Proposal of a SMEs Forecast Management Support System

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Abstract

This paper describes the main findings of the authors' research concerning the conceptual aspects, the architecture and the functionality of a proposed SMEs forecast management support system, with customization on projected production management.

The proposed system was experienced in SMEs industrial activity and is based on the concept of procedural modelling. Thus, it aims to assist the decision makers in elaborating forecasts and business planning in SMEs.

Planning models are based on flexible optimization methods with vague restrictions and objective functions. The forecast activity is assisted by procedural models required to simulate several structures of indicators in order to forecast the evolution of the medium and long term synthetic indicators.

Keywords: *SMEs, forecast management, support system, procedural modelling, planning activity.*

JEL classification: C53, C61

Introduction

In the current economic context, where countries are still recovering from the recent economic crisis, SMEs are facing a very difficult period. Therefore they have a great need for good managers in order to help them overcome the main effects of the crisis. It is well known that any economic crisis is actually preceded by a management crisis. At the moment, management is facing serious problems and that is why SMEs need competent people with skills and know-how in order to be able to manage the situation. Thus, the need for a strategic approach is becoming more obvious not only to the new firms, but also to the old firms as well. Despite the fact that the economic environment has several negative implications, a well-established vision on short and long term is required, based on solid

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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 the Romanian companies in search of their identity, that by using strategic management they can overcome the challenges of the Romanian economic environment and benefit from this new method of managing added value. These benefits contribute not only to improving the quality of management, but also to increase the competitiveness of the companies and their profitable adaptation to new demands and challenges.

According to Andreica et al. (2013), 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 force the managers to adapt their strategies and actions accordingly. 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. An appropriate tool should be *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.

1. Conceptual issues in building the forecast management support system

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

The required steps for implementing a forecast management are the following:

- qualitative and quantitative differences must be identified between the current and the desired state for a given time 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 (see Andreica, 2011).

It is know that the primary components of a 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 *operational phase* in which operational programs and the budget management interface are developed (see Micu and Lefter, 2011). Moreover, according to Andreica (2006) the budget management is carried out by means of a budget system that is only implemented in the first year of activity.

Basically, in order to implement foresight management in a company, the time horizon of the forecast and its initial state must be specified. Then the following steps should be taken: defining the objectives, identifying the strategies, analysing them and choosing the best one (Carnot et al., 2005; Badea et al., 1999).

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

As stated above, at the bases of SMEs strategic management lie the processes of forecasting and planning. Usually, in order to forecast SMEs activity one has to simulate the structure of the 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.

According to Andreica (2006), in such cases, the connection with other synthetic indicators of the system will be made with the use of several parameters (cost and profit per leu or measure of physical indicators). In practice, each decision maker has his own approach based on his experience and the volume of information that decreases once the forecast horizon increases. 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 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 modelling to the computer, while by procedure we mean a sequence of operations performed in order to solve a problem (see Figure 1).

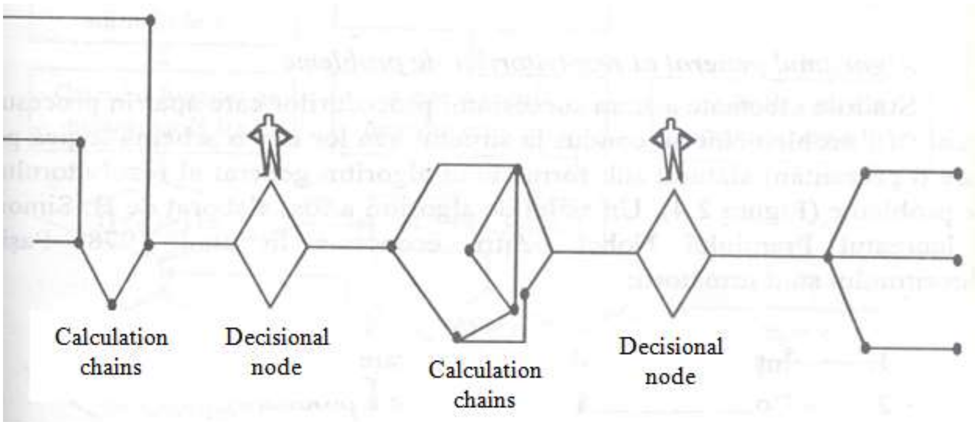

Figure 1. The general scheme of a procedural chain
Source: Stoica, Andreica, Sandulescu (1989), *Introduction to procedural modelling*, Editura Scrisul romanesc, p. 22

A computer assisted procedural modelling includes: the sequence of procedural chains that integrate the components of human decision, the decision marker`s creative thinking that after testing the quantitative modelling chain allows the decision to continue several sequences of a new chain of calculations and the problem`s solution that is obtained in real-time.

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

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, on experience and on the working hypothesis made about its behaviour. The computer simulates the evolution of the driven object according to decisions, by providing the decision maker the consequences of these decisions upon the object. Based on the obtained results, the decision maker either accepts them or 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 modelling.

For the planning phase, we need to turn to flexible optimization, because planning models aims at harmonizing the objectives with the resources. In the harmonizing process, there are frequently incompatibilities between objectives resulted from forecasts and the available resources on the planning 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 required to achieve them is determined; the resources are fixed and must then 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 planning structure simulation when defining the categories of restrictions to be relaxed and when simulating the variations for different specific resource consumption.

2. The architecture and functionality of the forecast management support system

The architecture of the forecast 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. Analysing 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, let's consider the following economic indicators: Commodity production (CM), Gross profit (P), Production cost (C), the number of productive employees (N), Labour productivity (W) and the value of Investments (I).
- It 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.
- It requires knowing 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 the indicators values for the base year: CM_0, P_0, C_0, N_0, W_0, I_0.
- It 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 can be given and these ones are calculated directly without using similar procedures. The same 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.

- It simulates the evolution of the system of indicators and graphically highlights the evolution.
- It requires the decision makers to reformulate working hypotheses / indicators sequence or stop the working session.
- It resumes 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.
- It requires decision makers to input data 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)
- It generates the model of harmonizing the 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.
- It requires decision makers to formulate options related to variants (combinations) of relaxation for resources constraints and objectives.
- It identifies the optimal solution and the additional resources needed and tells by how much the goals must be lowered in order to achieve harmonization with the resources.

Solving involves the following 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.

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

Conclusions

The forecast 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 "*Introduction to procedural modelling*" (Stoica, Andreica, Stanculescu, 1989) settles a distinct approach of mathematic modelling in the economy, the one known as *"procedural modelling"*. The starting idea is one disarmingly eloquent, namely that only the decision maker is capable of assuring a company`s leap from an imminent failure to an eminent success. That is why, econometric models will be successions of procedural chains that insert nodes of human decision.

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