FORESIGHT MANAGEMENT SUPPORT SYSTEM FOR SMES

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Abstract

The paper brings forth the authors research regarding the creation of a system of models designed for forecast management of SMEs with customization on projected production management, base component of forecast management.

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INTRODUCTION

In the current context of economic crisis, SMEs are facing a very difficult period, and that is why they have a great need for good managers, to help them overcome this crisis. Any economic crisis is preceded by a management crisis. At the moment, management is facing big problems and that is why SMEs need people that know and are able to manage the situation. The time has come for the economic environment from our country, both new and old firms, to use a strategic approach. Despite the fact that the economic environment has several negative implications a well-established vision of the future is needed, preceded by solid theoretical arguments. It makes no sense to wait for things to go the way we want them to without getting involved.

The fact that more and more western companies use strategic management represents a guarantee for Romanian companies, who are in search of their identity, that by using strategic management they can overcome the challenges of the Romanian economic environment, as well as benefit from this new method of managing added value. These benefits contribute to improving the quality of management, increasing the competitiveness of companies, and their profitable adaptation to new demands and challenges.

In the context of a globalized economy, SMEs must be prepared to face a wide range of economic turbulences that can disturb the internal economic environment through contagion phenomenon and it forces the managers to adapt their strategies and actions accordingly[4]. The economic and financial crisis monopolized economies all around the world in recent years, having a negative impact on the evolution of the entire economic environment and especially on SMEs activity. In such a situation, SMEs must establish adaptive evolutionary trajectories as soon as possible, in accordance to the economic environment evolution and the markets where they operate in. Managers will be faced with unprecedented problems of adaptation, reason for imposing a suitable tool in their support. A tool like this is *management forecasting* which allows: assisting the action decision; ensuring coherence and coordination between different processes in SMEs in order to achieve their objective; communication and mobilization with upward and downward flow of tasks and progress towards the objectives; managing actions by setting goals, checking the disparities against the ones in progress and timely adoption of corrective measures. Forecast management aims to set targets for SMEs, in which strategic and tactical decisions are prevalent, which gives it a strong anticipatory aspect.

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MATHEMATICAL SUPPORT OF THE FORESIGHT MANAGEMENT SUPPORT SYSTEM

It is known that in order to implement a forecast management system the activities and the structure of company must be known as well as analytical accounting data.

The needed steps for implementing forecast management are:

- there must be identified qualitative and quantitative differences between the current and the desired state in a given times horizon;

- a policy must be defined in order to reduce the differences from the given time horizon;

- possible evolution strategies are implemented and the implementation process is controlled[5].

It is know that the primary components of forecast management are strategic management and budget management. In turn, strategic management is composed out of 2 phases: a *strategic* one in which *forecasts and plans* are developed and the second phase is the *operational* one in which operational programs and the budget management interface are developed[6]. Budget management is carried out by means of a budget system that is only implemented in the first year of activity[7].

Basically, to implement foresight management in a company, the time horizon of the forecast and its initial state must be specified. Then the following steps are taken: defining the objectives, identifying the strategies, analyzing them and choosing the best one[89].

Action strategies are either for specialization, diversification or restructuring, or for expansion, merger, etc. In practice, multiple strategies can be used, and most of the times it is necessary, in order to achieve the chosen objectives. For each strategy a number of assumptions are made for the forecasted period and longtime forecast variances are made. The degree of plausibility of the assumptions determines the viability of each variant. Usually *optimistic, pessimistic* and *probable* assumptions are used.

