

Project Management and Uncertainty



Matching project framework to the level of uncertainty

To examine potential areas of failure in projects

To examine if current project delivery methods are still fit for purpose

Propose new framework for successful delivery of large, and complex projects or megaprojects.



People have been doing projects for a long time

- **Human history is littered with examples of great projects.**
 - **Tower of Bable**
 - **Hanging Gardens of Babylon**
 - **Pyramids (in Egypt and Sudan)**
 - **Greek and Roman**
 - **Great Cathedrals over the millenia**
 - **Modern infrastructure**
- **Why do 70% or projects fail (data approximate and based on various types of project from the project management industry)**
- **Projects fail for a variety of reasons, often unique.**
- **Iron Triangle**
- **What if the reasons for failure is that we are using the wrong techniques for the projects**



Organisation Project Categories

Current system used by a number of organisations:

- Size 0 projects – up to \$5m
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- Critical Projects – Over \$200m

They use project value to the company to determine the category.

Simplistic measurements based around what executives, with no real project management experience, deem to be important to the organisation.

Greater the \$\$\$\$ Value greater the risk to the company



Categories based on the Iron Triangle

- Cost
- Scope
- Quality

Definitions set by organisations based on organisation requirements

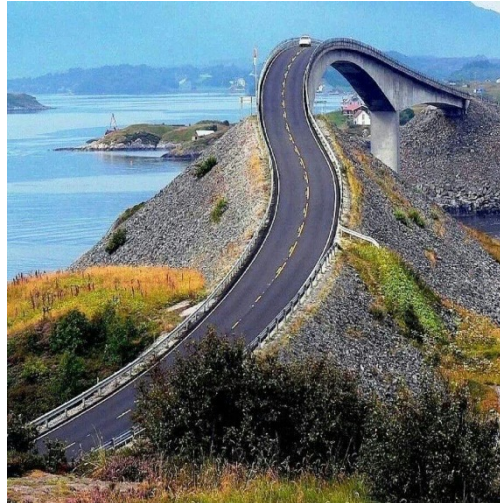
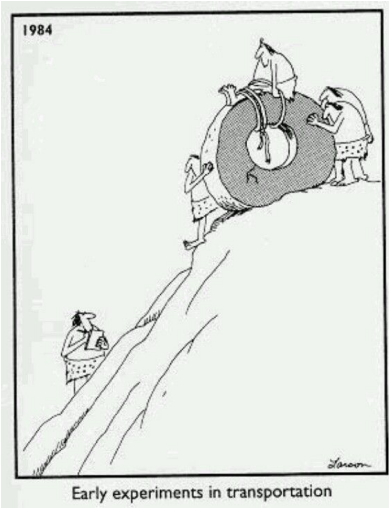
Usually based around the expectation of Finance

Standard business practice influences projects, but they shouldn't



Simple Projects?

- Size = 0 up to 5 million dollars
- Projects we (humans) have been doing since we fell from the trees.
- Low risk, existing knowledge, and existing technology
- First recorded project – The Ark
- Roads,
- Bridges, Houses, etc



Simple Projects?

- Low level of uncertainty
- We have experience with them
- We understand them
- We have built millions of them over thousands of years

- **Simple Projects = Low Risk, very little uncertainty**

- PMBok practices work and the Iron Triangle metrics can be applied



Complicated Projects

- Basically a slightly larger simple project, often with new technology, techniques or methods
- Existing systems in a new way, multiple existing systems.

Can still be delivered using the PMBok Framework, although the Iron Triangle, has moved to an Elastic Square.

- Cost
- Scope
- Quality
- Benefits

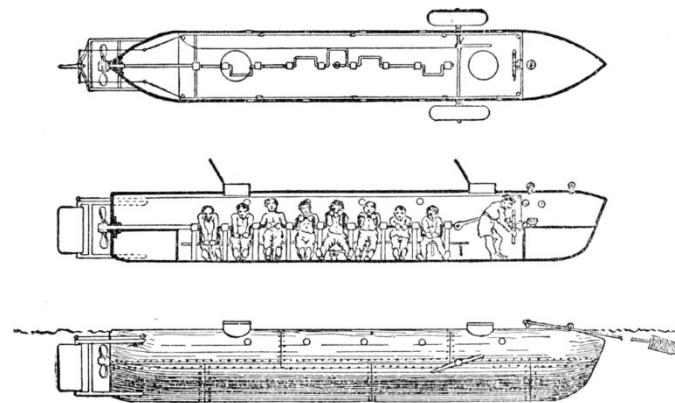
Delivered benefits need to taken into consideration



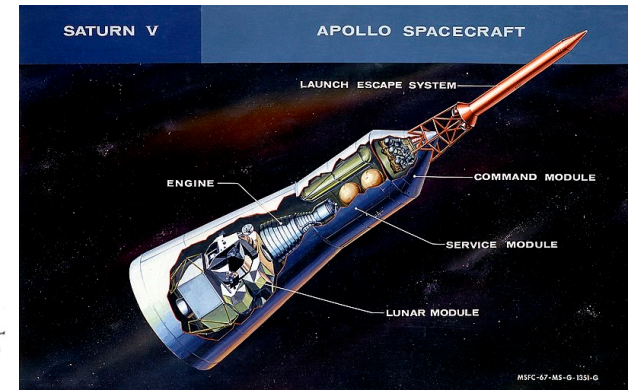
Complicated

Complicated Projects

- Size 1 projects value between \$5m and \$50m
- A project that uses existing technology and practices in a new and/or unique way.
- The Apollo Moon Landings are an example of a Complicated project.
 - Used existing technology in new ways:
 - Diving suits – Space suits
 - Submarine – Space capsule – Pressure vessel in a hostile environment
 - Rockets – Congreve Rocket 1804, Goddard's Rocket 1926, German V2 Rockets 1940's



