The art of project leadership: Delivering the world's largest projects

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Preface

The performance of large capital projects has been historically poor and prone to overruns despite extensive research, literature, and practice. Previous work has analysed why these projects have deviated from plan, and many root causes have been identified, largely around the issues related to systems, process, and technical mastery. However, we believe a critical element for successful large project delivery has so far been neglected: specifically the "soft" issues of project delivery such as leadership, organisational culture, mindsets, attitudes, and behaviours of project owners, leaders, and teams. In this report we refer to this blend of soft organisational topics as "the art of project leadership", as opposed to standards, systems, processes, and technical subject matter expertise which we refer to as project management "science".

We assert that a better understanding of how to get this art right will materially improve delivery of large capital projects, and moreover, that it is especially true in the context of the largest and most complex capital projects (those with budgets exceeding US $5 billion).

We set out to answer a simple question: Why do so many large projects continue to fall short of expectations despite so much global experience, learning, discussion, and analysis? To answer this question we researched the existing literature on the topic and conducted in-depth interviews with 27 large project practitioners, who collectively have more than 500 years of project delivery experience.

Our research kept coming back to topics included in the art of project leadership; that is, the organisational and leadership aspects—capabilities, mindsets, practices, attitudes and behaviours—required to deliver the largest and most complex projects. Through our interviews we have found that the art of project leadership gains greater importance with increasing project size and complexity. In this report, we distil our findings to four mindsets and eight leadership practices across project setup and delivery phases that are critical to success. We discuss these findings, and provide actionable advice to capital project practitioners and those responsible more broadly for capital project delivery.

Our intended audience is large project "owners" (company CEOs, chairs, government ministers, military leaders, and so on) as well as the project leaders who design and execute the projects (such as project directors and managers). These people, and their teams, face a challenging undertaking: delivering a large project not only requires a combination of technical skills and experience, but also strong measures of motivation, innovation, and leadership. Creating and maintaining these softer elements over an extended period is the art required to lead and deliver on the world's largest project challenges.

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1 An external advisor to McKinsey & Company.

In brief

To understand more about ultra-large projects, we interviewed **27 people** with a collective **500+ years** of project delivery experience.

Billy Varnado	Christian Placines	David Knox	David Watkins	Grant King	Hilary Mercer	Jack Futcher	Lester Belanger	Louis Bon
Martin Houston	Matthias Bichsel	Maurice Bannayan	Mikhail Tretyak	Nick Manocha	Peter Wilson	Richard Henfield	Trevor Brown	Chris Toomey
Filipe Barbosaa	Ghassan Ziadat	Mark Kuvshinikov	Michael Della Rocca	Patricia Griffith	Roberto Charron	Samer Theodory	TG Jayanth	Tim McManus

We segmented **20,000+ words** of interviewee insights on best practice into "science" and "art"

THE "SCIENCE"—WELL UNDERSTOOD

Processes	Design	Methodology
Stage gate	Engineering	Quality assurance
Technical skills	Estimate	Specification
Plan	Critical path	Standard
Risk	Scope	Tolerance
Schedule	Documentation	Work package
Cost	Gantt	WBS

THE "ART"—AN OPPORTUNITY

Leadership	Culture	Fulfilling promises
Judgment	Purpose	Personal growth
Investor relations	Identity	Coaching
Delegation	Behaviours	Attitude
Accountability	Role modelling	Inclusiveness
Decision making	Values	Community engagement
Partnership	Mission	
Mindset	Training	

We synthesised **4 mindsets** and **8 practices** that define the **"art"** of project leadership

MINDSETS

- Lead as a business, not as a project
- Take full ownership of outcomes
- Make your contractor successful
- Trust your processes, but know that leadership is required

PRACTICES

Setup

- Define purpose, identity, and culture
- Assemble the right team
- Carefully allocate risk and align incentives
- Work hard on relationships with stakeholders

Delivery

- Invest in the team
- Adopt forward-looking performance management
- Ensure timely decision making
- Drive desired behaviours consistently

The art of project leadership comprises 4 mindsets and 8 practices

Mindsets

Lead as a business, not as a project
An ultra-large project is more akin to building a business than executing a construction project, requiring CEO-level leadership and judgment to address a broad range of organisational issues.

Take full ownership of outcomes
The project owner needs to maintain full accountability for delivery. They must remain well informed throughout and be ready to step in to make tough decisions in a timely manner.

Make your contractor successful
Owners and contractors work best as a business partnership with a mindset of "we win together or lose together". Productive contractor-owner relationships are based on mutual trust and joint problem solving.

Trust your processes, but know that leadership is required
Processes alone will not resolve every challenge on an ultra-large project. Leaders should trust and enforce the appropriate process, but recognise their benefits and limitations.

Practices

SETUP
Define purpose, identity and culture
Effective project teams have a unique and shared identity, and create a culture of mutual trust and collaboration. Project leaders should articulate purpose, role model behaviours, and nourish the desired culture.

Assemble the right team
Besides shared values, owner and contractor team members need to have the appropriate blend of leadership qualities, cultural and local awareness for the task ahead. This must complement the requisite technical skills and experience.

Carefully allocate risk and align incentives
Successful owners thoughtfully delegate only those risks that the contractor is better positioned to manage. Leaders should establish and maintain relationships, not only contracts, to facilitate ongoing alignment of incentives.

Work hard on relationships with stakeholders
Strong and transparent trust-based relationships with stakeholders enable prevention and rapid resolution of problems. Invest in stakeholder management as a core activity.

DELIVERY
Invest in your team
Delivering an ultra-large project requires continual investment in the effectiveness of the team. Leaders must think deeply about how to develop and challenge their people throughout.

Ensure timely decision making
Timely decision making depends on the delegation of decisions to the lowest appropriate level. To achieve this, leaders must have confidence and trust in their systems and people. Leaders are then free to resolve and anticipate critical issues.

Adopt forward looking performance management
Effective project leaders use fact-based performance dialogues to strengthen trusting relationships and instil accountability. This allows for early problem resolution and opportunity identification.

Drive desired behaviours consistently
Effective project leaders inspire their teams—especially in challenging times. They define, communicate, and role model expected attitudes and behaviours. Leaders should take the time to connect with team members on a personal level.

Contents

Executive summary

Extraordinary projects have been executed through millennia. Think of the scope of project management required to build the Pyramids of Giza, the Great Wall of China, and the cathedrals of Europe; or more recently, the development of the world's transport, energy, space, military, and science infrastructure.

Today, the prize for executing large projects successfully is significant. With ever-increasing size and ambitions, the modern large construction project not only has a lasting impact on the organisation, but can also impact wider industry dynamics, the regulatory landscape and even geopolitical relations. However execution of large projects has historically proved difficult. On average, projects with budgets above US $1 billion, commonly referred to as "megaprojects" in the industry, are delivered one year behind schedule, and run 30 percent over budget. If this trend continues, US $5 trillion in value will be destroyed in the projects currently announced around the world. For the sake of economic prosperity and lost opportunity alone, this must change.

The vast majority of research into root causes of failure in large capital projects has concentrated on flaws in project management processes, standards, systems, tools, and technical mastery—the body of knowledge that we call the "science" of project management. These topics are important. This paper does not seek to question, challenge, or expand the existing knowledge around the science of large project execution. Rather we aim to supplement current practice with a focus on "soft" organisational and leadership elements of project delivery, which we call the "art of project leadership". We believe that it is this art that presents the critical missing element, mastery of which increases the probability that a large capital project meets its objectives and purpose. As the size of capital projects rises, these multibillion dollar investments combine unparalleled complexity of strategy, design, financing, procurement and, ultimately, project execution. We have chosen to focus this report on a new subclass of capital megaprojects, which we refer to as "ultra-large projects"—the largest and most complex of capital projects, with budgets exceeding US $5 billion, and timeframes exceeding five years. These characteristics bring unique complexities associated with the scale of the project: multiple complex interfaces with stakeholders such as local communities and government bodies, new regulatory and environmental requirements, and often unique technological challenges.

When we refer to "ultra-large projects" we choose our language deliberately—we assert that an "ultra-large project" is as different from a megaproject as an ultramarathon is from a marathon. A marathon is a substantial challenge—yet many thousands prepare for one by covering the full distance in training and complete one each year. An ultramarathon is exponentially harder and one can never train for the full distance. Similarly, an ultra-large project represents an exponentially tougher challenge than a typical ~ US $1 billion megaproject, and is the preserve of the few.

We set out to answer a simple question: Why do these ultra-large projects continue to fall short of expectations despite so much experience, learning, discussion, and analysis? What are the unique factors of success of those who managed to avoid significant time and cost deviations? To get insights into these questions we decided to ask the "project practitioners"—people with hands-on experience in ultra-large project delivery. We conducted in-depth interviews with 27 practitioners who collectively have over 500 years of project delivery experience. We then distilled, structured, and synthesised our findings.

While our interviewees give full credit to the absolute necessity of getting the core project management systems and processes right (the science), most of the practitioners almost take that part for granted, claiming that many companies attempting large capital investment already do (and must) have best practice standards and processes implemented. While addressing the importance of the science, our interviewees kept coming back to the criticality of the right mindsets, practices, attitudes, behaviours, leadership capabilities, and organisational culture—all the topics covered under the umbrella of the project leadership art—for successful delivery of the largest and most complex projects. In fact, analysis of the interviews demonstrates that in discussing success factors of these projects, our interviewees spent roughly 50 percent of the time talking about the science, and 50 percent on the art. This proportion is strikingly different to some of the subject literature, which at times barely mentions these soft topics.

Moreover, our interviews supported our hypothesis that the art of project leadership gains importance with increasing project size and complexity. Given the scale, extended timeframes, number of parties involved and interfaces to manage, successful delivery of an ultra-large project requires an equal mastery of both the science and the art. Practitioners consistently emphasise the order of magnitude increase in difficulty of managing projects of ultra size, and the importance of the topics under the art umbrella—significantly more so than in smaller US $1 billion sized "megaprojects".

Whereas these leadership skills might be termed soft, the reality is that they can be the most difficult elements to ingrain within a capital project organisation—to put it differently, the soft stuff is the hard stuff. Our interviews and research support the view that the art of project leadership becomes ever more vital with the growth of project scale and complexity, and becomes critically important for projects of ultra-large size.

"Process does not deliver projects. Leadership does, and has to trump process." Jack Futcher

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Based on our research and interviews, we synthesised the critical elements of the art into four discrete mindsets and eight practices. Of the eight practices, four are relevant to the project setup phase and four are relevant to the project delivery phase. We believe that by embracing these mindsets and practices, project leaders can dramatically increase the chance of successful delivery of ultra-large projects. For completeness, we also articulated the "deadly sins" of project leadership—these are the mindsets and practices that are best avoided to ensure successful project outcomes.

Mindsets

Mindsets play a critical role in the development of ultra-large projects. Good systems and processes will positively influence team behaviour to a certain extent, but success or failure is largely determined by how well a team works together. Team mindsets inform the multitude of decisions and interpersonal interactions that occur on a project. Constructive mindsets lead to good decisions and strong trust-based relationships, which in turn lead to high team morale and excellent performance.

Through the synthesis of our interviews, we have identified four mindsets that underpin the development of the project from start to finish.

Lead as a business, not as a project

An ultra-large project is more akin to building a business than executing a construction project, requiring CEO-level leadership and judgment to address a broad range of organisational issues.

Take full ownership of outcomes

The project owner needs to maintain full accountability for delivery. They must remain well informed throughout and be ready to step in to make tough decisions in a timely manner.

Make your contractor successful

Owners and contractors work best as a business partnership with a mindset of "we win together or lose together". Productive contractor-owner relationships are based on mutual trust and joint problem solving.

Trust your processes, but know that leadership is required

Processes alone will not resolve every challenge on an ultra-large project. Leaders should trust and enforce the appropriate process, but recognise their benefits and limitations.

These four mindsets need to be adopted by the majority of people in the project organisation and the broader owners' team, not just the top management of the project itself. Owners and project directors need to create an environment where these mindsets are aligned with the natural way the team approaches their day-to-day work and how they interact with each other, contractors, and other stakeholders.

Practices for setup

Unsurprisingly, the setup phase of the project is fundamental to establish healthy management practices that deliver successful project outcomes. As one of our interviewees noted, "The way you start is the way you finish." In the setup phase, there are four practices that require "artful" application that leaders should uphold as crucial.

Define purpose, identity and culture

Effective project teams have a unique and shared identity, and create a culture of mutual trust and collaboration. Project leaders should articulate purpose, role model behaviours, and nourish the desired culture.

Assemble the right team

Besides shared values, owner and contractor team members need to have the appropriate blend of leadership qualities, cultural and local awareness for the task ahead. This must complement the requisite technical skills and experience.

Carefully allocate risk and align incentives

Successful owners thoughtfully delegate only those risks that the contractor is better positioned to manage. Leaders should establish and maintain relationships, not only contracts, to facilitate ongoing alignment of incentives.

Work hard on relationships with stakeholders

Strong and transparent trust-based relationships with stakeholders enable prevention and rapid resolution of problems. Invest in stakeholder management as a core activity.

The art of project setup extends far beyond checking boxes in a corporate process. It requires making the right trade-offs and adjustments to accommodate the unique constraints that each project faces. The setup phase needs a strong focus on building constructive relationships (and specifically, trust) with both internal and external stakeholders, to address issues early in the project timeline that would otherwise impede delivery. Building trust is also critical to productively addressing the inevitable crises that arise in projects of this size and complexity. A good setup facilitates smooth execution and, importantly, sets the project up as you mean to go on for the full span of its operating life.

