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# **Modeling the Strategic Planning Decisions of Construction Companies**

*A Thesis*

*Submitted in Fulfillment of the Requirements for  
the Degree of Doctor of Philosophy in Structural Engineering*

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا

إِنَّكَ أَنْتَ الْعَلِيمُ الْحَكِيمُ ﴿٣٢﴾

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This thesis is submitted to Ain Sham University, Cairo, Egypt, on 2013 for the degree of Doctor of Philosophy in Structural Engineering.

The Work Included in this thesis was carried out by the Author in the department of civil engineering, Ain Sham University.

No Part of this thesis has been submitted for a degree or qualification at any other university or institution by the Author

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*Dedicated with Affection*  
*To ...*  
*My Parents*  
*My Sisters, and My Brothers*

## **ABSTRACT**

Strategic planning is a method that many organizations use to drive processes that defines the whole company. Strategic planning allows organizations to make fundamental decisions that guide them to a better future vision. The result of this effort, the strategic plan, serves as the basis for a road map that directs all resources toward an ideal future. On the other side, the tools for achieving the future goals of any construction company should include the company mix of assets and the company's capital structure. Other factors shown rather clearly are the effect of the macro-economic factors on the strategic planning decision for any construction company. These factors mainly include the expected inflation, interest rate and cost of capital. One should also consider the effect of the construction market conditions. Among these conditions is the expected growth in the construction market and the degree of competition in such market.

The objective of this study is modeling the strategic planning decisions that can help construction companies to identify their future goals regarding the expected annual volume of work and the expected level of profitability by developing two models utilizing the Artificial Neural Networks and Statistical Regression analysis for predicting (Turnover of Total Assets (Revenue/Total Assets), Revenue / Working Capital, Return on Revenues (Profit/Revenues) and (Profit / Total Assets). To achieve the objective of this research, a comprehensive literature survey was performed in the area of construction industry to identify the most significantly effective factors upon the models in-question. The results were the identification of nine factors (Inflation Rate, Interest Rate, Gross Domestic Product (GDP) at market price, Total Investment, Construction Investment, Total Assets, Current Ratio (Current Assets/Current Liabilities), Total Debt/Total Assets, and Total Debt/Net Worth).

This research studied the potential application of the Artificial Neural Networks and Statistical Regression analysis for predicting (Turnover of Total Assets (Revenue/Total Assets), Revenue / Working Capital, Return on Revenues (Profit/Revenues) and Profit / Total Assets). Two models were developed. One model was developed utilizing artificial neural networks and the second model developed utilizing statistical regression analysis. For models development, 110 realistic data were used while the remaining ten realistic data were used for models validation.

The research results indicated that the best neural network model was obtained through 94 experiments for predicting (Turnover of Total Assets (Revenue/Total Assets), Revenue / Working Capital, Return on Revenues (Profit/Revenues), Profit / Total Assets). This model consists of input layer with 9 neurons, one hidden layer with 15 neurons, and one output layer with 4 neurons. The learning rate of this model is 0.50 and the training and testing tolerance is 0.10. The results of testing the best model indicated a root mean square error (RMS) of value 0.0683 and average error = 0.0606. The research's results were indicated that backward regression model is preferable to other regression models because it has the advantage of looking at all the available variables in the early stages of the model development process.

A comparison between the predictive capabilities of the neural network model versus the predictive capabilities of the backward regression model indicates that the neural network model was preferred.

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