



Ain Shams University
Faculty of Engineering

BENCHMARKING THE PERFORMANCE OF EGYPT'S CONSTRUCTION INDUSTRY USING KEY PERFORMANCE INDICATORS

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M.Sc. 2011, Structural Division
Civil Engineering Department – Faculty of Engineering
Ain Shams University

A Thesis
Submitted In Partial Fulfillment
For the Requirements of the Degree of
Doctorate of Philosophy in Construction Management

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I would like to dedicate this thesis to the soul of my father, my mother, my wife, my sons (Taymour and Seleem), my brother and my sister for their sacrifice help and everything they have done for me.

STATEMENT

This dissertation is submitted to Ain Shams University for the degree of Ph.D. in Civil Engineering (Construction Management).

The work included in this thesis is carried out by the Author in the Department of Structural Engineering, Ain Shams University.

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

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ABSTRACT

Construction contractors works in Egypt need to find a unique tool to measure project management performance. This tool is very important to improve contractors' effectiveness. Key performance indicators (KPI) and Benchmark techniques can be the requested tool to evaluate such effectiveness of construction project management performance in Egypt. A framework is established to select and calculate KPIs values. One hundred and sixty two engineers participated in a Questionnaire to select main six KPIs that affect construction projects in Egypt. The selected factors are 1) cost performance, 2) construction time performance, 3) quality management, 4) safety management, 5) cash flow indicators and 6) customer satisfaction on product. Weighting System using Analytic Hierarchy Process method is implemented to set relative weight between selected KPI by using face to face sessions. Brain storming sessions are used with directors in construction companies to select a method of calculation for each factor. The main outputs are generation of equation for each KPI related to Egyptian market, especially for quality management and cash flow indicators. Three tier one construction companies are selected to share their projects data to calculate their project management performance, KPIs equations are calculated for each project then for each company to develop individual KPIs for each company then create benchmarking for the construction projects in Egypt. Produce predictive analytics modulus using Artificial Neural Networks (ANN) and Linear Regression (LR) are used to calculate time performance of construction projects, thirty projects used in training process and ten projects used in testing process. ANN model error or accuracy was 3.8% in training process and 6.6% in testing process and LR model errors or accuracy is 5.6% in training process and 5.6% in testing process. Both algorithms have testing error less than 7% which yielded acceptable results for ANN and LR models, however LR is recommended than ANN because testing error is 5.6% while in ANN testing error is 6.6%. Research outputs and results are very essential for construction companies to improve their performance, and compare their performance to other companies work in Egypt. Also it is genuine method for decision makers and investors to estimate correctly their project performance.

Keywords: Construction Industry; Project Management (PM); Performance Measurements; Key performance indicator (KPI); Managing projects; Egypt; Benchmarking; Predictive Analytics; Annual Neural Networks (ANN); Linear Regression (LR).

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