As stated above, at the base of SMEs strategic management lie the forecasts and plans. Usually, in order to forecast SMEs activity we resort to simulating the structure of economic indicators that reflect the system activity. This implies structuring the indicators in a specific manner and knowing the relations between them. The production will be represented in a system of indicators through commodity production and global production, and possibly production of the major product groups (physical indicators) expressed in units or in conventional measurement units. In such cases, the connection with other synthetic indicators from the system will be made with the use of parameters (cost and profit per leu or measure of physical indicators[10]). In practice, each decider has his own approach based on his experience and the volume of information that decreases with increasing forecast horizon. Therefore procedural simulation models are developed in order to take into account all these variations, and the interpretation of intermediate and final results will require decision makers reasoning. They give a primary role to the algorithm and a secondary one to the model. Their specificity and necessity is explained by the fact that mathematical models are not capable of assuring the jump of company from imminent bankruptcy to eminent success, which sometimes can be

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achieved by hums. Therefore, in many cases it is advisable to integrate human decision nodes in the course of solving the model, thus forming *procedural chains*. By procedural chains we mean a succession of logical procedures that adapts different methods and quantitative techniques of modeling to the computer, and by procedure we mean a sequence of operations performed in order to solve a problem (Figure 1).

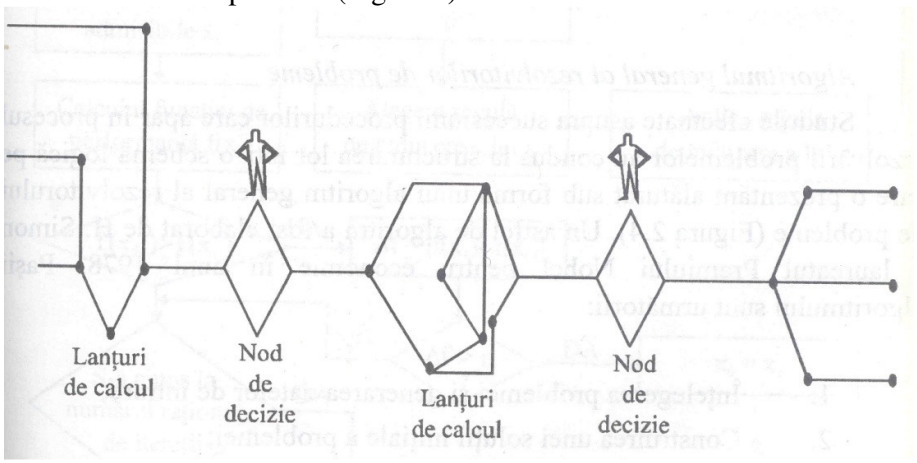

Fig. 1 The general scheme of a procedural chain

The sequence of procedural chains that integrate components of human decision, the decision marker`s creative thinking that, from the result obtained by testing the quantitative modeling chain, takes the decision to continue certain sequences of a new chain of calculations and the problem`s solution is obtained in real-time is called computer assisted procedural modeling.

It is based on the idea that man cannot be excluded from managing a system, because he is the main source formulating the hypothesis regarding the behavior of the system and the only one able to comprehend in integrative reasoning the results of various development options it has.

Most procedural models are based on the principle of simulation whereby the decision maker makes decisions based on the knowledge acquired on the object led, experience and working hypothesis made about its behavior. The computer simulates the evolution of the driven object according to decisions, providing the decision maker the consequences of these decisions upon the object. Based on the obtained analyzes, the decision maker either accepts them, either formulates new hypothesis and adopts new decisions. This process (dialog) is iterative, often leading to self-improving of the man-machine system. The forecasts are made exclusively with procedural modeling.

For the planning we turned to flexible optimization because planning models aims at harmonizing the objectives with the resources. In the harmonizing process frequently there are incompatibilities between objectives resulted from forecasts and the available resources on the plan horizon. Therefore, harmonization aims at simulating strategies of correlating the objectives with the resources in different possible hypothesis: the objectives remain fixed and the minimum resource surplus needed to achieve them is determined; the resources are fixed and we must determine the minimum changes to be made to the forecasted objectives in order to achieve them; it is possible to relax both constraints and objectives in order to identify the minimum necessary resources additional and the minimum deviations from the forecasted goals in order to achieve compatibility between objectives and resources. Nodes of human decision are involved in the simulation of plan structures in defining the categories of restrictions to be relaxed and simulation of variations for different specific consumption of resources.

