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## Benchmarking Performance of TQM Principals in Electrical Subcontracting in Dubai: A Case Study

Edgar P. Small<sup>a\*</sup>, Lu'ay Ayyash<sup>b</sup>, Khaled Al Hamouri<sup>c</sup>

*a University of Delaware, Newark, Delaware, USA*

*b Khansaheb, Dubai, United Arab Emirates*

*c Arcadis, Dubai, United Arab Emirates*

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### Abstract

Construction productivity influences all aspects of a project, from estimating and bidding to scheduling, safety and quality during project delivery. Management techniques, such as Total Quality Management (TQM) have been proven to provide positive impact and to increase productivity. However, these techniques are seldom employed on international projects or on mechanical, electrical and plumbing (MEP) subcontracts. A unique opportunity existed to explore the impact of using TQM on an electrical subcontract using an on-going project in the United Arab Emirates. The project utilized for this examination was symmetric around the center-line of development. One side of the project was constructed and managed using status-quo procedures, which were generally top-down and authoritarian in nature. The other side of the project, contained all the same tasks but was constructed and managed incorporating TQM principles. Data was collected and earned value analysis implemented to compare the performance of the two approaches over the life of the project. It is shown that TQM presented real benefit in terms of productivity and project progress. Data is evaluated, day-to-day challenges and unexpected results are discussed, and future research efforts are outlined.

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\* Corresponding author. Tel.: +1-302-831-8459; fax: +1-302-831-3640.

*E-mail address:* [esmall@udel.edu](mailto:esmall@udel.edu)

## 1. Introduction

Across the globe, the construction sector is a vital industry for economic growth and economic prosperity. This reality is even more pertinent when considering the economy of Dubai and the United Arab Emirates where the construction industry is a multi-billion dollar industry contributing in excess of 20% of the national GDP. The industry and the region has progressed and realized construction at a furious pace transforming the city of Dubai into a destination of international prominence for business, commerce and tourism.

The industry, historically, has been buoyed by the oil economy, high liquidity, a stable political environment and the availability of cheap labor from surrounding Asian and African countries. Construction project sites are typically a melting pot of dozens of nationalities, which brings about challenges in terms of language barriers and customs, cultural norms with respect to work initiative and views of authority, work ethics, and so on. These factors strongly influence the management styles, which tend to default to authoritarian forms of leadership with little consideration of input from labor.

Studies, primarily performed on Western job-sites, have demonstrated the importance of the labor work-force in terms of the capital expenditures, which may account for upwards of 40% of the direct capital costs. International studies performed by Jarkas and Bitar [1] confirm that, in electrical and mechanical works, labor costs comprise between 30% and 50% of the overall project costs. Results were not limited to Western nations with high labor costs and the trends were observable through most countries internationally, which includes areas with low labor costs, such as in Dubai and throughout the Gulf States. The general presupposition that output is relatively insensitive to labor effects due to the low labor costs is challenged by such results.

A significant impact can be made by focusing on enhanced performance and positive productivity increases, especially given the stagnant record of productivity in the construction industry. When considering productivity increases, areas of concern relate to the instantiated inefficiencies within the industry, labor output and management factors. Over several decades throughout multiple industries, total quality management (TQM) approaches and TQM principles have been proven to measurably improve performance. Empirical evidence has shown that construction projects benefit from the application of TQM principles in terms of cost and schedule performance, safety, productivity and quality. However, mixed results have been also reported, nevertheless, the promises of TQM adoption within the construction industry cannot be overlooked. Implementation of TQM principles could significantly impact construction job-site management in Dubai and throughout the Gulf States.

A unique opportunity existed to explore, in quantitative terms, the impact of applying TQM principles on an actual project undertaken in the Emirate of Dubai. The project utilized for this examination was symmetric around the centerline of development. To explore the concept, electrical subcontracting tasks were compared and contrasted using status-quo versus TQM approaches. One side of the project was constructed and managed using typical management procedures, which were generally top-down and authoritarian in nature. The other side of the project, contained all the same tasks but was constructed and managed incorporating TQM principles. The project will be described as will the alternative management approaches employed in the following sections. To measure the performance and to evaluate the differences between the respective teams or sides, earned value analysis data was collected and evaluated. The differences between the two approaches are shown to explore whether superiority of the TQM approach is justified by the results, either empirically or quantitatively. As the study progressed, unexpected results were also observed. These results will be discussed and the paper will conclude with recommendations for future research efforts.

## 2. Background Literature

The study undertaken seeks to prove the importance and benefit of employing TQM principals for electrical subcontracting using a case study from the Emirate of Dubai. A literature review was first performed to establish the efforts completed through past research and to document the current state of the art. Low productivity within the industry has been well documented in both developed countries and in developing countries [2]. Factors affecting low productivity have been well documented [3,4,5]. A primary factor for low and stagnant productivity are management practices, which include lack of communication between the workforce and leadership, improper planning, lack of involvement of the workforce, poor planning, and many other factors.

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