



Construction Industry Institute®

Successful Delivery of Mega-Projects

Construction Industry Institute

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**Prepared by
Construction Industry Institute
Research Team 315, Successful Delivery of Mega-Projects**

**Research Summary 315-1
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Executive Summary

The increase in global population demands in recent decades has created serious constraints on resources and put immense pressure on already deteriorating infrastructures around the world. As the demand for new facilities has grown, technological advances have allowed the construction industry to pursue previously unattainable economies of scale, and the result of both trends has been that the size of capital projects has grown substantially. The prevailing term for these very large efforts is “mega-projects.” Although not precisely defined, the term is generally used to describe projects with capital budgets exceeding one billion dollars. As the number and size of mega-projects continues to increase across all sectors of the capital projects industry, one fact stands out: mega-projects tend to underperform more often than not. More specifically, mega-projects fail to keep within their approved budgets, fail to meet their approved schedules, or fail to achieve their premised business objectives.

While it would seem that the proper deployment of traditional project management techniques should keep mega-projects on track, this has not proven to be the case. Even when organizations use best practices and proven scope definition assessment methods, mega-projects often fail to achieve their objectives. Recognizing the enormous amount of capital dollars at stake and the prevailing trend towards poor performance, the Construction Industry Institute initiated Research Team (RT) 315, Successful Delivery of Mega-Projects, to determine why these projects fail and how to prevent or reduce these failures. Specifically, RT 315 sought to answer the following question: “What sorts of changes in project development and execution are needed to increase the likelihood of success on mega-projects?”

RT 315 pursued the following research objectives: 1) describe the current state of the practice in mega-project delivery; 2) rank the root causes of poor performance of mega-projects; 3) identify changes in planning and execution practices to address these root causes and improve performance; and; 4) develop any appropriate tools to support

proactive mega-project planning and execution. In conducting this research, RT 315 utilized a combination of literature review, surveys, interviews, and detailed case studies. After gathering data from more than 100 projects, the research team identified 34 impact factors with high occurrence and high negative performance impact on mega-projects. The team also prioritized the factors with the most negative impact on mega-project outcomes.

While determining which factors are more likely to occur and which have more negative impacts on mega-projects were valuable first steps, the research team went deeper by identifying specific case examples of how the negative impacts might manifest themselves on a project. Furthermore, for each of the factors, the team identified specific mitigation strategies and recommendations to adopt during front end planning and execution. All of these results have been incorporated into Implementation Resource (IR) 315-2, *Mega-Project Assessment of Criticality Tool (MPACT)*, an Excel-based tool and guide.

The MPACT tool is a flexible resource that allows project teams to assess which impact factors are relevant to their projects, assign project-specific criticality assessments, incorporate project team comments, access real project case examples and recommendations, and generate customized reports. MPACT is designed to complement but not replace any existing organizational processes; its output can supplement any of an organization's other project planning and execution processes. In developing this tool, the research has gone beyond any previous generic lessons learned, to enable project teams to make structured assessments of critical mega-project impact factors. Assessing these impact factor will enable more accurate and thorough mitigation planning for them and, thus, improve mega-project performance.

Introduction

Problem Statement

Because mega-projects have become increasingly common across many sectors of the capital projects industry, understanding them better has become critical. RT 315 defined a mega-project as any capital project with a total installed cost of greater than \$1 billion, with one or more of the following complexity criteria: a significant number of stakeholders; a large number of interfaces; a challenging project location; an inadequate supply of resources; unfamiliar technology; difficult regulatory constraints; extensive infrastructure requirements; geographically dispersed teams; or significant political, economic, environmental, or social influence.

Given their size and scale, mega-projects are important not only to the immediate project stakeholders, but also to the societies, economies, and environments affected by them. Despite the impact and significance of mega-projects, many recent studies assessing their performance have concluded that cost and schedule overruns are common in all industry segments and world regions. After analyzing more than 300 mega-projects, Merrow found that approximately 65 percent failed to achieve the performance objectives established at approval (Merrow, 2011). Another recent study by Ernst & Young (EY, 2014) concluded that 73 percent of the mega-projects they studied experienced schedule overruns, and 64 percent had cost overruns. On average, actual costs were 59 percent higher than original estimates. The Construction Owners Association of Alberta (COAA) and others who have also studied the issue have arrived at similar conclusions (McTague & Jergeas, 2002) (Slootman, 2007) (Jergeas, 2009) (Flyvbjerg, Bruzelius, & Rothengatter, 2003). Because mega-projects are large, complex, and problematic, they pose many planning and execution challenges. Failure to deliver a mega-project on time, within budget, or in accordance with regulatory or environmental requirements can have major repercussions on an organization's reputation and revenue performance (EY, 2014).

The current body of knowledge suggests that mega-projects are more sensitive to certain factors than smaller-sized projects. Although the capital projects industry has expanded, it is still underprepared to execute mega-projects successfully. To meet this tremendous challenge, the industry must identify what sorts of changes in project planning and execution must be implemented.