"I don't think anything avoids the need to think deeply about how you set these projects up, how you get the right people in the ventures and how you get the right behaviours between the partners and through the contractors. I think it's all about the beginning." Grant King

Practices for delivery

By the time that a project reaches the delivery phase, many of the key decisions have been made—it is the leaders' responsibility to execute the project within the evolved scope, constraints, and degree of complexity. Given the size and duration of an ultra-large project, unexpected challenges inevitably arise. Our research indicates that in order to absorb and deal with these challenges, leaders of these projects need to focus on the following four practices throughout the delivery phase.

Invest in your team

Delivering an ultra-large project requires continual investment in the effectiveness of the team. Leaders must think deeply about how to develop and challenge their people throughout.

Ensure timely decision making

Timely decision making depends on the delegation of decisions to the lowest appropriate level. To achieve this, leaders must have confidence and trust in their systems and people. Leaders are then free to resolve and anticipate critical issues.

Adopt forward looking performance management

Effective project leaders use fact-based performance dialogues to strengthen trusting relationships and instil accountability. This allows for early problem resolution and opportunity identification.

Drive desired behaviours consistently

Effective project leaders inspire their teams—especially in challenging times. They define, communicate, and role model expected attitudes and behaviours. Leaders should take the time to connect with team members on a personal level.

Our report examines each of these mindsets and practices, presents common "sins" to avoid, and provides a practical guide on how to implement these recommendations.

Introduction

Capital projects are getting bigger; the world's largest projects are increasingly complex and cost in excess of US $5 billion. At this scale, these projects cannot be delivered through standard project management systems and processes alone— the "science" of project management. This science must be complemented with critical attention to the "art" of project leadership—the necessary mindsets, attitudes, behaviours and practices.

Capital investment drives economic growth. Across all industries and sectors, the intelligent and efficient deployment of capital is a cornerstone of sophisticated and sustainable business decision making. However, the link between capital investment and return is not guaranteed; substantial capital is often wasted on value-neutral or even value-destructive business cases. Similarly, the quantum of capital that is invested does not always correlate to the size of economic growth generated; complexity increases exponentially with greater investment, and ultimately can lead to poorer returns on invested capital—this is not only important for the companies involved, but also the economies in which they exist. Large capital projects play an increasingly important role in the global economy as investors deploy capital to deliver returns in ever more challenging technical, social, and environmental situations.

The term "megaproject" denotes a construction project above the US $1 billion threshold. As the size of capital projects rises, these multibillion dollar investments combine unparalleled complexity of strategy, design, financing, procurement, and, ultimately, project execution. We have chosen to focus this report on a new subclass of capital megaprojects, which we refer to as "ultra-large projects"—the largest and most complex of capital projects, with budgets exceeding US $5 billion, and timeframes exceeding five years (Exhibit 1). These characteristics bring unique complexities associated with the scale of the project: multiple complex interfaces with stakeholders such as local communities and government bodies, new regulatory and environmental requirements, and often unique technological challenges.

When we refer to "ultra-large projects" we choose our language deliberately. We assert that an "ultra-large project" is as different from a megaproject as an ultramarathon is from a marathon. A marathon, at a little over 42 kilometres, is a substantial challenge—yet many thousands regularly complete the distance and they generally prepare for it by covering the full distance in training. They stand on the start line knowing that they will likely finish. An ultramarathon, at up to 100 kilometres, is exponentially harder—every additional kilometre necessitates greater physical and mental conditioning, with increased risk of injury. You can never really train for the full distance of an ultramarathon; because of the enormity of the challenge, you stand on the start line never quite knowing whether you will finish, much less of your expected result. Only a select few know what it's like to complete an ultramarathon. Similarly, an ultra-large project, with a multibillion dollar budget and a multiyear duration, represents an exponentially tougher challenge than a typical ~ US $1 billion megaproject. It is the preserve of the few.

Focus

Small & medium projects

- <US$1 billion
- <2 year execution
- Proven technology
- Frequent for company
- Asset manager decisions

Megaprojects

- >US$1 billion+
- 2-3 years execution
- Proven technology
- Experienced contractor available on the market
- VP projects decisions

'Ultra-large projects'

- >US$5 billion
- 5+ years execution
- May have new technology
- Infrequent for the company / owner
- Complex stakeholder management
- CEO / board level decisions
- Can introduce changes to the market / environment

Examples

Major equipment upgrade

Asset expansion
Constructing a new unit

Major greenfield project
(e.g. new mine, LNG facility,
O&G field, infrastructure program)

The impact of these ultra-large projects is vast: often changing industry supply and demand fundamentals, demanding changes to the regulatory environment, and even driving regional geopolitical tensions. Financial investments of this magnitude can have existential or market-shifting implications for the organisations that are executing them. These direct and indirect project participants are outlined in Exhibit 2.

EXHIBIT 2: KEY ROLES IN LARGE CAPITAL PROJECTS.

ILLUSTRATIVE

Project Owner

Typically either:
- Private sector organisation
- Joint Venture Partnership
- Minister in a government sponsored project

Stakeholders

- Shareholders
- Community
- Government
- Regulator
- Industry

Project Director

- Responsible for project delivery and management of contractors

Principal Contractor(s)

- Responsible for delivery of Engineering, Procurement and / or Construction scope

Subcontractor(s)

- Engaged by Contractor to deliver discrete package of work

US $10 trillion a year is spent on capital projects, and a growing share of this is spent on projects larger than US $1 billion

In excess of US $10 trillion a year is spent on the buildings, infrastructure, and industrial installations that drive the global economy. Construction constitutes approximately 14 percent of global GDP (approximately 1.3[2] times that of global health expenditure), with projections steadily rising at 3.3 percent per annum as investors seek ever better returns on capital (Exhibit 3).

EXHIBIT 3: GLOBAL PROJECT SPEND IS GROWING AT 3.3 PERCENT PER NNUM.

USD, trillions

■ Non-construction
■ Construction

Construction industry related spending

2016 Global GDP

65.5 (86%) $76 trillion 10.5 (14%)

3.3% p.a.

10.5 | 10.9 | 11.4 | 11.4 | 11.9 | 12.4 | 12.9 | 13.4 | 13.9 | 14.0

2016 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 2025
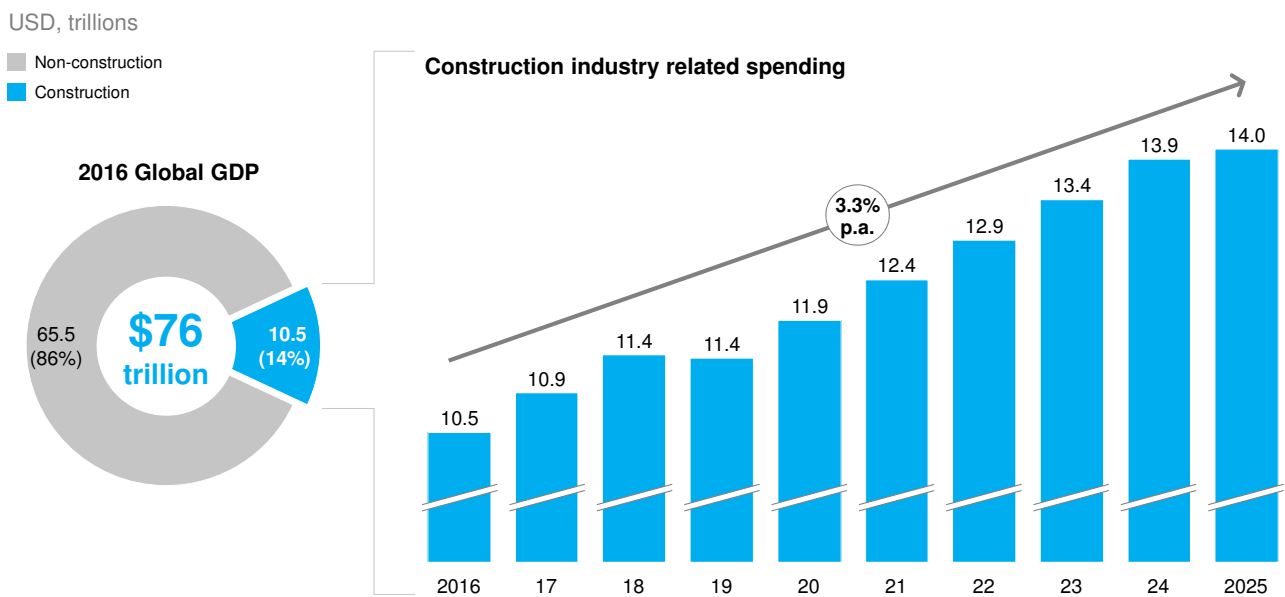
SOURCE: World Bank; IHS Global Insight, ISSA, Economist Intelligence Unit

At the time of publishing, 3,660 new megaprojects are planned across the globe.[3] With an average total project cost of US $3.8 billion, this means there is a pipeline of US $14 trillion in global megaproject spend—over 1.2 times more than China's GDP in 2016.[4] In the past ten years, the share of megaprojects has grown to 42 percent from 4 percent of all construction spending (Exhibit 4). This highlights a shift in the way that capital is deployed in the global economy—despite greater complexity and increased risk, the private and public sectors are investing proportionately more capital on projects larger than US $1 billion. Given this trend, it is increasingly important that leaders can execute these large projects efficiently.

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2 The World Bank health expenditure database.

3 McKinsey Infrastructure Project Analytics Tool (IPAT), with input from CIC IJ Global, MEED, Zawya, Dodge, India Infrastructure Monitor.

4 National Bureau of Statistics of China, http://data.stats.gov.cn/easyquery.htm?cn=B01.

Performance of US $1 billion+ projects has been historically poor across sectors

Troublingly, large capital projects that are completed on schedule and within budget are the exception, not the rule. We reviewed a dataset of more than 500 global projects above US $1 billion in resource industries and infrastructure, and found that only 5 percent of projects were completed within their original budget and schedule. In the completed projects, the average cost overrun was 37 percent and average schedule overrun was 53 percent (Exhibit 5).

EXHIBIT 4: MORE CAPITAL IS BEING INVESTED IN MEGAPROJECTS.

Global construction spending[1,2]
USD trillions

- Smaller projects (<US$1 billion)
- Mega and ultra-large projects (>US$1 billion)
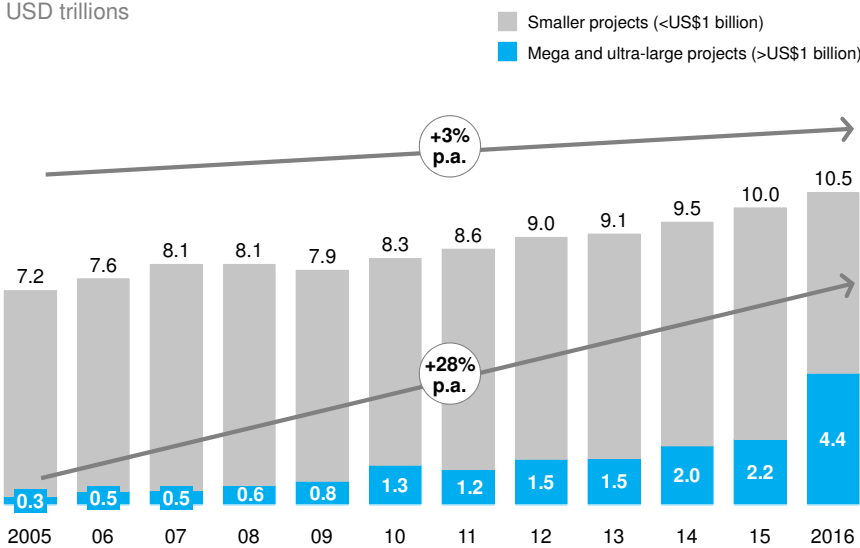
More than **3600** projects >US$1 billion **announced**

Average project budget of **US$3.8 billion**

1 Spend allocated to award year; 2. Includes parent and standalone projects only, excludes subprojects
SOURCE: IPAT(June 2016), CIC, IJGlobal, MEED,Zawya, India Infra Monitor, Dodge, SNL Mining, CGLA, Exame, IHS, ITF, GWI, MGI analysis

The soft root cause of failure in large projects must be better understood

Faced with the prospect of such substantial value destruction, it is essential to understand the root causes that drive the under-performance of large projects.

The failures in the core processes of project under-performance are well understood: post-project reviews generally audit the systems, process, and project management root causes for overruns. However the disruptive influence of failures in project leadership, ineffective culture of the project organisation, failed mechanisms of collaboration between multiple parties involved—and their increasing importance as the scale and complexity of projects increase—are typically not examined to the same extent.

This paper aims to fill this void and charts the fundamental soft issues that drive failures in project delivery. We call this area "the art of project leadership", further defined in the next section. To study this art, we performed 27 interviews with global practitioners with experience in delivering the world's largest projects—both as project owners and contractors. This group of interviewees collectively has over 500 years of project delivery experience.

