


## Chapter 5

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


**Alexandros E. Grigoras**

*Aristotle University of Thessaloniki, Greece*

**Georgios N. Aretoulis**

 <https://orcid.org/0000-0002-9248-3454>  
*Aristotle University of Thessaloniki, Greece*

**Fani Antoniou**

 <https://orcid.org/0000-0002-0773-5144>  
*International Hellenic University, Greece*

**Stylianos Karatzas**

*University of Patras, Greece*

### 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*

DOI: 10.4018/978-1-6684-7786-1.ch005

*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.”*

28 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: [www.igi-global.com/chapter/application-of-artificial-neural-networks-for-the-prediction-of-cashflows-in-public-road-works/333679](http://www.igi-global.com/chapter/application-of-artificial-neural-networks-for-the-prediction-of-cashflows-in-public-road-works/333679)

## Related Content

---

### FDTD Simulation of the GPR Signal for Preventing the Risk of Accidents Due to Pavement Damages

Fabio Tosti and Andrea Umiliaco (2016). *Civil and Environmental Engineering: Concepts, Methodologies, Tools, and Applications* (pp. 597-605).

[www.irma-international.org/chapter/fdtd-simulation-of-the-gpr-signal-for-preventing-the-risk-of-accidents-due-to-pavement-damages/144517](http://www.irma-international.org/chapter/fdtd-simulation-of-the-gpr-signal-for-preventing-the-risk-of-accidents-due-to-pavement-damages/144517)

### Managing Risk in Small and Medium Enterprises (SMEs) Supply Chains' Using Quality Function Deployment (QFD) Approach

Mohd. Nishat Faisal (2015). *Transportation Systems and Engineering: Concepts, Methodologies, Tools, and Applications* (pp. 1469-1489).

[www.irma-international.org/chapter/managing-risk-in-small-and-medium-enterprises-smes-supply-chains-using-quality-function-deployment-qfd-approach/128732](http://www.irma-international.org/chapter/managing-risk-in-small-and-medium-enterprises-smes-supply-chains-using-quality-function-deployment-qfd-approach/128732)

### Multi-Degrees of Freedom System and Hydrodynamic Principle

(2021). *Structural Dynamics and Static Nonlinear Analysis From Theory to Application* (pp. 81-142).

[www.irma-international.org/chapter/multi-degrees-of-freedom-system-and-hydrodynamic-principle/273509](http://www.irma-international.org/chapter/multi-degrees-of-freedom-system-and-hydrodynamic-principle/273509)

### A Sensitivity Analysis of Critical Genetic Algorithm Parameters: Highway Alignment Optimization Case Study

Eungcheol Kim, Manoj K. Jha and Min-Wook Kang (2016). *Civil and Environmental Engineering: Concepts, Methodologies, Tools, and Applications* (pp. 863-880).

[www.irma-international.org/chapter/a-sensitivity-analysis-of-critical-genetic-algorithm-parameters/144528](http://www.irma-international.org/chapter/a-sensitivity-analysis-of-critical-genetic-algorithm-parameters/144528)

### Effect of a Motorway on Development of Accidents in a Big City

Hermann Knoflacher (2017). *Engineering Tools and Solutions for Sustainable Transportation Planning* (pp. 270-285).

[www.irma-international.org/chapter/effect-of-a-motorway-on-development-of-accidents-in-a-big-city/177963](http://www.irma-international.org/chapter/effect-of-a-motorway-on-development-of-accidents-in-a-big-city/177963)