



## **Chapter XII**

# **Neural Network Models for the Estimation of Product Costs: An Application in the Automotive Industry**

Sergio Cavalieri, Università degli Studi di Bergamo, Italy

Paolo Maccarrone, Politecnico di Milano, Italy

Roberto Pinto, Università degli Studi di Bergamo, Italy

## **Abstract**

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*The estimation of the production cost per unit of a product during its design phase can be extremely difficult, especially if information about previous similar products is missing. On the other hand, most of the costs that will be sustained during the production activity are implicitly determined mainly in the design phase, depending on the choice of characteristics and performance of the new product. Hence, the earlier the information about costs becomes available, the better the trade-off between costs and product performances can be managed. These considerations have led to the development of different design rules and techniques, such as Design to Cost, which*

*aims at helping designers and engineers understand the impact of their alternative decisions on the final cost of the developing product. Other approaches, which are based on information about already designed and industrialised products, aim at correlating the product cost with the product's specific characteristics. The real challenging task is to determine such a correlation function that is generally quite difficult. The previous observation led the authors to believe that an artificial neural network (ANN) could be the best tool to determine the correlation between a product's cost and its characteristics. Several authors hold that an ANN can be seen as a universal regressor, able to approximate any kind of function within a desirable range, without the necessity to impose any kind of hypothesis a priori on the characteristics of the correlation function. Indeed, test results seem to confirm the validity of the neural network approach in this application field.*

## Introduction

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The ever-growing competitive pressures that characterise most industry sectors force firms to develop business strategies based on a large number of differentiation factors: higher quality and service levels, as well as customisation and continuous innovation.

The research of organisational, technological, and managerial solutions and tools that can shift the trade-off line between costs and differentiation is extremely important in a competitive environment. In this perspective, the “process view” has been given great attention in all managerial and organisational disciplines, and the development of the theory of “management by processes” has led to the gradual elimination of functional barriers. In addition to being responsible for the results of his or her unit, each functional manager is usually in charge of the overall effectiveness of the processes in which his or her unit is involved, following to a typical input-output logic (Berliner & Brimson, 1988; Hammer & Stanton, 1999; Zeleny, 1988).

Obviously, this process reorientation requires the implementation of a radical cultural change supported by a tailor-made re-engineering of the organisational structure and of the management-control systems, with particular regard to performance-measurement systems.

In particular, the R&D department is one of the areas most involved in the process of organisational change. Since the R&D unit is mainly made up of technical or scientific experts, during the new product development (NPD) process this unit traditionally puts much more emphasis on the technologically innovative contents and on the absolute performance of the product, rather than on the impact of the adopted solutions on convenience and results (like the manufacturing costs or the contribution margin generated by the new product).

The estimation of future product costs is a key factor in determining the overall performance of an NPD process; the earlier the information is known, the better the relationship between costs and product performances will be managed. Typically, the cost per unit of a given finished product is the sum of different kinds of resources — raw

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