis result based on Hurwicz criterion.

10-10-2011 Alternative	Maximin Value	Maximax Value	Hurwicz (p=0,8) Value	Minimax Regret Value	Equal Likelihood Value	Expected Value	Expected Regret
Alternative1	$2.013	$3.300**	3.042,60 lei**	$294	2.762,67 lei**	$3.300**	0**
Alternative2	$2.110	$3.100	$2.902	$200**	2.686,67 lei	$3.100	$200
Alternative3	$2.307**	$3.000	2.861,40 lei	$300	2.710,67 lei	$3.000	$300

Fig. 8. Solutions in case of costs type consequences.

The solutions in case of costs type consequences are given in Fig. 8.

In case of profit consequences type version, the decisional matrix is completed, with total profit for each cell in part: $Pr = V - CT$ where, Pr represents the total profit, V – incomes (Figs. 9 and 10):

$$Pr(O1,S1) = 35 * 100 - 3300 = 200 \text{ u.m;} \quad (10)$$
$$Pr(O2,S1) = 35 * 100 - 3100 = 400 \text{ u.m;} \quad (11)$$
$$Pr(O3,S1) = 35 * 100 - 3000 = 500 \text{ u.m;} \quad (12)$$
$$Pr(O1,S2) = 35 * 75 - 2975 = -350 \text{ u.m;} \quad (13)$$
$$Pr(O2,S2) = 35 * 75 - 2850 = -225 \text{ u.m;} \quad (14)$$
$$Pr(O3,S2) = 35 * 75 - 2825 = -200 \text{ u.m;} \quad (15)$$
$$Pr(O1,S3) = 35 * 1 - 2013 = -1978 \text{ u.m;} \quad (16)$$
$$Pr(O2,S3) = 35 * 1 - 2110 = -2075 \text{ u.m;} \quad (17)$$
$$Pr(O3,S3) = 35 * 1 - 2307 = -2272 \text{ u.m;} \quad (18)$$

The solutions in this case are given in Fig.11.

Decision \ State	Scenario 1	Scenario 2	Scenario 3
Prior Probability	0,1	0	0
Option 1	200	-350	-1978
Option 2	400	-225	-2075
Option 3	500	-200	-2272

Fig. 9. Calculation of costs.

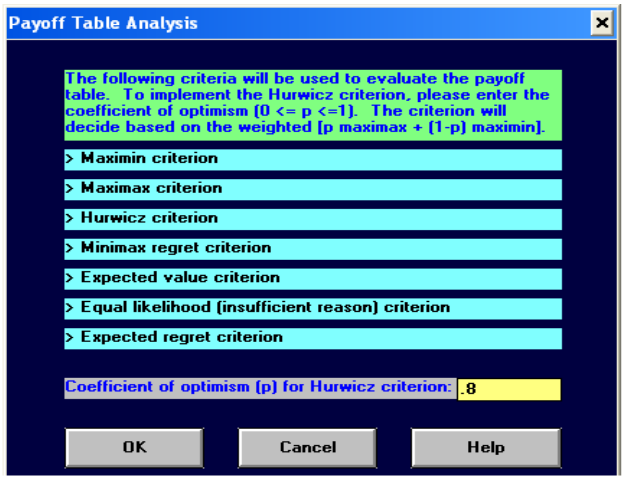

Fig. 10. Analysis result based on Hurwicz criterion.

10-10-2011 Alternative	Maximin Value	Maximax Value	Hurwicz (p=0,8) Value	Minimax Regret Value	Equal Likelihood Value	Expected Value	Expected Regret
Option 1	($1.978)**	$200	-235,60 lei	$300	-709,33 lei	$200	$300
Option 2	($2.075)	$400	-95,00 lei	$100**	-633,33 lei**	$400	$100
Option 3	($2.272)	$500**	-54,40 lei**	$294	-657,33 lei	$500**	0**

Fig. 11. Solutions in case of costs type consequences.

5. CONCLUSIONS

This article presents the decision-making process in business of the enterprises and the information systems for decision support. Solving the case study using the *Decision Analysis* module of WINQSB software offers a new vision of assisting decision and choosing the right economic strategy of many for a company.

The article results can be put into practice exactly in the mode that have been, or can be modified according to the needs of the project. The software used provides a wide range of application in practice.

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