Historical performance for projects with budgets >US$1 billion
N=274

Cost overrun[1]

O&G Downstream	53%
Mining	53%
Other Infrastructure	43%
Transport	40%
O&G Upstream	34%
O&G Midstream	28%
Real estate	24%

37%

Schedule overrun[2]

O&G Downstream	38%
Mining	41%
Other Infrastructure	63%
Transport	63%
O&G Upstream	41%
O&G Midstream	69%
Real estate	85%

53%
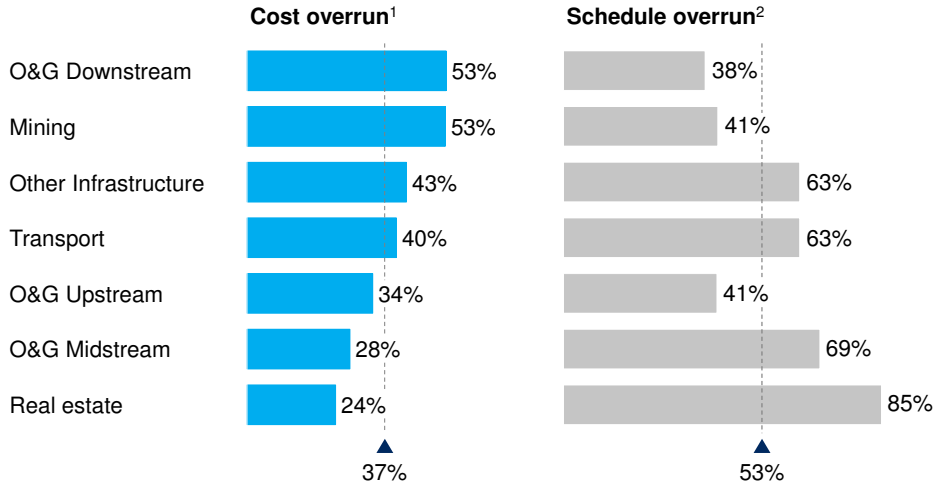
If this performance continues, we will see a further US$5 trillion loss on the 3600+ currently planned megaprojects[3]

1 Cost overrun = (actual cost – budgeted costs) / budgeted cost
2 Schedule overrun = delivery delay / budget duration
3 Excludes consideration of broader economic impact of late projects

SOURCE: IHS Herold Global Projects Database (2017), Basic Materials Database (2012), Megaprojects Database (2015)

Interviewees

We interviewed 27 project practitioners with a collective 500+ years of project delivery experience

INDUSTRY EXPERTS

Billy Varnado[*]
Former Project Director, Chevron

Christian Placines[*]
Former Project Director, Santos GLNG

David Knox
Former Managing Director and Chief Executive Officer, Santos

David Watkins
Former Regional Director Mace Group

Grant King
Former Managing Director and Chief Executive Officer, Origin Energy

Hilary Mercer
Vice President, Projects Integrated Gas, Shell

Jack Futcher
President and Chief Operating Officer, Bechtel

Lester Belanger[*]
President, Argos Project Management Inc.

Former Vice President Projects ECL, division of Rio Tinto Alcan

Louis Bon
Managing Director Ichthys Project, INPEX

Former Vice President Operations, Total

Martin Houston
Vice Chairman, Tellurian Inc.

Former Chief Operating Officer, BG Group

Matthias Bichsel[*]
Corporate Director

Former Director Projects and Technology, Shell

Maurice Bannayan
Former Senior Vice President, Reliance Industries

Mikhail Tretyak
Principal, Evergreen Process Solutions

Former Senior Vice President, Reliance Industries
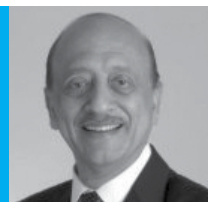
Nick Manocha[*]
President, ProCon Consultants

Former Project Manager, ExxonMobil

Peter Wilson[*]
Former General Manager and Project Director, Fluor

Richard Henfield[*]
Advisor at David Francis Associates

Former Project Director, Shell

Trevor Brown
Former Vice President, Santos GLNG

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[*] An external advisor to McKinsey.

Chris Toomey
Vice President
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Senior Vice
President, AECOM

Filipe Barbosaa
Co-Leader of
Capital Projects
& Infrastructure
Practice,McKinsey
& Company

Ghassan Ziadat
Vice President
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Regional
Director, Atkins

**Mark
Kuvshinikov**
Vice President
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Deputy
Project Manager,
ExxonMobil

**Michael Della
Rocca**
Leader Project
Development NV,
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Chief
Executive Americas,
AECOM
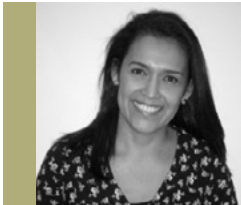
Patricia Griffith
Senior Expert,
Capital Projects,
McKinsey &
Company

Former Vice
President,
Independent Project
Analysis

Roberto Charron
Expert, IPD and
Lean Construction,
McKinsey &
Company

Samer Theodory
Vice President
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Senior
Project Manager,
Bechtel

TG Jayanth
Expert, Capital
Projects &
Infrastructure,
McKinsey &
Company

Former Vice
President Capital
Projects, SunCoke
Energy

Tim McManus
Vice President
Capital Projects
& Infrastructure
Practice, McKinsey
& Company

Former Senior Vice
President, AECOM

Art vs Science

The art of project leadership

Big projects have always been complex and difficult to execute successfully. Project management approaches, processes, and methodologies have evolved and developed to meet the unique challenges big projects bring, with significant effort undertaken by companies and the academic community to develop current best practice. In response, engineering and environmental codes and social practices are continually updated to ensure the safe and efficient collaboration of the multiple parties involved—across design, construction, and the operation of facilities. Best management practices around project planning, the stage-gated approach, project controls and performance management, as well as costing and estimation, have been developed, codified, and widely disseminated.

The *"science"* refers to the systems, processes, and methodologies of project management…

In this report, we refer to these systems, processes, and methodologies as the science of project management. While our experience shows that in some companies this science still lags best practice, we believe that it is generally well understood. Most mature companies with a sufficiently large investment portfolio have a well-defined stage-gate process, standardised procedures, clearly defined responsibilities between the project owner's and contractor's teams, as well as experienced personnel in the areas of planning, costing, project controls, and other critical functional areas. These processes and capabilities are very important—no project of reasonable size should start without them in place. We believe most projects of less than US $1 billion will be delivered if these science-based factors are in place and followed. Although differences between standards exist (for example, stage gates differ across industries), these are generally minor and not the critical drivers of the wide range of outcomes for large projects.

… the *"art"* refers to the blend of soft leadership and organisational skills, mindsets, and behaviours that complement the science.

In all projects, excellence beyond good systems and processes is required—specifically, a blend of leadership, organisational skills, mindsets, attitudes, behaviours, and organisational culture that need to complement the science. We call this blend the "art of project leadership". As projects increase in size and complexity, this art becomes increasingly important. Whereas these leadership skills might be termed soft, the reality is that they can be the most difficult elements to ingrain within a capital project organisation—to put it differently, the soft stuff is the hard stuff. Our interviews and research support the view that the art of project leadership becomes ever more vital with the growth of project scale and complexity, and becomes critically important for projects of ultra-large size (Exhibit 6). It is the art of project leadership that we explore in this work.

Our interviewees emphasised that the skills that project managers acquire throughout their career typically under-represent the importance of the art of project leadership. They observed that young practitioners are educated at universities in the science of project management, and their formative years in a project environment are spent mastering the systems, processes, and methodologies of specific disciplines. The art is generally learnt more informally, through experience and apprenticeship, and often finds its roots in the wisdom learned from mistakes—it is usually implicit, not explicit.

EXHIBIT 6: THE "ART OF PROJECT LEADERSHIP" GAINS IMPORTANCE WITH INCREASING PROJECT SIZE AND COMPLEXITY.

Organisational capabilities required to deliver
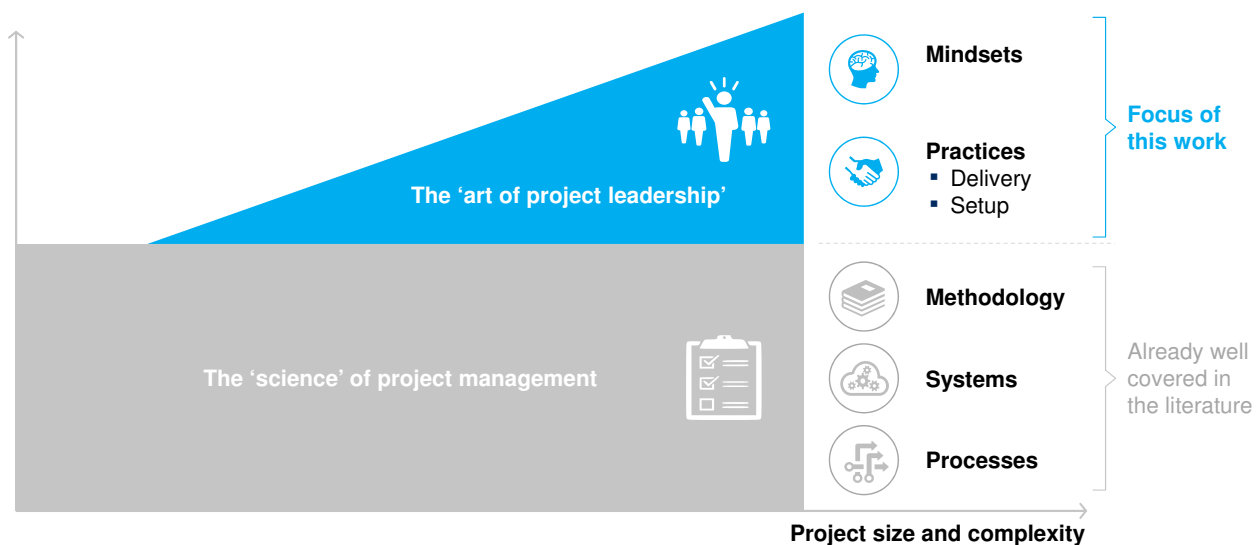
A review of leading project management literature highlights the strong emphasis that the discipline places on the science. A word search comparison analysis was performed on two data sources—the Project Management Body of Knowledge (PMBOK),[5] a leading publication on project management, and on the responses to questions on the success factors in project management from our experienced interviewees. The searched terms were a mix of words associated with both the science and the art. The results (Exhibit 7) are clear: those practitioners who have delivered large projects emphasise the art far more than in the literature.

5 Project Management Institute, A Guide to the Project Management Body of Knowledge – Fifth Edition, Project Management Institute Inc., 2013.

Word search
% searched words

Art
Science

99%
1%

55%
45%

Literature¹
Interviews

Word	Literature¹	Interviews	
Process			The 'science'
Plan			
Risk			
Cost			
Schedule			
Leadership			**The missing piece of the puzzle**
Collaboration			
Trust			
Mindset			
Ownership			
Coaching			
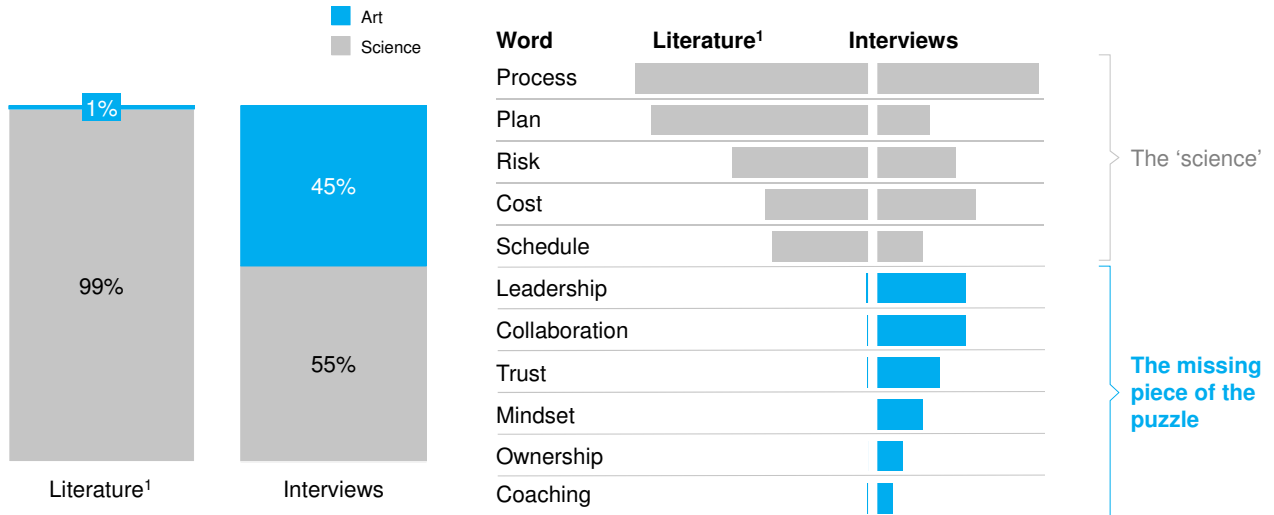
1 Based on PMBOK (Project Management Body of Knowledge)
SOURCE: PMBOK Guide 2013, interviews

"Our project managers are not trained adequately. As an industry, we do not have the processes in place to develop the skills that they need to manage this type of project."
TG Jayanth

Throughout our interviews, practitioners consistently reinforced the importance of the "art of project leadership" as a vital and necessary complement to the science. To distil this insight into something tangible and practical, we have synthesised these factors into a set of four discrete mindsets, with eight corresponding practices. Four of these practices are relevant to project setup, and four are relevant to project delivery. In the following sections we will dive into each of these mindsets and practices, and offer both a guide on how to implement each practice in a large project setting and some common "deadly sins"—these are the mindsets and practices that are best avoided to ensure successful project outcomes.

Mindsets

Lead as a business, not as a project

Take full ownership of outcomes

Make your contractor successful

Trust your processes, but know that leadership is required

Mindsets

Lead as a business, not as a project

An ultra-large project is more akin to building a business than executing a construction project, requiring CEO-level leadership and judgment to address a broad range of organisational issues.

The characteristics and scale of ultra-large projects, and their influence on the owner, whether a business or government, are so significant that they have more in common with running a business than executing a typical construction project with a discrete start and end date. Project leaders must address a broad range of organisational issues, typically associated with running a business, such as partner and stakeholder management, community engagement, governance, financing, regulatory issues, marketing, industry perceptions, top-management succession planning, capability building and retention, as well as industrial relations and cultural issues. There are several reasons for this.