Purpose and Objectives

The primary purpose of this research was to identify and characterize the changes needed in project planning and execution practices to improve the probability of mega-project success. Composed of owners, contractors, and academic researchers, RT 315 aimed to achieve the following objectives:

1. Describe the current state of the art for mega-project delivery, identifying current planning and execution practices used on mega-projects.
2. Identify and prioritize the primary contributing factors of good and bad performance on mega-projects.
3. Identify any changes needed in planning and execution practices to address these primary contributing factors and improve performance.
4. Develop any appropriate tools to support proactive mega-project planning and execution.

Methodology Adopted to Achieve These Purposes

Considering the breadth of this research topic, the research team conducted an extensive literature review of previous publications on mega-projects in order to understand key lessons learned from previous successful and unsuccessful mega-projects. At the same time, the team conducted several preliminary interviews with experienced mega-project professionals to gather information on factors contributing to success and failure on their mega-projects. Using the findings from both background review and preliminary interviews, the team identified and categorized

impact factors that occur more often and that have higher impacts on mega-projects. To learn more about these impact factors, the team conducted a survey, collecting data to gauge the frequency and impact levels.

After analyzing the survey data, the team prioritized the factors and conducted case studies to analyze their manifestations and effects on mega-projects. Using the findings from all its data collection and analysis, the team developed an assessment methodology to help project teams effectively plan and execute mega-projects. Figure 1 presents an overview of the RT 315 research methodology.

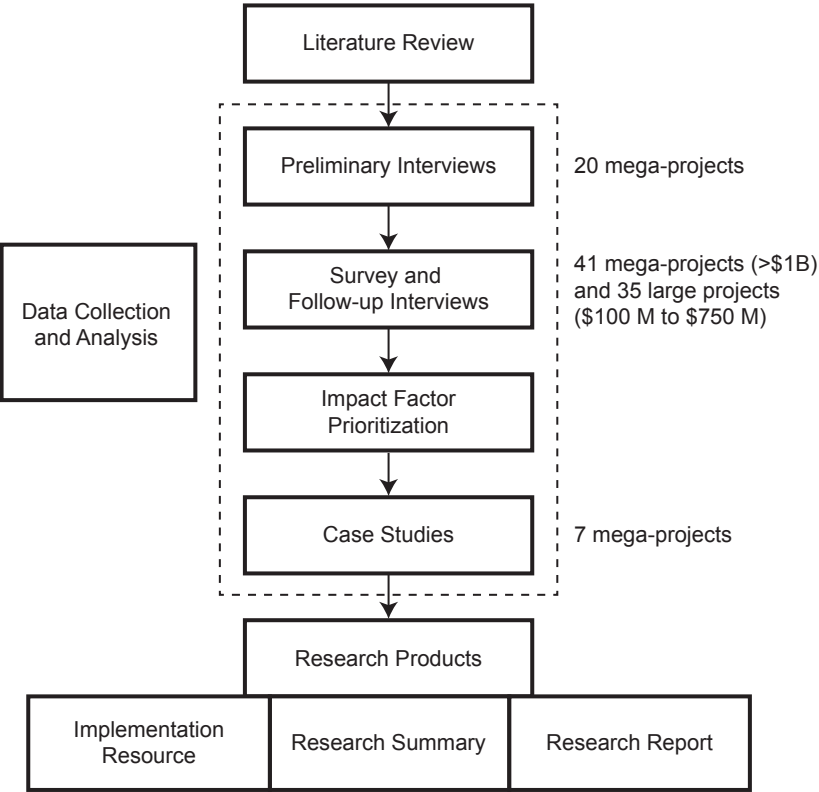


Figure 1. RT 315 Research Methodology

Assumptions and Limitations

- Since the majority of respondents were in the industrial sector, the findings mainly address heavy industrial mega-projects. However, the findings may apply to other industry sectors.
- More than 100 projects participated in the data collection efforts. All participants were approached as volunteers for the study.
- The research focused on the performance of mega-projects in terms of cost, schedule, and business goals. The data gathering and analysis did not include safety and quality performance.

Literature Review

The team reviewed previous publications on mega-projects from academic and industry sources, including journal papers, articles, case studies, and recent reports on mega-projects inside and outside the capital projects industry. The main objectives were to characterize the current state of the art in mega-project delivery and to identify lessons learned from successful and unsuccessful mega-projects. The review helped the team identify a number of focus areas for further examination, including the following: appropriate front end planning; realistic cost and schedule estimates; geopolitical risks; technical challenges; personnel management; organizational effectiveness; appropriate governance structures; clear and adaptable project management processes; appropriate mega-project contracting and procurement strategies; effective communications; and stakeholder management (Procaccini, Lea-Cox, & Hoop, 2012) (Merrow, 2011) (EY, 2014) (KPMG, 2013) (Flyvbjerg, Bruzelius, & Rothengatter, 2003).

Upon completing the literature review, the team concluded that, while the existing literature includes several lessons learned and generic recommendations, it does not prioritize the factors that affect mega-project performance. Also, it does not provide specific solutions to mitigate such factors. Based on these conclusions, the team refined its two main research hypotheses:

1. There are factors that have higher occurrence and performance impacts on mega-projects.
2. These factors require changes in mega-project planning and execution to improve the chances of successful outcomes.

After conducting a series of data collection and analysis tasks to validate these hypotheses, the team developed a methodology for assessing the critical impact factors and formulated implementation recommendations for the front end planning and execution phases.

