

## ABSTRACT

Qingbin Cui, Ph.D. Purdue University, August, 2005. A Dynamic Model for Profitability Analysis of Construction Firms: Towards Complexity, Learning, and Uncertainty. Major Professor: Makarand Hastak

The construction industry has changed significantly over the last decade due to the effects of globalization, delivery system innovations, increased competition, and the application of information technology. Industry professionals know that to compete in these times of unprecedented competition they need to manage their performance more efficiently and fine-tune their business strategies to maintain and improve profitability and increase the company value. However, traditional theory and understanding of profitability management are not flexible and powerful enough to lead construction firms to a higher performance in the rapidly changing market. It has been a widespread and serious problem in the construction industry that profitability appears low, unreliable, and unmanageable.

As a pioneer attempt in the exploration of a new theory of profitability management for construction firms, this study identifies the elements of the profitability as: quality, potentiality, and sustainability of profits. The study presents that these three elements are interactive and integrated into a profitability system which is dynamic, adaptive, and process based. And moreover, this study develops a model for analyzing the profitability of construction firms using system dynamics. The model is illustrated for the bidding practice in a medium-size general contractor. The study identifies the path dependency occurring in the construction practice. A small change of external variable could amplify and cause significant change in the business performance. Learning as an important strategy for the organizational unit was studied and simulated. The study found out that learning is effective and helps to improve the performance when the uncertainties are reduced.

As another aspect of the profitability system, company overhead is affected by the cash flow management. Overdraft, early payment to suppliers due to purchase discounts, and overbilling constitute the most important issues regarding project cash flow management. Construction firms have to balance the material savings and overdraft in an attempt to reduce costs. Based on a case study on a warehouse project, the study finds out that payment policy can be optimized within the framework of the profitability system by integrating overdraft, material credit, and overbilling. The overdraft requirement, the timing of taking material discounts, and the overbilling strategy are analyzed and discussed under uncertainties.