The magnitude of the financial investment of an ultra-large project has existential implications for even the largest corporate entity. The stakes are high; success can secure the owner's future prosperity for years to come. A poor project outcome can leave a legacy with the potential to cripple cash flow, unseat CEOs and ruin long-lasting reputation and relationships—with customers, joint venture partners, contractors, and suppliers.

Ultra-large project time scales are long, potentially spanning a succession of chairpersons, CEOs, and project directors. The project has to be approved and then executed with a perspective beyond the immediate work horizon. Management, regulations, public opinion, and the social impacts of the project may change over its life. The setup and decisions should therefore be made in the context of long-term business goals.

Large projects are executed in an increasingly complex stakeholder landscape: media and public, government, and investors will all have the potential to influence outcomes. The "social licence" to conduct large projects is increasingly coming into focus—these projects are subject to public opinion, and as such, the public must be brought along on the journey. Investors scrutinise ultra-large projects particularly closely; critical accounting responsibility and the supporting governance processes must be maintained to the highest quality standards. The board of directors, auditors, financial investors, all have to be kept informed, and negative surprises are especially risky for these projects. If investors believe their money is not being spent wisely, then the viability of the project and owning company can be threatened. Under this scrutiny, project leadership and the businesses they work for have to be prepared for a bumpy ride.

Talent management is a burning concern. The company must recruit, integrate, and manage thousands of new employees and contractor staff. For an ultra-large project, the owner's team could be over 1,000 staff with more than 10,000 employed by the engineering and construction firms. Resource management may become a bottleneck, particularly for projects in remote and hard-to-access locations. Due to their scale, these projects can also distort the labour market and drive up costs—often because the contracting ecosystem is not developed to a sufficient scale for effective competition. Thousands of employees on the owner's and contractor's side need to have an understanding of company values

and mission; how health, safety, and environment is managed; the ultimate objectives of the project for the owner; and how decisions will be made. They must also be effectively motivated to deliver successful outcomes.

Finally, the world's biggest investment projects require CEO-level leadership. The project leader should have a deep understanding of the context of the project with respect to the wider business, a high level of business judgment, the ability to build and lead large and diverse teams, the skill to maintain trust-based relationships with stakeholders, and the flexibility to adapt to uncertainty in a way that is unlike anything experienced on a smaller "construction-only" project. This leader will need to bring all these skills together under one leadership team, with a common purpose and a culture that pushes the project through inevitable highs and lows. He or she should have the personal resilience, as well as the clarity of vision, to endure and inspire throughout any periods when completion appears unachievable. These are CEO-level qualities; the owner should be ready not only to recruit and select this "project CEO" but to continually ensure their motivation and commitment.

"A project director of a large project doesn't need to understand the technical 'nitty gritty' — they need to lead. Engineering training channels project managers to think in a particular way and often this emphasises technical over leadership skills." TG Jayanth

We offer the following advice:
Match the organisation design to the nature of the project challenges. Typically large project organisations have a well-understood organisation design, staffed with project professionals who are experienced and understand their roles. Often these professionals move from one large project to the next and in doing so take their individual learnings with them. Combining this roving and experienced "guns for hire" workforce with the owner's team will typically deliver a reasonable outcome for a medium-sized project.

However, for ultra-large projects this approach is unlikely to deliver success. For example, if the project has a significant impact on the environment or local population then conventional organisation design may be insufficient. The design in this case must cater for a much broader flow of information horizontally and vertically across the project team, to enable all staff in the project to "face the public" with a common and compelling message. This is complex, and requires project silos and hierarchies to be overcome to create a culture where information is shared and staff trust their peers to do their part well.

For example, one of the project leaders we interviewed set the tone during a town hall. The leader declared: "Working collaboratively is a prerequisite for being on this project team." He also backed these words with concrete action through his consistently inclusive behaviour—a clear signal to the organisation that he meant what he said. These words and actions set the tone and created the obligation to freely share information across the project.

In addition, the project organisation must not neglect community engagement, commercial management, finance, and regulatory management. It may be possible to do without these

functions in smaller projects, but not on a large project. The project director either needs to access these skills from one of the project owners, or build it within the project itself. In the face of community and environmental challenges, the project must speak with one voice.

Hire a project director with CEO-level qualities and skills. The breadth of responsibilities that a project director must have is vast and akin to that of a CEO. In addition to the ability to flawlessly run the processes and systems of projects management (the science), the project director must have broader business skills and the ability to manage and motivate people. Therefore, the owner needs to approach recruiting a project director with the same rigor as when recruiting a CEO.

"We are so much more selective when choosing a CEO, not like a project director; traditional project directors rise through the project management ranks and do not gain the CEO characteristics needed." TG Jayanth

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Adopt a "new business" approach at board level. In addition to probing project leadership on the what (budget, contracting strategy, schedule), owner boards and senior management need to treat an ultra-large project as if a new company were being set up. We recommend the following questions be asked at board level:

> **Questions to address before project approval:**
>
> - What is the organisation's shared vision for the project?
>
> - Do the CEO and project director have the knowledge and breadth of experience to lead?
>
> - What is the culture they will build?
>
> - What is the delegation of authority?
>
> - Does the project team own the agreed outcomes?
>
> - Does the project have sufficient stakeholder support, or at least a clear path to establishing this?
>
> - How will the leadership continue to build trust with stakeholders and contractors?
>
> - How will the owner's team respond to major problems within the scope of your contractors?
>
> - Does the financing plan cater for an unfavourable outcome?
>
> - Does the project have sufficient stakeholder support, or at least a clear path to establishing this?

- How will the leadership continue to build trust with stakeholders and contractors?

- How will the owner's team respond to major problems within the scope of your contractors?

- Does the financing plan cater for an unfavourable outcome?

- What is the long-term impact of the project on the business: cash flow, return on capital employed (ROCE), total shareholder return (TSR)?

- What are the minimum market conditions to avoid risk of impairment during the execution phase?

- What is the project resourcing model? Have resourcing requirements in areas beyond "core" engineering and construction been adequately considered?

Questions to address during execution:

- What is the progress with respect to the deterministic project KPIs?

- What are the top execution risks and how are they being mitigated? How are risks in areas beyond "core" engineering and construction (for instance, stakeholder management and talent management) being controlled?

- What is the morale in the project team, how is it measured?

- Are there reputational issues that could impact the company?

- How can the board support the project team?

At each board meeting, a one-page summary of the progress against the deterministic KPIs should be provided so that qualitative questions can be explored in tandem with the quantitative project outcomes. In addition, boards should prioritise an annual visit to the project site. This fulfils three objectives: first, it enables the board to verify progress as reported; second, it provides context for an intervention if the project is off track; and third, it reinforces the importance of the project to the company.

Take full ownership of outcomes

The project owner needs to maintain full accountability for delivery. They must remain well informed throughout and be ready to step in to make tough decisions in a timely manner.

The owner is the ultimate risk holder for all activities associated with any large project and must manage the project accordingly—they must take true accountability of project results and ensure that the desired outcome is delivered. At the end of the day, irrespective of contracting strategy and risk allocation, it is the owner's responsibility if the project is late, over budget, or fails to achieve the predicted performance.

"The project owner should take the same level of responsibility as the project director. The project owner should not be [solely] an escalation point—they should be anticipating issues. They should be helping get things done. You cannot contract away your responsibility as an owner."
TG Jayanth

Taking true accountability for project outcomes means ensuring the owner has a clear and comprehensive vision on the desired outcome, and is fully invested in the decisions made, especially around dealing with challenges that arise.

An owner "owns" a project by making difficult decisions. When the project experiences major problems, it is the owner who needs to be ready to intervene. In fact, it is often only the owner who is equipped with the right resources, information, incentive, and decision-making power to resolve the most significant challenges. There are owners who, when they believe the project is off-track, start demanding solutions from the contractor by writing accusatory or unhelpful letters. Our interviewees are universal in their view that this is not the way to resolve a problem; they focus instead on the necessity to make (often) difficult decisions to facilitate a solution. These decisions may be around reshaping the project, changing the contractor or their scope, replacing team members, or increasing resourcing and intervening more directly in project execution. When an owner is reluctant to intervene in these areas, and in particular when they fail to make decisions swiftly, productivity and morale drop, and the key contractor and owner relationship is strained.

"Owners need to intervene when things are not going to plan. Some [owners] prefer to 'nag' the contractor, being reluctant to intervene—this is lack of accountability as an owner…. Be ready to make difficult decisions."
Lester Belanger

Define the scope clearly. This is one of the golden rules of project management science, yet, as one of our interviewees mentioned, it is surprising how many owners do not know exactly what they want, especially on reimbursable projects. Defining the scope clearly can best be achieved by sufficient upfront investment in a detailed project design. This should involve the contractor and the right expertise at an early stage to understand constructability and rigor in scope management of contractors.

Be sufficiently informed. The owner needs to have ongoing, detailed knowledge of project status to understand the main risks and identify when the project is in distress and needs intervention. It is important for owners to build intuition through understanding progress metrics and field dynamics. This requires that owners not only develop the performance management system (metrics, cadence of reviews), but also spend significant time in the field, testing the accuracy of reported progress—so that they can build understanding of issues at the work face and the trajectory of scheduled construction. Risks must be explicitly assessed and monitored by the owner's team. The owner's team needs to maintain its own schedule and have a forward-looking view on progress against the schedule.

"Use your gut feel when analysing metrics—understand your numbers and the field dynamics. Move to action when things are going off the rails, when you cannot see progress. Making this call is extraordinarily hard." Martin Houston

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Avoid starting a "review" in case of setbacks. Project reviews are often performed with good intentions, yet rarely prove to be a valuable exercise. Reviews, especially in the time of crisis or setback, typically occur when the project is least able to manage them and have a tendency to distract a large portion of the organisation away from delivery. When an owner considers a review, it is a signal that they are not sufficiently informed, and indeed, highlights an opportunity for the owner to work more closely with the project team and the contractor to solve problems as opposed to examine shortcomings.

Support the team. Any large project will inevitably have its "ups and downs"—the owner should provide the entire team with support accordingly. When a project is going well, the owner should focus on encouraging the contractor and clearing the path for the project to execute at speed; this means making swift decisions on scope and resources. When problems arise, the owner should work out how to help solve the problem, not assign blame.

Communicate confidence in the project director. At all times the project director should have unfettered access to the owner with regular communication, particularly in times of difficulty. The team needs to know their leader has the full support of the company CEO or equivalent. This helps to maintain the project director's ability to act and influence, which is usually critical to resolving issues.

Be prepared to intervene. It is important for owners to be decisive in their interactions with the contractor. In particular, the owner should avoid "nagging" the contractor—continually

pointing out problems and neither supporting the contractor by fixing them nor finding another party to do so. Our interviewees rarely regretted acting early on these issues.

"Sometimes tough [personnel] decisions have to be made, and this should be done sooner rather than later. Do not just hope things will get better." Peter Wilson

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Make your contractor successful

Owners and contractors work best as a business partnership with a mindset of "we win together or lose together". Productive contractor-owner relationships are based on mutual trust and joint problem solving.

In our interviews we heard a consistent message: in order for a project to be successful, the contractor needs to be successful. The best working relationships are those where the owner considers the contractor as a business partner, with mutual respect, trust, and a joint win-win mindset. This requires a jointly developed and regularly updated understanding of project risks, a clear assignment of accountabilities, alignment of incentives, and an investment in building a relationship of trust.

For example, in one recent ultra-large project, a declining level of trust between owner and contractor led the contractor to prepare long and complex monthly reports aimed more at providing future evidence in potential legal proceedings than providing clarity on the real issues in the project. For both owner and contractor, this took focus away from effective leadership of the project, ultimately leading to an inability to accurately diagnose the project's status and address looming problems.

The common spiral of blame relationship can also detrimentally impact productivity, morale and, consequently, successful project outcomes. In the most egregious circumstances, the tension between owner and contractor paralyses the project with relationships breaking down over an inability to resolve variations to everyone's satisfaction. This outcome can be avoided with specific science levers such as scope clarity and informed management choices on contractual structure, but also needs some art—such as early leadership from the owners on setting the tone and behavioural norms of the relationship with the contractor, which will influence the respective teams and their behaviours. This enables the teams to productively work together even in challenging project circumstances.

No one other than the owner can set the tone of the relationship with the contractor. Unfortunately, the traditional school of project management has a heavily engrained attitude of "squeezing the contractor"; it is important for leaders to be aware of the pervasiveness and consequences of such an approach. The owner's behaviour can undermine the contractor, and this is sometimes the result of an entrenched mindset from historical projects—where the outcomes were defined by a combative relationship. Owners and project directors must be unshackled from this mindset.

The owner must think long term. The typical combative mindset can lead to well-intentioned owner team members driving a hard bargain on variations—minimising costs on a local level, but potentially undermining relationships across the wider project. The owner must acknowledge that all parties have a right to make a reasonable margin/return on their investment of time and resources. Importantly, owners must also recognise that in the end, any project problem will ultimately become their problem. Therefore, the focus of their energies and efforts should be placed on solving project problems, rather than allocating blame (and variations). This is entirely congruent with the desired project outcomes of on-time and on-cost delivery.

Making your contractor successful sounds simple, but in practice it is difficult. The owner can set the contractor up for success in many ways. Interactions between the teams should be defined by joint problem solving, and not just by controlled reviews and micromanagement. Given the high financial stakes involved in ultra-large projects, the natural tendency for the teams is to avoid blame and "lean out" when it comes to problem resolution, to avoid being held responsible and potentially liable. It is more difficult, but more productive, to instead "lean in"—collaborating to solve the problems positively and constructively. The owner needs to create and support a culture that gives both the owner's team and contractor's team the courage to lean in and solve the problems.

