

# **A Hybrid Cross-Impact Approach to Predicting Cost Variance of Project Delivery Decisions for Highways**

Tran, D. Q., Molenaar, K. R., & Alarcón, L. F. (2016). A hybrid cross-impact approach to predicting cost variance of project delivery decisions for highways. *Journal of infrastructure systems*, 22(1), 04015017. <10.1061/(ASCE)IS.1943-555X.0000270> Accessed 18 Dec 2020.

## **Abstract**

Cross-impact analysis (CIA) is a technique that is designed to predict future events by capturing the interactions among variables. It is an appropriate tool to deal with the selection of a project delivery method. Project delivery selection involves the assessment of tradeoffs between numerous risks and uncertainties, complex relationships among variables, and multiple decision alternatives. In fact, the number of variables involved in project delivery decisions creates CIA models that are extremely complex, and few researchers have attempted to apply them. This paper presents a hybrid CIA approach to project delivery decisions in highway design and construction. It provides for the evaluation of project cost with projects in three fundamental delivery methods: design-bid-build (DBB), design-build (DB), and construction manager/general contractor (CMGC). The paper discusses in detail how the cross-impact concepts support the selection of an appropriate delivery method in highway projects. The hybrid CIA approach integrates the results from the factor analysis of 31 delivery risk factors, which were evaluated by 137 practitioners, to determine the interaction between variables in the cross-impact matrix. These data allowed the researchers to reduce the number of required judgments in the CIA model approximately from more than 3,000 to fewer than 300. A case project from the Florida Department of Transportation demonstrates the approach. The hybrid CIA approach provides a defensible and repeatable process for highway agencies to quantitatively select an appropriate delivery method for their projects. More fundamentally, the findings from this paper contribute to theory by providing a new method to apply the CIA technique. It is expected that researchers can use this hybrid CIA approach for other areas in construction engineering and management research..