



Mega Project Management

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WELCOME AND INTRODUCTION

- Session coverage:
 - What is a mega project?
 - Reasons for the increase in size and frequency of mega projects
 - What is their track record and reasons why they fail?
 - What are the drivers for increase in cost of a mega project?
 - What are the characteristics of good mega project management?
 - An LNG EPC case study
 - Common mistakes and pitfalls when managing mega projects



WHAT IS A MEGA PROJECT?

- A mega project is an extremely large-scale investment project
- Wide sector coverage e.g.
 - oil/gas, mining, construction and infrastructure sectors
 - also water and energy
 - IT, industrial processing, science/space/defence
 - government admin and intelligence, banking etc.



MEGA PROJECT CHARACTERISTICS

- Typically defined as costing more than US \$1 billion, and \$50-100 billion projects are common
- Often characterised by comparably high benefits and correspondingly high risk
- They typically take many years to develop and build
- Involve multiple public and private stakeholders and large labour forces
- Can have substantial impacts on communities, the environment and economies - locally, nationally, regionally and in some cases internationally



MEGA PROJECT CHARACTERISTICS

- Unique characteristics – i.e. mega projects are not just a bigger version of a smaller project
- Project management must fit with those characteristics to be successful
- Conventional project management processes and priorities can be a square peg in a round hole



SOME FACTS AND FIGURES

- Total global mega project spending - USD 6-9 trillion annually (8% of total global GDP)
- If \$50-100 billion projects were countries, they'd be in the top 100 countries by GDP
- Mega projects can dwarf international debts between countries
- Meeting global energy needs is estimated to need \$17 trillion investment by 2030 (International Energy Agency)
- \$57 trillion needs to be spent on infrastructure by 2030 to enable the anticipated levels of GDP growth globally (McKinsey Global Institute)
- Two-thirds will be required in developing markets
- During 2004-2008 China spent more on infrastructure in real terms than in the whole of the twentieth century
- China's One Belt One Road Initiative – estimates for these projects range from between \$1 trillion to \$8 trillion

GEOGRAPHICAL SPREAD AND EXAMPLES

- Mega projects are undertaken everywhere
- Increasingly in Less Developed Countries (LDCs)
- Major 'hubs' across India, the UAE and China
- Historical mega projects include:
 - Sydney Opera House
 - Channel Tunnel
 - Burg Khalifa
 - Dubai Metro
 - Panama Canal Expansion



GEOGRAPHICAL SPREAD AND EXAMPLES

- Current mega projects include:

- Doha Metro
- HS2
- Crossrail
- MRT
- Hong Kong-Zhuhai-Macao Bridge



GROWTH OF MEGA PROJECTS



- Mega projects are getting bigger, spanning more sectors and increasing in frequency
- Why?
 - Economic kick start after a recession
 - To meet demand, especially in emerging markets
 - The success of optimism over experience in aiming for “bigger/taller/faster”
 - Technological, political, economic and aesthetic reasons behind many mega projects

MEGA PROJECTS' TRACK RECORD

- Look great on paper
- If done well, social and economic benefits can be huge
- It's a big "if"...
- ...and it depends on how you judge success
- But mega projects do not have a good track record of success when judged on traditional 'on time and on budget' criteria



MEGA PROJECTS' TRACK RECORD

- 90% go over budget (Flyvbjerg)
- Overruns of 50% are common
- The problem is global and spans private and public projects
- Rail projects go over budget by an average of 44.7%, and their demand is overestimated by 51.4%
- Bridges and tunnels incur an average 35% cost overrun; for roads, it's 20% (McKinsey)
- Time overruns and benefit shortfalls are also perennial problems
- But – projects which 'fail' can still be great successes e.g.
 - Channel Tunnel
 - Sydney Opera House



WHY DO MEGA PROJECTS FAIL?