"Contractors have an incredibly difficult job. In many ways, their job is more difficult than the owner's. Too often the owner's team has a lack of respect for the contractor."
Hilary Mercer

We offer the following advice:
Think of a contractor as a business partner rather than a vendor. A partnership approach is required between owner and contractor to solve the challenges that a large project brings. Transactional supplier style arrangements are largely ineffective, as the duration and complexity is so great that all issues cannot be covered sufficiently in supplier agreements. Adopting a business partner mindset unlocks opportunities that would otherwise be constrained by the inflexibility of a traditional contract. This requires investing in the relationship. This means spending time to get to know each other at all levels. For example, our interviewees noted offsite workshops and social functions were worthwhile opportunities to build the personal relationships critical to project success. Co-location of the owner and contracting teams is also very helpful.

"It is a long horse race—you cannot beat your horse to death. I see too often that people say: 'The problem is the EPC.' Instead you need to get the enabling mindset—you are in a long-term relationship." Richard Henfield

Spend your energy on solving the problem, not assigning the blame (there will be moments of truth which set the tone). While problems during construction are inevitable, they are often the moments of truth. The owner can choose how to react: either strengthen the trust-based relationship, or default to blame and ensuing contractual acrimony. The mindset—and the messages—in the joint issue resolution meetings should be "how can we solve this problem together effectively to minimise the damage" rather than: "Who is to blame?". The response of senior leaders in these situations is critical. Trust and respect, especially in challenging circumstances, empowers people on both sides, while assigning blame will encourage future problems to be suppressed and ignored, rather than unearthed and resolved.

"Just because the contractor does something wrong, doesn't mean the owner needs to lose respect. The owner needs to help them where possible." Hilary Mercer

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Trust your processes, but know that leadership is required

Processes alone will not resolve every challenge on an ultra-large project. Leaders should trust and enforce the appropriate process, but recognise their benefits and limitations.

At the heart of the best-practice science of project management are well-designed processes, which serve as an essential ingredient for the successful execution of any project. Processes alone, however, are insufficient to ensure the success of ultra-large projects. As discussed, the art of leadership is required to properly implement appropriate and robust processes, but additionally, it is also used to judge precisely *when* process alone is not enough.

Ultra-large projects' unique characteristics—increasing project size and complexity, interdependencies of project elements, complex interfaces, high numbers of stakeholders, and sophisticated ownership structures—put higher requirements on the robustness of processes and governance.

However, while it is possible to design individual processes appropriate for each element, uncertainties are so significant that it becomes impossible and impractical to foresee and develop a standard response for every possible challenge and situation.

Leaders need to ensure that guidelines, rules, and standards are in place and are by default being followed with rigor and discipline. However, it is also a leader's responsibility to ensure that the project neither drowns in an escalating suite of administrative processes nor loses the ability to anticipate problems through a slavish adherence to process. While fully understanding the need for effective processes, leaders should appreciate their weaknesses. Judgment needs to be exercised to decide when, if ever, it is sensible to deviate from process for the overall project benefit. Leadership provides guidance and flexibility to adapt when necessary.

"You can't write enough rules to manage complexity; a project director can write procedures to manage things that work in a logical way, but as risk and complexity increases, it is not sufficient. In a simple project, if a project director follows the rules, they will get a good outcome. In a megaproject, this is not so. Leadership is required."
Hilary Mercer

We offer the following advice:
Trust and enforce the stage-gate process. Enforcing the stage-gate process prevents difficulties compounding. Too often there is a desire to start early on construction and "bend the system just one time"—creating a cascade of coordination issues associated with activities being executed out of sequence, and team members lacking clarity on a modified process. In particular, it is crucial to freeze the scope before execution, and set a very high hurdle for change, even to the extent of requiring project director approval.

"Companies which follow their processes rigorously deliver. Those which are eager to 'get the shovel in the ground' often miss." Lester Belanger

Invest heavily in front-end loading (FEL) but understand its limits. Effective front-end loading is important for success as the ability to impact project outcomes decreases significantly as the project progresses. The business case must be rooted in high-quality basic data, as a minor oversight in planning can lead to a costly rectification later on. Best-practice companies require first-quartile FEL scores, and invest heavily in understanding and addressing risks and contingencies. However, the reality of ultra-large projects is such that even with first-quartile FEL, significant uncertainty remains. This is due to the very nature of these projects (long duration, complexity, and multiple interdependencies). Effective project leaders are not frozen by uncertainty, but invest resources to understand it well and use judgment on when and how to proceed.

"Front-end loading does not guarantee success, but not doing it properly leads to certain disaster. Our experience shows that most failed projects had poor FEL."
Matthias Bichsel

Use proven processes and systems and make sure people know how to use them. Our experience shows that in most companies project management processes are present, but are often not used effectively. An effective process needs to be both designed correctly and followed diligently. Poorly designed processes typically find their roots in insufficient resourcing and poor interface management, and result in lack of project team's clarity on

how to execute. Process adherence issues often arise in response to misaligned incentives (typically due to schedule pressure) and cause confusion over the sequence of activities and roles of team members. Owners may bend the rules—for example, to start early in the expectation of improving the final project outcome—and contractors adapt processes to address one-off issues or cut corners. The impact of ineffective processes leads to, at best, a multitude of coordination issues, and at worst, safety-related procedural breaches. The best systems are those that have been proven in similar applications, and are well understood by the team. If the owner does not have robust systems, it is important to engage a partner or contractor that does.

"We want project managers [and teams] to understand the principles of the process, not follow it blindly."
Mikhail Tretyak

Consider process deviations—but have a high bar in doing so. Given the complexity of large projects, you will be faced with situations when following the established process may be detrimental to overall project progress. What if all modules but one are ready to pass the stage gate, should the project go ahead or wait? The right answer depends on package criticality, significance of the delay, deep understanding of interdependencies, and overall risk of bending the rules. The following questions should be considered:

- Can we add extra resources to minimise delay?

- Will having packages out of sync create havoc, and will interfaces continue to be manageable?

- Do we truly believe that risk of disruption will be minimal and the benefits significantly outweigh this?

Some of our interviewees emphasise the importance of not always being pedantic to the extreme—at times, judiciously breaking the rule ensures that the project continues at full steam and avoids accumulating delays. We encourage project leaders to consider whether and when bending the rules and standards is possible and when strict observance with no compromises is required—such as with questions of safety.

Mindsets: The "deadly sins"

The bulk of this report is dedicated to the critical mindsets and practices that deliver outstanding project outcomes. Conversely, however, there are also mindsets and practices that must be avoided to ensure the project does not derail and slip into acrimony. We call these mindsets and practices the "deadly sins" of project leadership.

Failing to inspire the team to operate like a business rather than a traditional project

"This is the way we have always run projects"

Believing you can delegate delivery

"It's the contractor's job to bring in the project on time and on budget"

Blaming the contractor and not solving the problem

"The contractor is underperforming; we need to ramp up the pressure"

Blindly following processes

"I like your idea but I know the project manager won't consider it because it's not following process"

Practices: Setup

Define purpose, identity, and culture

Assemble the right team

Carefully allocate risk and align incentives

Work hard on relationships with stakeholders

Practices: Setup

Define purpose, identity, and culture

Effective project teams have a unique and shared identity, and create a culture of mutual trust and collaboration. Project leaders should articulate purpose, role model behaviours, and nourish the desired culture.

Effective project teams not only execute projects as business as usual, but they also share and understand the value of being a part of this unique, "once-in-a-lifetime" experience. There is the allegorical tale of three masons building a cathedral wall. When asked what they are doing, the first one answers "laying bricks"; the second one says, "building a wall"; and the third replies: "I am building a magnificent cathedral." The shared purpose of building a "magnificent cathedral" makes teams more inspired, collaborative, productive, and more resilient to inevitable setbacks. A shared purpose and culture provide the moral compass for the team members working together to achieve something extraordinary. Ultimately it contributes to better project outcomes and a richer project experience.

With an ultra-large project, the purpose and culture must be carefully developed and articulated to all stakeholders, and not just left to evolve organically. In the same manner that a large organisation defines its mission and business values, the best projects make a set of deliberate choices around purpose and identity. These often look beyond the project's financial and technical agenda, and seek to leave a positive legacy on the people and communities impacted by the investment. These choices tie together a range of different objectives and ambitions of the community, government, employees, and business partners into a coherent and appealing whole.

The owner must be clear on the purpose of the investment. For business, the purpose is defined through the lens of strategic, financial, and growth measures; for government, it is defined by nation building, security, prosperity, community and political goals. It is critical to define the purpose and ensure that owners and stakeholders are supportive. Examples of such purpose can be seen in the Apollo program, which had the clear goal of landing a man on the moon and returning him safely to Earth by the end of the 1960s; and the Hoover Dam, which would irrigate farmland, provide a reliable water supply for southern California, and control the flow of the Colorado River.

For governments, the purpose can be strategic rather than economic. For example, securing the maritime safety of a nation through investment in submarines, or the global eradication of polio. For these "nation-building" projects the decision making will not be driven by cost, schedule, or economics but societal, heath, and security considerations. Whatever the project, it is absolutely critical that its purpose is explicitly agreed, articulated, and broadly communicated from the beginning, and remains constant throughout the lifespan of the work.

This overarching purpose needs to be supported by the values of the organisation. Simply put, the values define "the way we do things around here". This includes addressing questions such as:

- What attitudes, mindsets, and behaviours are expected?

- What type of people do we hire?

- How do we communicate with our staff and our stakeholders?

- How are our staff rewarded and developed?

- How are decisions made?

Of course, it is one thing simply to agree on these values as a leadership team—it is quite another to live and lead by them.

We offer the following advice:

Articulate a clear purpose and define the culture and values. A project's purpose and objectives enables the project organisation to understand what they need to do, why they are doing it, and provides an important direction for team members to make thoughtful day-to-day decisions. This begins at a top level by clearly defining the project purpose. Then, for the team, clearly define the expected attitudes, behaviours, team norms, and expectations around performance. The consequences of expectations not being met should also be defined.

The project purpose must be clear to everyone—the project team, partners, and external stakeholders. Ensure the purpose does not only stay "on paper", but is lived—constantly remind the project team that you are building a "magnificent cathedral". Refer to the project purpose and norms in frequent communication with your team as well as other stakeholders.

A practical way to support this is the investment in the design of a visual identity for the project: a theme or brand logo and project "look and feel" that will resonate with participants and foster inclusiveness. As well as giving the project a name, this might include adding a tagline, and project colours or shapes that can be applied to communications, posters, construction hoardings, and branded personal protective equipment (PPE). Take care that this identity builds on and strengthens the owner's brand and values. An identity that feels too separate can foster isolation, or the belief among the project team that the owner's views and influence do not matter.

Reinforce desired behaviours through role modelling and formal mechanisms. Owners should role model values and mentor their top team to do the same. Seek the moments of truth when values will be tested—it is in these moments that a burgeoning organisational culture can be galvanised, or undermined by an inconsistency between word and deed.

Make sure that formal mechanisms (such as performance appraisal) are consistent with the organisation's purpose and values. For example, include assessment of how a person performs against the set of desired mindsets, behaviours, and team norms in the performance evaluation. Ensure that the team understands how the performance appraisal system is linked to the organisation's greater purpose and values. As a leader, do you motivate people who perform well, but exhibit behaviours that the team agreed were unacceptable? If this happens, the cultural effort is undermined—consistency is vital for credibility.

Monitor progress on culture. Establish a way to get feedback from the project team on the project culture, mindsets, and behaviours. This can take a form of a regular survey with questions such as:

- Is our purpose clear?

- Are we consistently adhering to our values?

- Are we exhibiting the right behaviours?

- Are we acting in true partnership with our contractors?

- Where have we deviated, why, and how can this be corrected?

Devote the resources necessary to complete the survey and ensure the outcome is both communicated widely and promptly acted upon.

Be transparent on current priorities. Too often lack of clarity around the "priorities" of the project results in confusion at the front line. Leaders must communicate precisely the current priorities between cost, schedule, and quality. They must also clearly articulate the inflection points at which these often mutually exclusive variables change: that is, *"the commissioning work is critical path and an absolute priority—overtime is required and we therefore expect and accept up to a 5 percent cost overrun on that package (but no more)."*

Assemble the right team

Besides shared values, owner and contractor team members need to have the appropriate blend of leadership qualities, cultural and local awareness for the task ahead. This must complement the requisite technical skills and experience.

One of the owner's most important tasks is to select the right team. Recruitment and team assembly for large capital projects poses unique challenges, which necessitate careful resolution.

For ultra-large projects, there is little margin for error and having experienced leaders who are alert to the potential pitfalls greatly supports project delivery. However, executing a "one-of-a-kind" or an "industry-first" project means that it is often not practicable (or even possible) to assemble a team that has done it all before. The owner must invest time and resources to find the right experience for key roles while also accepting compromises. Any

relevant previous experience should be exploited as much as possible, and critical project work packages should be filled with the best people. But team expertise must be fit for purpose; the team does not need to have experts in every box on the organisation chart—rather, the team should have complementary skills. Leaders must use their judgment to understand this delicate trade off and build the right team accordingly.

"Do not start before the right team is assembled."
Matthias Bichsel

Having the right technical expertise is important, but is not in itself sufficient to qualify a person for a position. As discussed throughout this report, project culture and working environment are as critical to success as individual capability. Recruitment and placement efforts for the project team must fully take these considerations into account:

- Will the person fit in the project environment?

- Does he or she share the team values and exhibit the appropriate mindsets and behaviours?

- Does he or she have the right soft skills and the ability to effectively collaborate with others, adapt to change, be resilient under stress and uncertainty?

