

## A Systems Thinking approach for understanding the complexity of cost overruns in transportation megaprojects

Godawatte Arachchige Gimhan Rathnagee Godawatte (Heriot-Watt University)

Research has shown that transportation megaprojects perform poorly in terms of cost. Although a considerable amount of research has been conducted to identify the causes of cost overruns in megaprojects, there is a lack of holistic understanding of the complex interrelationships between the causes of cost overruns. To fulfil this gap, this research adopted a qualitative systems thinking approach to understand the cost overrun causation in transportation megaprojects based on a case study project. California High-Speed Rail project was selected as the case study and empirical data were collected from a range of sources - interviews with key decision-makers, professionals, and stakeholders involved in the project, project reports, board meeting transcripts, and newspaper articles. Data were analysed using grounded theory method and systems thinking approach was used to develop a conceptual model (causal loop diagram) to understand the cost overrun causation in megaprojects.

Four causal loop diagrams - Ignorant Strategic Leadership, Immature Project Organisation, External Actor Relations, and Political Power Relations were developed from the analysis of data using grounded theory. The research shows that compared to the predominantly reductionist approaches in construction management research, the developed causal loop diagrams and systems thinking approach could be used as alternative tools for decision-making in megaprojects to explain and understand how cost overruns emerge as a result of multiple interrelated causes and events occurring at different levels and phases of a project.

**Gimhan** is an Assistant Professor in Quantity Surveying at Heriot-Watt University, Edinburgh. His professional background is very much into construction cost management, and he holds a bachelor's degree in Quantity, a master's degree in Construction Project Management, a master's degree in Quantity Surveying, and a PhD in Construction Management. His current research focuses on using system dynamics for understanding the complex behaviour of causes of cost overruns in construction megaprojects.