Chapter 5
Application of Artificial Neural Networks for the Prediction of Cashflows in Public Road Works

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ABSTRACT

An attempt was made to predict the cashflows of public road projects using artificial neural networks. In the context of the development of prediction models, an introduction to the financial flows, to the Greek legislation that defines them, and finally to artificial intelligence was made. Also, a literature review concerning the application of artificial intelligence in the construction industry was carried out. Neural networks were then applied based on 37 public road projects. The methodology highlighted three models for the prediction of cashflows for public road projects: a statistical exponential regression model, an artificial neural network model, and finally a hybrid model that combined the two previous ones. The hybrid model had

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the lowest mean absolute prediction error, followed by the model using only artificial neural networks, and lastly the statistical regression model. Finally, the conclusions of the study, the limitations that existed, suggestions for the application of the model, and ideas for future research are presented.

1. INTRODUCTION

According to the Government Gazette (Law No. 4412/2016, 2016) the definition given for the project is the following: *"Project" is the result of a set of building or engineering works which is sufficient in itself to fulfil an economic or technical function"*.

The people who are assigned to manage a project are called project managers and work as leaders of the project team to meet the objectives set (PMI, 2017). The procedure for selecting the construction company that will undertake the completion of the project, that will be appointed as the project contractor, varies depending on the type of project. The most common form for contracting a public project is an auction, which can be divided into open (any contractor meeting the necessary criteria can participate) and closed (participants in the auction are invited by the developer to participate).

According to the first paragraph of Article 86 of Law 4412/2016 (Law No. 4412/2016, 2016), the criterion for the award of public contracts is the most economically advantageous tender. However, in order to avoid problems that may arise from this selection criterion, in the case of abnormally low tenders, a sufficiently detailed report must be made by the cost engineer to justify the discount submitted by him/ her and the way in which the work will be carried out at such a low cost and in line with the quality requirements set out in the original contract.

Key steps for the awarding authorities before the project is put out to tender include:

- Feasibility study
- Preliminary study
- Environmental Impact Assessment
- Final Studies and Expropriations

The first three phases are essentially preliminary steps of the final phases, where the final studies are carried out. Before a project reaches the tendering phase, it must be properly "matured" by the awarding authority that wishes to carry it out. *"The maturity phase of a project means the overall preconstruction period, covering the whole range of planning, studies, surveys, permits, etc."*

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