

Construction Project Scheduling Evaluation Considering Correlated Risk Analysis

Alvaro Cuadros

David Ramirez Soto

School of Industrial Engineering

Universidad del Valle

Cali, Colombia

alvaro.cuadros@correounivalle.edu.co

david.soto@correounivalle.edu.co

Armando Orobio PhD.

School of Civil Engineering and Geomatics

Universidad del Valle

Cali, Colombia

armando.orobio@correounivalle.edu.co

Abstract

Infrastructure construction is considered the way through economic activities are created and improved in a country. In particular, transport infrastructure is considered a key factor in economic development and represents the link among production centers and consume. However, during the construction of road infrastructure, risky factors may affect the project in such way that the results could be presented in a different way than anticipated by the interested parties.

Facing risk factors, it is essential for project managers to adopt a rigorous and systematic risk management methodology, which take advantage of experiences in previous projects. Risk management usually includes the identification of risk factors, a qualitative or quantitative risk analysis, according to the complexity of the project, the design of risk responses and control during the construction phase of the project. In Colombia, road construction suffers frequent scope changes, costs overrun and time delays, due to an inadequate assessment of risk factors.

A research project was performed to establish risks factors and categories that affect the normal development of road construction projects in local environment. A long list of risk factors was obtained, so a prioritization process had to be done. In order to be sure not to lose a risk, two different methods were applied. To study the risks impact over projects, a road construction project was selected to apply the risks prioritized. The research project used Monte Carlo simulation considering the correlation among risks and activities and among risks themselves.

The results made it possible to measure the impact of risk factors on activities and project durations, concluding in first place that the project had 0% probability to comply with that established in the contract. In addition, sensitivity analysis allowed to identify specific risks factors that could affect the project, which were contrasted to real performance of the project. In conclusion, it was obtained realistic results when using local risks factors and capturing correlations between the factors considered.

Keywords

Risk management, qualitative risk analysis, correlation effect, Monte Carlo Simulation

Biographies

Alvaro Cuadros is currently a PhD. candidate in Engineering Doctoral program at Universidad del Valle. Mr. Cuadros holds a B.Sc. in Industrial Engineering and MBA degrees from Universidad del Valle, Cali, Colombia. His research interests include risk management, earned value management, project scheduling, and project management maturity models.

David Ramirez is Industrial Engineer from Universidad del Valle (Colombia). He is currently Operations Manager at a supplier company of Beer companies in South and Central America. His responsibility is to efficiently manage resources (Materials, Machinery and People) for the achievement of efficiency goals and deliveries of finished products.

Armando Orobio is Civil Engineer and Master in Road Infrastructure from Universidad del Cauca (Colombia), He earned a PhD in Civil Engineering from West Virginia University (EE.UU.). He is currently professor at the School of Civil Engineering and Geomatics at Universidad del Valle (Colombia) and director of the Construction Research Group. Prof. Orobio has authored several international scientific articles and an international research book. His research topics are Highway construction, construction planning, construction management, and pavements construction. Within the professional field, he has extensive experience as a consultant in pavement and road construction.