When selecting the team, owners should also appreciate that success in one environment does not always equate to success in another. For example, an individual who was highly successful in their home country may not be as effective when staffed in a country with different cultural norms and ways of working. Cultural awareness and the ability to adapt to different working environments are important, particularly in the case of international contractors working with a local owner's teams. This does not mean that the team must be "all local" to ensure a cultural fit. Diversity in management experience is essential to get the right team members with the requisite soft skills. Our interviewees highlighted the benefits of hiring people from non-traditional backgrounds to bring to the team skills more associated with the art. These individuals can add a novel perspective and provide a helpful challenge to typical approaches. For example, in one successful project, one of the senior project leaders was charged with anticipating, monitoring, and helping address problems in the social fabric of the project organisation (for instance, interpersonal conflicts)—a role which proved to be very important.

"You cannot be prescriptive on culture. It doesn't matter what you say; team members from different cultures will work in a particular way." Peter Wilson

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The joint owner-contractor team must have global reach to manage international engineering and procurement, but at the same time have intimate knowledge of the local environment. It is essential to work with contractors that have the experience, systems, and capabilities at a corporate level to conduct business across international borders. The team needs the contractor's best people, who understand how to bring their expertise and

systems to bear. Practically, this requires a contractor with a global footprint that has detailed local knowledge of the activities being performed on site.

We offer the following advice:
Assemble a team that has relevant experience and "fits" with the desired team culture and behaviours. Team members need to be selected for technical and leadership skills as well as experience in similar projects, contract terms, geographies, and cultures. Importantly, the team needs to be aligned with the owner's culture, and getting this right early on will prevent issues later. Look beyond personal networks and reach out to a large pool of candidates to attract the best possible people.

"You cannot get five years' experience in less than five years. There are no quick fixes. To be a top performer means that you have to be able to tap into networks, have an open mind, hone team-building skills, hone contractor interaction skills, etc. You cannot just read it in a book; flying hours matter." Matthias Bichsel

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Select people for top team roles with a high emphasis on values and mindset. A cohesive management team is central to a project's success and it is crucial that the top team shares the owner's values and mindset. An aligned management team can work together to solve problems and prevent silos forming; a misaligned team can waste energy and goodwill through internal conflicts.

"Leadership is the most critical skill; everything else you can buy on the street." Peter Wilson

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Engage a contractor that has a proven record in delivering similar projects and shares your values and mindsets. It is vital to recognise the expertise and capabilities of the owner and establish contracting relationships to bring complementary skills into the organisation. The selection process needs to extend beyond reviewing CVs and arrive at a deep understanding of the capabilities of every person in a potential contractor's team. Practically, the owner should run three- to four-day workshops with key personnel from the candidate contractors, during which the team is run through simulations of real-life scenarios to assess team dynamics, all well before a contract is signed. An effective exercise is to request leaders to introduce their team and share how they work together. Owners need to assess whether the candidates share their mindset, have a win-win attitude, and can be trusted. The rigor of this process incentivises the contractor to supply their "A" team and provides the owner with the comfort that comes with a practical understanding of how the team will work together.

Continuity of team members is critical to performance. Owners should minimise churn and take the time to get the team right from the outset—acknowledging that the skillsets required may fluctuate with the dynamic nature of construction phasing. The need for

continuity does not override the reality that, at times, the best outcome for the project may only be achieved by reconfiguring the team. When issues do arise, leaders should first focus on resolving process and procedural issues in preference to disrupting team make-up: structural deficiencies in project delivery cannot be resolved by personnel change.

Team reconfiguration is also required at critical transition points where the skills and capabilities change: for example, when moving from construction to commissioning phase. Leaders must prepare for these transition points—deploying the right recruiting, onboarding, and training resources early to ensure a smooth transition.

"Rightsize" the team. It is easy to fall into the trap of building a team that covers every potential task. The reality is that it is far more productive to manage a smaller, highly capable team. The team size should be expanded if, and only if, the workload cannot be effectively managed. Excess people have a tendency of creating work by adding processes and controls, and in doing so make themselves indispensable, which slows decision making and frustrates the "heavy lifters". In particular, beware of creating specialist "interface manager" or similar roles. These create complexity and reduce the ability of leaders and other team members within key disciplines to create direct relationships with their peers. Not only can this create a lack of ownership, it also stifles productivity, problem solving, and innovation.

Carefully allocate risk and align incentives

Successful owners thoughtfully delegate only those risks that the contractor is better positioned to manage. Leaders should establish and maintain relationships, not only contracts, to facilitate ongoing alignment of incentives.

While the practices of risk management and risk allocation between owners and contractors are well understood as part of the science of project management, the subtlety of managing risks through relationships, as opposed to contracts, is often neglected.

For obvious reasons, owners and contractors have differing appetites for, and perspectives of, risk—and this varies depending on contractual role, project phase, and organisation size. This risk asymmetry can drive misunderstanding, often leading to litigious outcomes. One of the root causes of this is that the assessment of risk is poorly understood and, as such, judicious risk management is a crucial part of executing large projects. Doing this effectively requires a blend of skillsets: alignment and foresight to understand the overall project risk; self-awareness to realise which party is best placed to own a given risk; and a pragmatic view that getting the contract right is only the beginning when it comes to risk management. Deeper relationships need to be formed between the owner and contractor to bridge any differing perception of, or appetite for, risk.

In ultra-large projects, some degree of risk is inevitable—regardless of project phase, organisation size, or contractual role—and it therefore comes down to how risks are managed. A common fallacy is the perception that owners are able to delegate risks to the contractor. In doing this, owners are transferring responsibility for solving the problem despite the fact that, ultimately, the owner still has accountability for the overall

project outcome. Owners who shirk this responsibility do so at their peril, often leading to uninformed decisions being made, and undesirable outcomes. The owner must own the outcome and manage the risk, not simply outsource it to others. This being said, there are some risks that are naturally better owned by the contractor; part of the owner's role is to recognise which party is best placed to manage this risk.

"At the end of the day, no matter what your contracting strategy is and how you plan to allocate the risks, the ultimate risk owner is the owner. If the project is not ready, is over budget, or doesn't start, it is the owner's problem."
Lester Belanger

The contract is an important tool, but it is not the only one for managing risks. Contracts need to provide optionality to account for a large variety of outcomes. Commercial agreements need to dovetail with the funding and execution plan, and have sufficient flexibility to cater for uncertain outcomes. In particular, it is advantageous to have sufficient optionality in the contracting strategy to bring first production delivery dates forward or back to fit with operational requirements. Equally, it is important to ensure that the revenue stream is locked in to cover a minimum return on the funds invested. Due to the multiyear nature of these agreements, the contracts must be written to take global market fluctuations into account. However, in a successful ultra-large project, this risk is informally managed through the collaborative strength of the relationship between owner and contractor—and the recognition that the fates of both organisations are aligned with the project outcome—with the contract providing a formal backstop with carefully aligned incentives.

"The relationship between owner and contractor is more important than bidding processes. When you get a relationship that works, stick with it." Martin Houston

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We offer the following advice:
Understand and own the project risk. Delegate judiciously *only* those risks that the contractor is better positioned to manage. Workshops should be held between owners and potential contractors to create the best possible shared understanding of risks prior to commencement and to regularly assess the evolution of risks through to completion. Based on this, the owner can determine which risks they are best placed to own, and which risks should be shared. Once the risks are well understood, the owner can determine the contractual styles that best align incentives and the final criteria for choice of contractors. As the project unfolds, this common understanding of risk must be updated.

"There is a tendency which is seductively simple—to think that the less you know, the more you're going to rely on an EPC-type contract." Grant King

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Develop the contract where "good for the contractor" is "good for the project".
Some contracting strategies inadvertently set up potential for adversarial behaviours, and are therefore more likely to fail. Build the relationship with the contractor to understand their motivations and their needs in a contract, and ensure the contractor is rewarded well for doing an exemplary job. Further, misaligned incentives destroy trust—where there are multiple contractors, then there must be equanimity with the alignment of all incentives. A large project typically has many contractors who need to work together. It is important that the contracts promote cooperation when different work packages converge on the finish line. Consider innovative contracting approaches such as integrated project delivery (IPD).[6]

Incentives need to set up both the owner and contractor for success, not to extract value or take a strong position from the outset. It is also very important to anticipate changes; contracts need to have suitable flexibility to be renegotiated if they do not work—if there is no option to renegotiate, contractual claims increase exponentially and positions get more and more entrenched.

"You want the contractor to receive every penny of the incentive program—you really want your contractor to win, because that's when your project wins." Tim McManus

Know the limitations of a contracting mechanism. Contracts should be seen as a tool for formalising understanding, not driving execution. Risks are best managed when owners and contractors work together to execute in the best interests of the project, rather than focusing on claims management and abiding rigidly to contract terms. We emphasise that projects are not delivered by legal teams defending contractual positions.

"If the contractor's got a problem then you've got a problem, and they'll make sure you have a problem." Grant King

Work hard on relationships with stakeholders

Strong and transparent trust-based relationships with stakeholders enable prevention and rapid resolution of problems. Invest in stakeholder management as a core activity.

In business, it is often said that deals are done by people not by companies—relationships are the key to success. Ultra-large projects, just like businesses, exhibit high levels of interaction and need to address the concerns not only of top leadership but of governments, regulatory bodies, agencies, local communities, and future users of the asset. Due to the nature of these projects, investing in stakeholder relationships is critical.

6 See for example, Integrated Project Delivery: A Guide, American Institute of Architects, 2007 version 1.

When stakeholder relationships are strong, communication occurs without barriers. CEOs, ministers, and the community can talk frankly to find common ground and move to solutions at pace. Good relationships with key stakeholders allow the project team to ask for help, or bring in a wider stakeholder group to address problems when necessary.

Building stakeholder relationships is difficult in any large project. Not only is the breadth of stakeholders vast but priorities can also change rapidly and roadblocks can come from anywhere. The scale of an ultra-large project inevitably creates challenging social engagement issues such as land acquisition, use of shared resources, and disturbance to the locality. Community support needs to be earned every day. Most of these projects affect, and are affected by, regulatory bodies. Regulatory constraints move in response to community concerns, often with speed. To add to the challenge, the parties typically have competing and often conflicting interests.

The project team must not take stakeholder support for granted or "outsource" it to public relations or government relations departments in the organisation. It is imperative to dedicate sufficient resources to establish a direct and effective dialogue with all relevant stakeholder groups. Owners should err on the side of over-engagement, as once the support is lost it is incredibly difficult to regain. To put this in context, a director of a large European infrastructure project currently spends two days per week focused exclusively on stakeholder engagement, supported by a team of 15 people, dedicated to addressing community concerns. This level of investment pays dividends in improving the relationships with the community in which the project operates.

We offer the following advice:

Invest in stakeholder management as a core activity. In some cases, stakeholder engagement becomes such an important task that the project director role is effectively split, with the "CEO" dealing with stakeholder management and "COO" dealing with day-to-day project issues. Another powerful example of investment in stakeholder relationships is offered by one of the world's largest engineering contractors—where the full executive team meets their major client for a full day each year to discuss issues and share experience and knowledge. They invest in the relationships as a company would invest in technology or safety, and it is ongoing. Successful projects dedicate significant resources on building the joint team.

Set realistic expectations with the community and fulfil promises. Large projects often have a great opportunity to make a contribution to society, and from the outset owners should look for opportunities to build a legacy within the community. It is imperative to be transparent with the costs and benefits of the project without exaggeration. In particular, avoid announcing project parameters before they are well defined—this most often occurs in public-sector projects where commitments are made for political reasons prior to their feasibility being fully assessed. Doing so destroys trust.

"You don't want to create unhappy stakeholders in the place where your plant will operate for 30 years." Lester Belanger

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Err on the side of transparency. Creating trust-based stakeholder relationships is not easy. The best leaders invest heavily in building and retaining trust. They do this through quality communications, third-party affirmation, and above all by spending time listening to issues and concerns. This requires a degree of humility and strong communication skills to explain the project in language that can be understood—by a broad set of community members— and in a way that is above all, honest. Our interviewees advocate full transparency as a way to achieve this. It can be uncomfortable, but is ultimately rewarding.

Transparency and open, trusting dialogues are essential not only between the project team and stakeholders, but also between different stakeholder groups. There are many false arguments for keeping distance between key stakeholders. Typical misperceptions include that judgment will be compromised, conflicts will be avoided, and difficult conversations will damage established relationships. We do not believe this is the case. Stakeholders are better off understanding each other's perspective and working together when difficulties arise, to find mutually beneficial solutions.

"As a project leader you cannot create Fort Knox.
If you do, when things go wrong you will have no friends."
Hilary Mercer

Practices: Setup
The "deadly sins"

The bulk of this report is dedicated to the critical mindsets and practices that deliver outstanding project outcomes. Conversely, however, there are also mindsets and practices that must be avoided to ensure the project does not derail and slip into acrimony. We call these mindsets and practices the "deadly sins" of project leadership.

Failing to inspire the organisation with a meaningful purpose

"Our people are driven by return on capital for investors"

Taking false comfort in a lump sum contract

"That risk is no longer a problem as the contractor is looking after it"

Hiring individuals who do not have the right mindsets and behaviours

"He is the best choice for technical expertise; we can manage his behavioural issues"

Under-investing in community engagement

"Community consultation was completed prior to FID. We can now build and not worry about it"

Practices: Delivery

- Invest in the team
- Ensure timely decision making
- Adopt forward-looking performance management
- Drive desired behaviours consistently

Practices: Delivery

Invest in the team

Delivering an ultra-large project requires continual investment in the effectiveness of the team. Leaders must think deeply about how to develop and challenge their people throughout.

Capital projects are delivered by individual people organised into a team, and these teams need to be connected on a personal level, not simply by lines on an organisation chart. This applies to both the high level "team" at the head of the participating organisations—that is, the owner and contractor—and the project teams within them. It is critical that leaders look beyond budget and schedule to invest in their employees. A large project can last five years or more, and over time it is inevitable that motivation can wane for the core team. The best project leaders think deeply about how to continually develop and challenge their people throughout a project, empowering the team and providing opportunities to grow.

