Chapter 10
The Use of Soft Computing in Management

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ABSTRACT

The decision-making processes in management are very complicated because they include political, social, psychological, economic, financial, and other factors. Many variables are difficult to measure; they may be characterized by imprecision, uncertainty, vagueness, semi-truth, approximations, and so forth. Soft computing methods have had successful applications in management. Nowadays the new theories of soft computing are used for these purposes. The applications in management have specific features in comparison with others. The processes are focused on private corporate attempts at money making or decreasing expenses. The soft computing methods help in decentralization of decision-making processes to be standardized, reproduced, and documented. There are various soft computing methods used in management-classical ones and methods using soft computing. Among soft computing methods there belongs fuzzy logic, neural networks, and evolutionary algorithms. The use of the theories mentioned previous is important also in the sphere of analysis and simulation. The case studies are discussed in the article. It can be mentioned, for example, which way should be used to address the potential customer (fuzzy logic), which kind of customer could be provided by a loan or a mortgage (neural networks), the sorting of products according to the kind of customers (genetic algorithms), or solving the travelling salesman problem (evolutionary algorithms).

INTRODUCTION

There are some tasks that nature manages to perform very easily but which algorithms designed by human beings cannot complete. We can find these tasks in complicated and variable environ- ments. Mathematicians have turned their attention to nature, and on the basis of analogy they created the fuzzy logic, neural networks, and evolutionary algorithms theories. There are various areas of use, such as management, data mining, optimization, simulation, prediction, the stock market, technol-

ogy control, risk management, cluster analyses, databases systems, decision making, and other branches of applications. Their importance has also been increasing in management.

The use of the theories mentioned previous is in the sphere of analyses and simulation. We can generally mention, for example, an optimization of technological decision-making processes with the aim of optimization (minimum losses and expenses, maximum profit), an estimation of prices of products and volume of production, an estimation of prices of real estate, an evaluation of quality of client creditworthiness, a risk rating of mortgages, a prediction of future trends in financial and economic data, an optimization of capital decision making, a solution of the problems of travel of salesmen/saleswomen, a creation and an optimization of portfolios, a prediction of prices of shares, indexes, currency ratios, etc.

The simulation covers the building-up of a model of searched systems for the purpose of providing the basis for decisions by decision makers. It also includes the analyses and prediction of the behaviour of the systems. The simulation plays an important role in the process of investigation of business, especially in management.

The business, economic, and management systems belong to the most complicated dynamic systems. The mathematical description of the system is used very often for the analyses of real ones. The models of the systems are simplified and are used for the analysis and for the prediction of their behaviour. The note system can be defined as a part of environment for the purposes

of simulation that can be separated by means of commands. The system S is defined as a set $S = \{E, B, I, O\}$, where E is a group of elements, B is a group of bonds (dependencies) among elements, I is a group of inputs, and O is a group of outputs. So the elements enable us to describe the system. Saying in other words, the inputs I represents the values that influence the outputs O of the searched system for the purposes of decision making.

A graph of a possible system S with two inputs I_1, I_2, two outputs O_1, O_2, four elements E_1, E_2, E_3, E_4, and their bonds V is presented in Figure 1.

Each element of the system represents the indivisible unit at given distinguishing level whose structure we do not to specify or we cannot specify. The system can be an element itself but also can be a part of a superior system.

We can characterize each system by its structure and behaviour. The structure of the system is represented by the set of elements and their bonds. The behaviour of the system is represented by its response to the inputs. The behaviour of the system depends on its properties.

The system consists of mutually connected parts of subsystems. The tendency is to build the model as simple as possible. The model will represent the behaviour of a real object with adequate accuracy. The simulation is a process in which the model is built up and used for simulation of its behaviour by the means of a computer. In our case, the model may be studied by means of a computer that will use the advanced methods described in this chapter.

Figure 1. System S
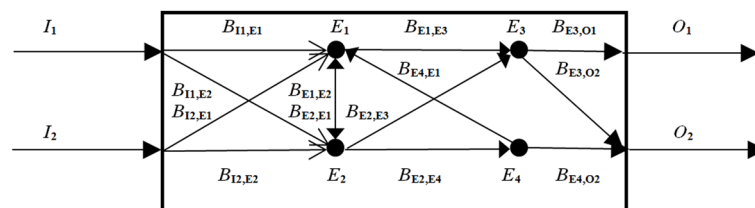
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