Success in high-tech mega-projects

An “Ockham’s Razor” Approach

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Me in a nutshell

- Translec Equipment
- Comms (field) Engineer trained
- Graduated into management
- Own business
- 12 years with NATA - Standards
- Managed projects all continents
- With CSIRO since 2006, SKAO 2009
- Adjunct Fellow
- Still learning, changing my views, and publishing
Why research mega-projects?

- Australian GERD = ~A$33.5bn 2.1% GDP
- Ranked 17th in ~30 OECD countries
- The top ten spenders average 3.4% GDP (United States ~US$500Bn)
- Big R&D projects = big money = big risk
- Failing cheaply is getting more difficult.

Mega-projects 2012 USD, billions

- Joint Strike Fighter 396
- China HSR 329
- International Space Station 156
- UK HS2 67
- Rebuild C'Church 17

Mega-project market in 2014 ~ US$6-7 trillion

Australian Gross Expenditure ($Bn) on R&D

(source ABS)
Are we learning?

“Little or no improvement in 100 years of project management”

“Large scale IT projects even more risky – average overrun of 200%”

- Flyvbjerg et al. (2003)

We don’t seem to be...

44% of U.S. executives surveyed said that the most pressing issue for them is managing complex projects; however, many lack critical know-how and/or core capabilities to perform effectively and efficiently


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<th>Percentage of Projects</th>
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<tr>
<td>Megaprojects (&gt;1 billion)</td>
<td>40%</td>
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<tr>
<td>Other Projects (&lt;$1 billion)</td>
<td>30%</td>
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- Booz Allen Hamilton data for the Oil and Gas Industry, March 2006
My Research Question

What are the key ingredients of project success?

1. To identify critical success drivers across a range of relevant major high-technology projects.

2. Develop a set of practical indicators useful as predictive tests of likely project success.

3. Keep monitoring and adapting – do they still hold up?
Research Approach

Ongoing literature scanning
- Peer reviewed journal papers
- Case studies, project artefacts
- Project management texts (manuals, books)
- Reports and technical articles

Field work
- Originally 17 large, high-tech projects
- Ongoing collection of data
- Giant Magellan Telescope
- Cherenkov Telescope array
- Thirty meter telescope
- EUROPEAN SPALLATION SOURCE
- JOINT STRIKE FIGHTER
- ECT…
Know what you're dealing with! - Multi-faceted, tricky, problematic, risky, awkward, etc.

Expect the unexpected. Irrationality is normal.

Beyond 'standard-practice' (PMBoK level) project management.

There are errors and learning in every mega-project.

Early project shaping (or "FEL") is absolutely crucial.

Your stakeholders will have different views of success.

Setting the Scene

Remington, Leading Complex Projects, 2011 p 18
How about IT projects?

Interestingly, no correlation between application of Risk Management processes to IT project success – jury still out!

However two examples. NASA’s Mars Climate Orbiter (1999) spacecraft - rudimentary software interface failure.

Eight years later, US Air Force’s F22 Raptor jet fighters lost all navigation capability at the moment of crossing the 180th meridian – the International Date Line. The failure was traced to a ‘partial line of code’.

A retired Head of the US National Guard commented that: “It used to be [aircraft] tails falling off, now it’s [programming] typos that ground a fighter” (O’Hare, 2009, p. 124).
The key conclusions can be interpreted as predictive success indicators for high-tech projects. When diligently applied and pursued, they will lift the probability of high-tech project success.

I offer the Checklist for High-Technology Project Success (CHiPS) tool.

“all [actions] are required. By only acting on a few, the project will not achieve significant improvement.”
<table>
<thead>
<tr>
<th>Project Phase</th>
<th>Key Indicators</th>
<th>Example Evidence</th>
<th>Findings</th>
<th>✓ or X</th>
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<tr>
<td>Final Review</td>
<td>58. The project is effectively reviewed through the lens of a representative</td>
<td>A process exists that describes the intent for post-project review(s). The process has specific budget allocation, and appears in the top level project timeline.</td>
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<td>group of project management, staff, and other stakeholders including key vendors.</td>
<td>The process includes personnel from project teams, key stakeholders, suppliers, and customers (users).</td>
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<td>59. The results of the post-project review are (or formally intended to be)</td>
<td>Post project review procedures include the requirement for results analysis for root cause analysis. There is evidence of this activity (as appropriate).</td>
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<td>captured and analysed effectively to reveal root causes.</td>
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<td>60. Barriers to organisational learning are understood and addressed, and</td>
<td>Knowledge gained from project review activities is actively managed to enable continuous learning throughout the organisation, and in accordance with the project/organisational culture.</td>
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<td>captured lessons learned for ready retrieval.</td>
<td>There is evidence of application of prior learning within planning for new projects.</td>
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Wow, Phil – a checklist!

- Whenever you fly – (or when crashing) – the pilot will use a checklist
- When you’re in hospital – your doctors & nurses will use checklists
- Dr Atul Gawande, Surgeon, Writer – developed an OR checklist based on research
  - The checklist was 19 items, under two minutes, before the operation started.
  - It includes “some dumb sounding things”, but it’s fundamentally about communication.
  - Deploying this checklist led to a 50% reduction in death (2009). More than any pill, or procedure, or the smartest surgeon could achieve.
  - It’s now used on one third of the world’s operations.
  - Your surgeon will likely use the checklist (you hope!)
Dr Gawande: “It seems really mundane, but one of the rules I’ve discovered is: there’s no mistake too dumb for us to make.”
Ockham's razor ...
- a problem-solving principle attributed to William of Ockham (c. 1287–1347), Franciscan friar and philosopher.

- The principle is: Among competing hypotheses, the one with the fewest assumptions should be selected.

- The CHiPs Checklist is about minimising the assumptions, and confirming the facts.
How does the CHiPS stack up?

What would I modify?

• Planning & Concept Design phase:
  ✓ Greater emphasis on robust project structure, down to project office level
  ✓ Avoid revolving door people
• Approval for Expense phase:
  ✓ Complete system description should be a HOLD point
• Project start & execution:
  ✓ More realistic approach to review panel members
How do I think the SKA stacks up?

- Muddled structure
- Command & Control – too little/late
- Innovative procurement lacking
- Learning opportunities missed
- Myopia about *Black Swans*
- Perhaps the biggest project risk will be – simply ‘running out of steam’

- Science mission remained solid
- Played to strengths with Gov’ts
- Mission Assurance now in place, and Head of Procurement hired.
- Mega-project skills emerging
- Increasingly robust project reviews, with panel diversity
- Signs of accelerating pace overall.
Onward & Upward!

Thank you