Structured learning is important. Best-in-class team development assigns each team member a personal development program for the duration of the project. In large lump-sum contracts, some companies make an allowance for training both the owner and contractor. Team members are assigned time to devote to personal development, and personal improvement is expected and tracked.

Apprenticeship plays an especially important role in ultra-large projects. Much of the art of project leadership can only be learnt on the job. The team needs to be apprenticed by its leaders with regular one-on-one feedback sessions and on-the-job coaching. The most successful projects learn lessons from elsewhere—beyond the immediate experience— and a starting point is for the top team to spend time visiting similar projects (complete or otherwise) at the very outset. This provides invaluable coaching and insight, and sets the project up for success.

Leaders need to be developed as well, with effective coaching of the project director (for example, through 360-degree feedback) providing an opportunity for reflection on leadership style.

We offer the following advice:
Define development plans and provide formal training. Team members should be given rotational opportunities and formal training in both technical and leadership skills while working on the project. Team members should not always be put in a delivery role, but given time to reflect on their performance, codify knowledge, and learn new skills.

"Do not always put people in a delivery role—give them time to reflect on their performance, codify knowledge, and learn." Matthias Bichsel

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Overinvest in coaching. Leaders need to spend personal time with the team to address concerns and inspire them to deliver. Informal coaching should be a way of life with leaders mentoring junior employees, so that they are ready to assume greater responsibilities when the time comes.

"Staff experienced leaders in the front end; coach younger leaders in the back end. Young leaders cannot be taught through a text-book approach, they need to be 'hands on'. Young leaders need to come behind the leader and learn by seeing the front end, and then go on to lead the project through its final stages." Hilary Mercer

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Reach across the contractual divide to build a single team. Engage with the broader project team (that is, including contractors), not just your own organisation's team. Co-locate the joint team and institute regular collective problem solving to build a sense of inclusiveness. It is important to conduct well-facilitated team-building exercises at least annually. Take the joint team on an offsite excursion to provide them time to get to know each other in a social environment. This is a great opportunity to run team-building exercises that can probe organisational issues that need to be addressed. In addition, host regular social gatherings to keep morale high and break down the contractual silos that inevitably tend to form between offices and on construction sites.

Ensure timely decision making

Timely decision making depends on the delegation of decisions to the lowest appropriate level. To achieve this, leaders must have confidence and trust in their systems and people. Leaders are then free to resolve and anticipate critical issues.

Projects of every scale, especially those of larger size and complexity, require daily resolution of multiple issues. As in any business, making good project decisions is not straightforward—they not only require technical and functional subject matter expertise, but also directly affect potentially conflicting variables such as project cost, schedule, and quality. Project decisions can also indirectly affect organisational effectiveness, stakeholder satisfaction, team morale, and professional development.

The success of a large project is largely dependent on the project's "metabolic rate" of decision making. That is, just how well and how quickly do the project organisations make the multitude of micro decisions collectively required to deliver the project? This metabolic rate impacts on the quality and speed of decisions: increasing decision quality means improving the depth of analysis, involving all appropriate parties, and reviewing every risk and point of view—all of which requires time. In isolation, a delay in a small decision such as approving a minor change notice may not be significant but, in combination, these delays can accumulate and become detrimental to on-time delivery. Striking the right

balance between improving decision quality and minimising delays requires experience and judgment, and is therefore an essential part of the art of project leadership.

All levels of the project leadership team must understand the risks of micro delays in decision making. They must ensure that processes are in place to identify and address issues early, before delays accumulate and become unmanageable, and to support rapid problem solving. Often the most timely and effective project decision is enabled by delegation of authority to those with the most intimate knowledge of the issue.

We offer the following advice:

Delegate decision making to the lowest possible level. This is possible when: the right team is in place; the purpose of the project is widely known; there is confidence in the performance tracking; and when people are acutely aware of their decision-making remit. We recommend the project director spends the time and energy getting these foundations in place, and then allows the assembled talent to deliver—this is only enabled by providing them with the appropriate level of authority. Of course, as a principle, all work should be delegated to the appropriate level—not just decision making.

"Most projects are late not because of a one-time event, but a collection of delays in resolving small questions and issues." Ghassan Ziadat

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Allow room for error. Delegating decision making can introduce errors. While these errors are likely to happen and unlikely to be prevented entirely, leadership must ask two questions:

- Would the decision have been the same if made at a higher level?

- Is the avoidance of consistent delays by controlling and double-checking each decision worth the risk?

For example, in some organisations, change requests valued at less than US $10,000 are exempted from approvals—enabling those matters considered trivial to be resolved quickly.

Of course, we are not advocating releasing control completely; however, our interviewees have seen too many leaders, on various levels, err on the side of "command-and-control" centralised decision making. Layers of controls, especially between site and head office, not only slow the decision-making pace, but also show a lack of trust. This can demotivate the team, lower its sense of ownership and consequently suppress involvement and productivity.

Avoid becoming a decision-making bottleneck. The project director should reflect and investigate how the behaviour and practices of their top team influence the project's decision-making processes. Too often leaders become bottlenecks, with some not even aware of the situation. They need to understand they cannot get involved in every decision, even if it is the case that their expertise on the subject is the best available. Do you impact the schedule and consistently become the root cause of decision-making delays? If you find that you or any other member in your top team are becoming a decision-making bottleneck, then you are either not delegating enough, or not sufficiently resourced.

Coach the next generation of problem solvers. The project director often has excellent judgment and experience in problem solving and decision making. Given the duration and complexity of ultra-large projects, it is important that the project director delivers the full benefit of these capabilities by coaching others. This means working with the team to help them understand such things as:

- How can a complex problem be broken into manageable pieces?

- What level of analysis is sufficient to pass a business judgment?

- How do you productively performance manage a contractor relationship?

Adopt forward-looking performance management

Effective project leaders use fact-based performance dialogues to strengthen trusting relationships and instil accountability. This allows for early problem resolution and opportunity identification.

The importance of good performance management cannot be overstated. An effective Performance Management System must be in place from the project outset to drive desirable outcomes and a culture of high performance. Setting this system up—selecting the right cascaded KPIs, creating one single source of truth, establishing reliable processes of data collection, deploying effective visual management and organising a regular cadence of performance dialogues at appropriate levels and frequency—is very much part of the best-practice project-management science.

The art of project leadership is not in how you set the processes and what KPIs should be reviewed at which level and frequency, but rather, what conversations are being held at performance meetings, and with whom—and, importantly, how these conversations are affecting the team's organisational culture. Effective leaders use performance meetings not only to stay informed, be in control, and help their teams resolve the arising issues; they also use the conversations to reinforce the trusting relationships, inspire and motivate the team, reinforce the "way we do things around here", and instil a strong sense of accountability at all levels. In particular, these conversations present an opportunity to reinforce the culture of problem solving, versus finger pointing. The main objective is better future outcomes, not better-defined root causes for historical problems.

We offer the following advice:

Root your performance discussions in the facts. This is obvious for the more tangible discussions on items such as progress versus plan, or costs. It is harder when addressing more ambiguous topics such as team effectiveness, or the quality of the relationship with the community. However, we assert it is still possible to make these discussions fact based and suggest project directors and other leaders consistently reinforce the importance of this. This underlines the need for a solid fact base. The performance discussions should be focused on debating what to do, not on what are the facts.

Make performance meetings forward focused and action oriented. The objective of performance management meetings is to make rapid decisions based on an objective, fact-based assessment of current performance and ongoing issues. Avoid making performance discussions mere reviews or status updates, and minimise time required for an update: provide relevant information as a pre-read, or through effective and visible management tools. Most importantly, each performance meeting should result in specific actionable decisions; this includes clarity on exactly what needs to be done, by exactly whom, and by exactly when.

When there is a deviation from the plan, project organisations often concentrate on justification and explanations of root causes for issues that occurred; there is a focus on "what went wrong". Instead, leaders should direct their efforts to the question of "how to recover". There may be a need to do a reconciliation of what went wrong, but only to learn from the past and apply to future decisions.

"There is always an explanation of what went wrong. The key is 'what are we going to do about it?'" Matthias Bichsel

Reinforce the atmosphere of trust. Effective leaders use performance management discussions to reinforce an atmosphere of trust and collaboration—the right performance dialogues, using the right metrics, demonstrate transparency and accountability. These leaders accept and share responsibility for setbacks and, in this way, foster a sense that the team are supported rather than blamed. This means that owner and contractors' teams should jointly own the outcomes, and both be held accountable for results. A culture of trust and collaboration not only inspires people to higher commitment and productivity, it also ensures that issues are raised early, discussed openly, and resolved before the damage is done.

"People strive when trusted; [this] dramatically enhances their commitment and skills, which benefits the project."
Christian Placines

Set high aspirations in performance discussions—play offense, not only defence. In any project, deviations and setbacks inevitably occur. Therefore it is important that high aspirations are set to drive the team to perform above and beyond, and in doing so compensate for the setbacks. Effective leaders constantly ask questions such as "what can be done better?" and "how can we beat the plan?" Just as in an ongoing operating business, they foster a culture of continuous improvement and constantly solicit and motivate their teams for ideas to "beat the plan". They dedicate resources to take specific actions and drive these ideas to deliver value. This "playing offense" is the only way to counter the negative cumulative effect of unpredictable deviations. It is always surprising what an organisation can achieve when challenged in such a manner.

"Drive a culture to constantly optimise the plan. Average project [organisations] talk to you about risks (weather, construction delays, contractor skills...) but very rarely about opportunities on what can be done better. [The] best project teams have this culture to understand and explore opportunities." Patricia Griffith

Beware of the "maximum data threshold"—and operate below it. Too little data, and forward-looking performance management is ineffective and based on conjecture. Yet too much data drowns the team and prevents quality management information flowing from the analysis before the next cycle starts. Leaders must strike this balance.

Drive desired behaviours consistently

Effective project leaders inspire their teams—especially in challenging times. They define, communicate, and role model expected attitudes and behaviours. Leaders should take the time to connect with team members on a personal level.

Large capital projects provide extraordinary challenges that are often only overcome by the determination of the individuals involved. A committed team is willing to provide an extra level of energy that is beyond the tasks outlined in their role description, and find opportunities to resolve issues quickly.

Keeping the peak level of determination, commitment, and productivity for extended periods of time is tough for individuals and teams. Missed deadlines, poor interpersonal relationships in the extended owner-contractor teams, bureaucratic processes, and a multitude of other negative external factors can demotivate the team, leading to burnout, loss of momentum, and poor output.

Effective project leaders recognise that personal and team commitment, determination, and motivation cannot be left to develop organically. One of the main purposes of project leaders, and arguably one of the most challenging aspects of the art of project leadership, is to keep energy levels high and keep their team thinking clearly through adversity.

A key part of the art of leadership is understanding deeply the concerns, fears, and ambitions of each individual on the team and addressing them to the extent possible. Examples might include the fear of unemployment following completion of a project or the ambition of being promoted within the project to manage a larger work package or subcontractor. Listening, empathising and caring go a long way, and it is important to show that concerns are heard and taken seriously. One-on-one interaction establishes a strong human connection—a one-size-fits-all approach to fostering productive relationships with team members should be avoided.

Role modelling is critical to influencing behaviours—even more important than more formal processes and mechanisms. Effective leaders not only define and communicate which attitudes and behaviours are expected, but consistently model these attitudes and behaviours through personal actions.

"[Leaders fail when] they don't spend enough time on the ground, having the right conversations, and role modelling the desired behaviours, but rather reporting and doing paperwork." Roberto Charron

We offer the following advice:

Be transparent on expected attitudes, behaviours, and project priorities. We already discussed the importance of clearly defining the expected behaviours and attitudes in the *Define purpose, identity, and culture* section. In addition, we suggest ensuring a uniform understanding of the principles for day-to-day compromises and decision making around often-shifting project priorities. Be clear on prioritisation of cost, time, and quality in the daily trade-off between these often mutually exclusive variables. Although these priorities may change as the project progresses, team members can make a multitude of small day-to-day decisions, and react swiftly when problems arise if the priority is made clear by leaders.

Invest personal time. The best way to connect with the team is to spend time together, to form personal relationships. Effective leaders make themselves available to the team (for example by regularly arranging one-on-one development conversations with their top team, or by completing frontline walks with package managers). They listen as well as share their feelings, ambitions, expectations and aspirations; they invest time to get to know the team beyond the confines of the project.

Be consistent in your messages and actions. The complexity and continual change of ultra-large projects makes aligning team members incredibly difficult. Leaders need to invest time clarifying their messages, and then ensure these messages are communicated consistently across all forms of media: both formally and informally. Leaders are often surprised by the number of times a message needs to be repeated for it to be absorbed by a large complex organisation. When a leader is well and truly tired of hearing themselves deliver a message, they are only half way there.

Leaders also need to remember that their actions often speak louder than words. Are you behaving consistently with the messages you are trying to drive? Are your actions consistent inside and outside the workplace? Taking a limo instead of a train to the airport speaks volumes about how committed the project leader is to the cost-saving initiative; flying business when the policy for other team members is economy is inconsistent with driving meritocracy as an expected behaviour in the team.

Prepare for inevitable setbacks. Times of crisis are the best opportunity for a leader to demonstrate the desired behaviours. In doing so, the project team will take note and recognise that these behaviours are "real".

"Stressed organisations take on the character of the leader. The project director needs to remain focused and calm. It is the project director's responsibility to lead root-cause analysis calmly and methodically to determine what went wrong, and what should be done about it." Chris Toomey

Reaching people on a personal level

"As a project manager I used to focus a lot on my team. The very first thing I would do is set up a 30-minute [informal meeting] with every single person on my team…. This was extremely time consuming—with 100 plus people, sometimes 300—but extremely important. The fact that you've taken time to talk to each team member changes their mentality for the rest of the project….