- All the 'usual' reasons + unique reasons:
 - Over-optimism and complexity
 - Insufficient attention to project drivers and managing the schedule
 - Leadership and project management issues
 - Poor execution



OVER-OPTIMISM AND COMPLEXITY

- Costs and timelines can be underestimated in order to “get to yes” – stakeholders often aware of this
- Optimism over experience – optimism bias
- Lack of proper business case analysis, lack of data, lack of lessons learned analysis
- Complexity underestimated
- Impact of long time scales (e.g. on technology) put proper planning in the ‘too hard’ basket



INSUFFICIENT ATTENTION TO PROJECT DRIVERS AND SCHEDULE

- Project drivers (e.g. cost vs. schedule) are a key factor
- With a 'fast track' schedule-driven project design, engineering and construction phases may overlap
- Research has shown that mega projects with aggressive schedules tended to perform worse than those with realistic schedules
- Typically, as the duration of the engineering-construction overlap increases, delays and inefficiencies in construction also increase
- Overlap may decrease productivity and increase the likelihood of changes



LEADERSHIP AND PROJECT MANAGEMENT ISSUES

- Management disconnect
- Decision-making accountability
- Poor project management
- Key personnel movement over time
- Lack of robust risk-analysis and risk-management tools that fail to keep up with the demands of such large projects



POOR EXECUTION



- Unrealistically low project budget and schedule can lead to cutting corners to maintain cost assumptions and protect profit margins
- Project complexity means routine problems have escalated impact
- Low productivity issues
- Scope changes, claims and disputes

DRIVERS FOR INCREASE IN COST OF A MEGAPROJECT

Oxford Institute for Energy Studies ranks the most important drivers for escalation in cost:

- (1) Project Scope*
- (2) Project Complexity*
- (3) Location*
- (4) Equipment and Materials*
- (5) Engineering and Project Management*
- (6) Contractor Profit and Risk*
- (7) Owner's Costs*
- (8) Contract Strategy*
- (9) Currency Exchange Risk*



KEY CHARACTERISTICS OF GOOD MEGA PROJECT MANAGEMENT

- Like any major project, scope, procurement, planning, time, cost, quality, resources and risk all need to be managed
- “Management” refers to all decision makers in the process, not just the project manager in charge of the site team
- Selection of the Project Management team is vital
- Planning on the basis of a clear understanding of project objectives



KEY CHARACTERISTICS OF GOOD MEGA PROJECT MANAGEMENT (ctd.)

*“The overall conclusion had to be that these cost fluctuations did not correspond to whether the plant project was a grass-roots project or an expansion or whether it was a 1-train or 2-trains project; and neither train size nor technology selection seemed to play a major role. **Price dispersion appeared to be more related to good or bad project management practices by existing and new operators in the industry.**”*

[Study by Barbara Bruce and Carlos Lopez-Piñon on LNG Mega projects]

LNG EPC CASE STUDY

- Mega project ‘credentials’
 - 10 years from planning to completion is common
 - a new build LNG Facility may have 6-8,000 people on site for up to 4 years
 - \$10-\$15bn values or more
 - LNG cost drivers include:
 - increased demand
 - limited pool of EPC contractors/skilled labour
 - rising raw material price
 - increasing project complexity



LNG EPC CASE STUDY (ctd.)

- Main cost drivers are project scope and complexity
- Even the simplest scope (a repeat liquefaction train with minimal gas treatment) is a big multi-billion dollar project
- Full scope can include ancillary works such as air strip, construction camp, roll-on roll off dock, jetties, pipeline infrastructure and marine works such as dredging, Breakwaters, land reclamation



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Such broad, multi-project scope requires careful planning and management



COMMON PITFALLS AND MISTAKES WHEN MANAGING MEGA PROJECTS



- Lack of clear decision making and lines of communication
- Inadequate contingencies and lead-in times in the project schedule
- Failure to pay sufficient attention to design risks
- Failure to properly address interfaces between EPC contract and other project documents
- Insufficient attention to ground risks
- Failure to manage and control changes
- Insufficient attention to social-project risks

SOME CONCLUDING OBSERVATIONS

- Mega projects are unlike other projects and demand a different approach to management
- The budget and schedule must be set without 'optimism bias' and in the context of a clear understanding of key drivers and objectives
- Strong, robust leadership is crucial
- The Project Management team must be experienced in running mega projects and empowered to make swift decisions within a clear decision making structure

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