The architecture and functionality of the foresight management support system

The architecture of the foresight management support system includes, in synthesis, the following modules:

For the forecast activity:

1. The user interface
2. The generation sequence of the simulated economic indicators
3. The mode of selecting and generating the simulation procedures of each simulated indicator
4. Analyzing and validating partial / final simulation results

For the planning activity:

1. Selecting the forecasted indicators for the given period
2. The user interface
3. The mode of generating the mathematical model of harmonizing the resources with the forecasted objectives
4. Flexible optimization of the plan
5. Analyzing the surplus / shortage of resources

For the forecast activity:

- the system highlights the economic indicators that can be simulated with the help of the designed software. For example, in the case study the following economic indicators have been used: Commodity production (CM), Gross profit (P), Production cost (C), the number of productive employees (N), Labor productivity (W), the value of Investments (I).

- requires the decision makers to choose a series of the indicators in the order of their priorities. Possible successions: 1) CM, P/C, C/P, N, W, I; 2) P/C, C/P, CM, N,W, I; 3) N, CM, W, C, P, I; 4) W, N, CM, P, C, I; 5) C, CM, P, I, N, W and so on.

- requires imputing the selected indicators initial state (their values in the base year). The initial state (base year) of the indicators must be known and can also be automatically selected from the database or inputted by the decision makers. Thus we will have CM_0, P_0, C_0, N_0, W_0, I_0.

- requires the decision makers to select one of the procedures to generate the evolution of each indicator (there are several procedures provided by the software). For example: a) annual exhaustive values are given for a desired indicator; b) the annual average growth rate is given; c) the interval in which the annual growth rate is generated is given; d) the indicator`s final value is given and the annual growth rate is calculated; e) the interval in which the indicator`s final value is generated is given. If CM is a priority of P or C, the annual percentage of one of these indicators in CM has can be given, and these ones are calculated directly without using similar procedures. The same this is true if P or C are a priority of CM, their percentage in CM is given and they are calculated without using similar procedures.

- simulates the evolution of the system of indicators and graphically highlights the evolution.

- requires the decision makers to reformulate working hypotheses / indicators sequence or stop the working session.

- resume calculation procedures if working hypotheses are reformulated.

For the planning activity:

- select the values of the economic indicators related to the plan period CM, P, C.

- require decision makers to input date related to products, resources and specific resource consumption, price related, cost and unit profit (if this data is already in the system , their validation is required)

- generates the model of harmonizing de available resources with the forecasted objectives, maximizing the profit in terms of compliance to the available resources, in the maximum planned production costs and the minimum production output.

- require decision makers to formulate options related to variants (combinations) of relaxation for resources constraints and objectives.

- identifies the optimal solution and the additional resources needed, and by how much the goals must be lowered in order to achieve harmonization with the resources.

Solving passes through 2 stages:

Stage 1: Restrictions are relaxed with tolerance variables.

Stage 2: The tolerance variable values are added to the free term and the initial model is resolved with the objective function of profit maximization. It is possible to build a multi-criteria function.

- requires the decision makers another combination of relaxation of restrictions and resumes the optimization process, respectively stops working procedures providing the optimal solution.

CONCLUSIONS

The foresight management support system was tested on a apparel company with the purpose of validating the designed software and to integrate it in a methodology of simulating possible evolutionary trajectories at the company`s strategic management level. This methodology implies performing the listed steps that were described in the system`s modules and combines sequences of computational operations with nodes of human decision. The paradigm launched by the authors of the paper "Introducere in modelarea procedurala" (Stoica, Andreica, Stanculescu, 1989) settles a distinct approach of mathematic modeling in the economy, the one known as *"procedural modeling"*. The starting idea is one disarmingly eloquent namely that only the decision maker is capable of assuring a company`s leap from a imminent failure to a eminent success. That is why, econometric models will be successions of procedural chains that insert nodes of human decision.

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