"I show the team that I take my job personally. I share with them my feelings and understanding of success. Team members know that their manager cares about them, and this makes them take their job a lot more seriously and personally to go above and beyond what's expected. You experience an explosion of energy— potential that you never knew was there…. It is important to continue to build the team throughout the project. Activities can include drinks on a Friday afternoon, take a different group of 10–15 people, and have them talk and share experiences, have a non-work relationship, and stick with it for the whole project. It has a real effect on the people, their productivity, and ultimately the project success.

"This is a huge opportunity and not a lot of people do this well and genuinely. This is how you drive ownership—and it is crucial to have project ownership within the team, not only run the process. Running the process is important, but it is not sufficient."

Samer Theodory

Practices: Delivery
The "deadly sins"

The bulk of this report is dedicated to the critical mindsets and practices that deliver outstanding project outcomes. Conversely, however, there are also mindsets and practices that must be avoided to ensure the project does not derail and slip into acrimony. We call these mindsets and practices the "deadly sins" of project leadership.

Managing, not leading and investing in the team

"The team will deliver the results; their development is the experience itself"

Failing to delegate decision making authority to the lowest possible level

"This is above my pay grade; you need to talk to my boss"

Creating over-cautious behaviour by over-reacting to bad news

"Let's get a better understanding of that issue before we tell the owner"

Starting a "review" of the project after every setback

"Let's start a review; that will keep our board and partners satisfied"

Advice for the project owner

PRE-FINAL INVESTMENT DECISION

As an owner preparing for FID, there are two priorities: strengthening the business case, and setting up a project organisation that will succeed in implementation. To do so requires making a set of complex decisions, and we offer the following questions for consideration:

1 Is the purpose of the project crystal clear and shared by the stakeholders who can most influence the success of the project?

2 Does your project director have true CEO qualities, being able to lead as a business, not just a traditional project?

3 Is the desired culture of the project clear? How deep in the organisation has this been communicated?

4 Are we allocating the management of risk in the right way (understanding that ultimately it is all ours)?

5 Do your partners (contractors) share your desired culture? Do you have a trust-based relationship with good alignment of incentives?

6 How will you align and mobilise your project organisation to operate in line with the desired purpose, culture, and identity?

7 Are you and the top team role modelling the desired behaviours and attitudes, at all times?

8 Are you helping the team (e.g. by pulling your weight to manage stakeholder relations)?

9 Are you ready for a downside (P70+) outcome?

POST-FINAL INVESTMENT DECISION

As an owner operating in the execution phase, the priority is to ensure the project organisation is delivering safely and efficiently. Owners must ensure their involvement strikes the right balance between the two extremes of micromanaging the contractor, and being too distant from the detail. Instead, the owner must seek to empower the delivery team, while still being across enough detail to make decisions quickly and intervene if necessary. We offer the following questions for consideration:

1 Are you truly and consistently on top of the project content—enough to step in immediately when needed (without the need to do a project review)?

2 Are you investing sufficient time in communicating your values and empowering the team?

3 Are there difficult decisions to be made and are they being resolved in a timely manner?

4 Are you giving feedback to your project director and top team, coaching, and mentoring as much as you think you should?

5 Is it clear how you add value to the project and is this view shared by the project leadership?

Advice for the project director

PRE-FINAL INVESTMENT DECISION

The project director plays the central role in navigating the uncertainty associated with taking a project from concept through to completion of the FID deliverables. The main challenges during this phase are around building and aligning the team, and there are several questions for consideration:

1 Have you articulated the purpose clearly?

2 Have you actually formed a true team, or is it still a collection of individuals?

3 Have you defined explicitly the expected behaviours from the team?

4 Does your team have the right mix of technical, industry, cultural, leadership, and geographic expertise?

5 Are you close to your top team—talking to them frequently on a personal level, addressing not only project tactics, but their personal concerns and ambitions?

6 Is your team optimising the plan, asking what is possible, rather than just aiming for what is acceptable?

7 What is the quality of your relationship with your partners (contractors) and stakeholders? Do these relationships need additional investment?

POST-FINAL INVESTMENT DECISION

The transition into execution marks a major step for the project team. Accordingly, this requires a change of approach from the project director as the project moves from planning to implementation. It is important to place greater emphasis on disciplined execution and maintaining energy levels, and there are several questions for consideration:

1 Are you asking future-focused questions ("What are we going to do about it?") more often than backward-looking questions ("What went wrong?")

2 Are you communicating the right messages? Are your messages being absorbed and understood?

3 Are you being open about the risks and providing the owner with transparency on site problems?

4 Is everyone in your organisation aware of the priority—cost, schedule, or quality?

5 Are you making the contractor successful, helping with problem solving, not micro-management?

6 Is everyone on your team co-owning the results with the contractor?

7 Are you playing "offence" as well as "defence"?

Epilogue: Ultra-large projects take a personal toll

Ultra-large projects seek to achieve something extraordinary, and in doing so place extraordinary demands on the individuals involved. The demands extend far beyond technical challenges, and often have a lasting impact on practitioners mentally, emotionally, and physically. Families of those involved know too well the strains endured in persevering for multiple years as project leaders seek to disentangle endless complexity. While our interviewees unanimously communicated enthusiasm for their profession, they highlighted that executing an ultra-large project does take a personal toll and, reflecting on their experience, offer the following thoughts.

Leaders do not begin an ultra-large project "in their comfort zone"; rather, they grow into the role. The burden of leadership is great and the sobering reality is that senior executives are liable for the events that occur under their charge—with a potential implication of jail time for egregious breaches of responsibility (especially for safety and environmental incidents). This drives constant vigilance, and with it constant stress—though, for many leaders, their comfort with this burden grows with experience.

An ultra-large project is a journey with an uncertain outcome and practitioners take on both personal and professional risk when signing up for a multiyear commitment. They put their reputations on the line with no certainty of success. After construction completion, the legacy of a project can endure for its practitioners. Even if the project is delivered on time and budget the project leaders' reputation can still suffer if the project does not achieve its ultimate purpose.

There is much at stake on an ultra-large project. At this scale of capital expenditure, project success is often inextricably linked with the future of the company. Success can propel an organisation to new levels of growth: failure can result in crippling losses and bankruptcy. Accordingly, the delivery of these projects is a responsibility that does not lay lightly on the owner's team. In particular, the CEO is the public face that commits the company, with all its history and financial dependents, to a pathway with little recourse. There is no room for hubris and the public pressure to succeed is immense.

Despite this high-pressure environment, leaders must be an enduring source of strength. Their behaviour is constantly on show and, even in difficult circumstances, they must energise, rather than drain, their teams. A true project leader must be aspirational: resolute, unwavering, and inspiring. Yet they must also blend this with realism: pragmatic, reasonable, and willing to compromise where necessary. The ability to reconcile these seemingly incongruent qualities is the art of project leadership.

Leaders should also know they are not alone in feeling this pressure. The interviews we have conducted have shown that even the most successful and experienced project practitioners also feel stress. They also note that one of the ways to deal with this stress is to get the art right. A strong and supportive top team, in particular, can make all the difference.

"Sometimes I go home thinking that the only thing that is going to drag this over the line is my own personal commitment." Hilary Mercer

Do not stand on the start line if you are not ready to race. The demands of an ultra-large project are strenuous. There is endless pressure of meeting schedule commitments amid the constant spectre of ensuring safety and protecting the environment. The delivery of these projects takes an extraordinary commitment over a long duration, and requires a type of person that thrives in such an environment. Our interviewees emphasise that, at the outset of a project, leaders must think carefully about the commitment and stamina required to see the challenge through to completion. In particular, we recommend project directors asking themselves: are they ready for it? Do they have a way to reenergise during the long, arduous project?

"A project is a short time in your life and it takes a lot out of you, so you need to be able to manage it well." Louis Bon

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Build understanding with families. Families are often only exposed to a narrow aspect of the project. Families can also be a wonderful source of strength and energy for a project leader. Our interviewees recommend helping families understand the broader context of the project—especially the potential impact of the project for the community and economy. Practically, this could mean many things, such as project newsletters prepared for families of project employees, or including families in town halls, open days, and team gatherings.

Expect crises and use them to build trust. Leaders need to steel themselves from the outset for the unforeseen challenges that will inevitably arise. Mistakes will happen and the best leaders know that these can be the most profound teaching moments—if approached with the right mindset. These are also the moments that can build (or destroy) trust in a team.

"The day the project director thinks they have everything under control is the day they should get worried."

Hilary Mercer

Your teams are human; monitor their wellbeing. Be vigilant in monitoring the wellbeing of both teams and individuals, and enlist an HR partner to support you in doing this—this should be agnostic of project success or failure. Projects, by their very nature, are transient and impermanent, and the closing phases can induce personal and professional stress as teams "work themselves out of a job". Provide support to your teams at this stage—to help them maintain a sharp focus on safety and delivery, and also assist them as they plan for their future.

"Listen carefully for the faint ringing of alarm bells."

Matthias Bichsel

Develop deputies to "rest" the team. Team members cannot infinitely sustain long hours and stressful conditions. Part of the role of the leader is to "rest" individuals by building redundancy and depth of capability in their teams. All roles should have adequately trained

deputies who allow team members to have a break. These breaks not only rebuild energy levels, they can also provide leaders with the time to see the project and its problems from a different perspective.

We offer a parting thought:

Our interviewees were unanimous in their perspective: ultra-large projects contribute tremendously to the social, environmental, and economic fabric of our society. They create short- and medium-term employment as well as delivering long-term community benefits. While construction itself can be heated and high-pressure, it is a crucible of professional learning: acting as a catalyst for leaders to develop deep technical and project leadership skills. These projects enhance the leaders of today, and forge the leaders of tomorrow.

Related McKinsey research

The new age of engineering and construction technology (July 2017)
New technologies are transforming all stages of the engineering and construction process. This article discusses what companies need to know about the evolving landscape.

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This collection of articles is dedicated to ideas about how project delivery organizations can improve productivity. The articles describe the current challenges and feature examples of successful integrated delivery models, process standardization, collaborative contractual frameworks, proven intervention techniques, and public-private partnership delivery benefits.

Voices on Infrastructure: Insights on project development and finance (March 2017)
This collection of articles by industry leaders and McKinsey experts focuses on the crucial opening phases of infrastructure projects: project development and financing. Smart development and stable financing can make the difference between a successful project and one that falls short. These elements, however, are often missing on projects ranging from toll roads in North America to renewable energy installations in Africa.

Reinventing construction through a productivity revolution (February 2017)
The construction industry employs about 7 percent of the world's working-age population and is one of the world economy's largest sectors, with $10 trillion spent on construction-related goods and services every year. However, the industry's productivity has trailed that of other sectors for decades, and there is a $1.6 trillion opportunity to close the gap.

Getting big mining projects right: Lessons from (and for) the industry (February 2017)
More than four out of five mining projects come in late and over budget, by an average of 43 percent. Intelligent interventions can improve the odds of success—particularly on distressed projects.

Beating the low-productivity trap: How to transform construction operations (July 2016)
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Bridging global infrastructure gaps (June 2016)
Global infrastructure systems are straining to meet demand, but the current spending trajectory will lead to worsening gaps. The world today invests some US $2.5 trillion a year on transportation, power, water, and telecommunications systems, but it is not enough. Yet there are solutions to unlock financing and make the sector more productive.

Imagining construction's digital future (June 2016)
Large construction projects typically take 20 percent longer to finish than scheduled and are up to 80 percent over budget. Yet, the sector has been slow to adopt process and technology innovations that could transform the industry over the next five years.

E-book versions of the above selection of articles are available at the McKinsey CP&I website:
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Authors

DAVID KNOX

David was appointed Managing Director and Chief Executive Officer at Australian Naval Infrastructure in 2017. He previously held the role of Managing Director and Chief Executive Officer at Santos. Prior to this he was Managing Director for BP Developments in Australasia. He has worked for BP in the United Kingdom and Pakistan, and has held management and engineering positions at ARCO and Shell in the United States, Netherlands, UK, and Norway.

MIKE ELLIS

Mike is a Senior Partner in McKinsey's Sydney office. Drawing on 20 years of experience in the resource industries (in particular oil and gas), he advises major energy and mining companies in Australia, Asia, and the United States and leads our Oil & Gas Practice in Australia. Mike began his career at Shell, spending 11 years working in Australia and the United States. This work included several corporate advisory roles and as an operations manager at an Australian refinery.

ROD SPEERING

Rod is a Project Manager in McKinsey's Sydney office and advises companies on their strategic and operational challenges. He has served clients in Australia, Europe, and South America, and has worked in a variety of industries including infrastructure, mining, oil and gas, power, higher education, and transport.

SERGEY ASVADUROV

Sergey leads the Capital Projects & Infrastructure Practice in Australia. He serves clients in production-intensive sectors such as oil and gas, metals and mining, electric power, as well as in infrastructure. Sergey brings deep expertise in improving the efficiency of large capital projects through optimising design, improving contractor management practices, applying best practices in contracting and procurement, using lean approaches in construction, as well as designing and running operational transformation programs.

TOM BRINDED

Tom Brinded is an Associate Partner in McKinsey's Perth office. He serves clients in the infrastructure and resources sector on capital productivity and operational topics. Prior to joining McKinsey, Tom worked in the construction industry on the delivery of UK megaprojects such as the London 2012 Olympics and Crossrail.

TREVOR BROWN

Trevor is an experienced leader of complex, major capital projects including the successful delivery of the upstream development for the US$18.5 billion Santos Gladstone LNG project. He is recognised for his ability to engage effectively with key stakeholders including board, joint venture partners, government, and the investment community.