CSS Hunley – 1864



Complicated Projects

- Some Uncertainty
- New technology
- New systems
- New Implementation
- Element of Risk
- Possibly multiple small projects combined
- **Complicated = Increased uncertainty**
- PMBok Frame work and the Iron Triangle can still be used, but benefits must be considered



What defines a Complicated Project

- **There are many different types of complicated projects:**
 - **Construction**
 - **Software**
 - **Aerospace/Defence**
 - **Social**
 - **Health**
- **Any industry related project**
- **A complicated project will use existing technology, knowledge, or framework in a new way, or attempt to incorporate new in an existing project type.**



Megaprojects

What is a Megaproject

- Any large-scale, complex (usually infrastructure) project that costs \$1 billion or more, takes many years to develop and build, involves multiple public and private stakeholders, are transformational, and impact millions of people.
- Examples of built Megaprojects are Panama Canal, Three Gorges Dam, 1915 Cannakale Bridge, etc



- These projects are vast in time, deliverables and logistics.
- More dreams than projects, but possible with existing technologies and knowledge.



What is a Megaproject

- Massive in scale
- Uses existing techniques, often difficulty in scaling up the solutions, or frameworks
- Existing management practices will not work due to the size, scale, distributed delivery
- PMBoK and existing frameworks, techniques can be used if broken down into smaller packages.
- Level of Uncertainty is exceptional.
- VUCA starts to affect the project
- Difficulty is seeing the dispersed big picture
- Requires a different delivery technique overall than is available in PMBok/Prince 2, etc



What is a Complex Projects

Any project that is defined as an intricate arrangement of the varied interrelated elements in which the elements can change and evolve constantly with an effect on the project objectives

- **Ambiguity – lack of awareness of events and causality**
- **Uncertainty – inability to pre-evaluate actions**
- **Unpredictability – the inability to know what will happen**
- **Dynamics – the rapid rate of change**
- **Social Structure – numbers and types of interactions**
- **Interrelationships – many interdependencies and interconnections exist**
- **Usually run over a period which exceeds the technology style time of the technologies involved**
- **Details – number of variables and interfaces, and/or**
- **Can be defined by effect, but not solution.**



- **Remington, Kaye and Zolan *** and ICCPM have determined that project complexity can be divided into five distinct groups.

These are:

- **Structural Complexity** - The structure of the project, multiple project partners, stakeholder, or suppliers, large number of interconnected activities; interdependence
- **Technical Complexity** - Development of new technologies, products, or services
- **Directional Complexity** - Misalignment of project goals, or expectations, hidden agendas, loss of original intent when handing over to a new team.
- **Temporal Complexity** - Shifting environment or strategic direction over time, often experienced during mergers or change of government.
- **Socio-Cultural Complexity** - Human interactions and needs, diversity, unconscious bias, organisational culture, societal expectations (ICCPM definition).

* Remington, Kaye and Zolin, Roxanne and Turner, Rodney (2009) *A model of project complexity : distinguishing dimensions of complexity from severity*. In: Proceedings of the 9th International Research Network of Project Management Conference, 11–13 October 2009, Berlin.

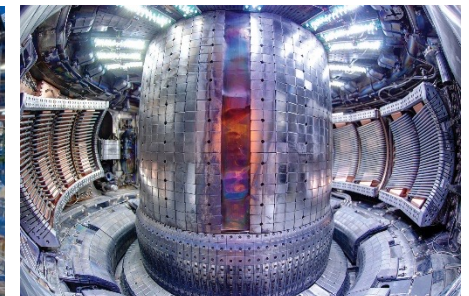
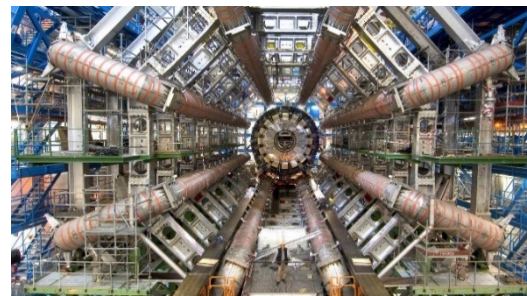


- **And then there is Emergence**
 - Emergence is a concept used to describe the sudden appearance of factors that increase the complexity of a project.
 - Factors are the five distinct groups that define complexity.
 - Can affect any project size (stop basing project size of dollar value).
 - Can happen at any time
 - What you have learned managing simple and complicated project will be useless



Complex Megaprojects

- Any project where the solution(s) are not known and the results are not a foregone conclusion.
- Any project that involve a number of factors, unproven technology, multiple stakeholders, multiple customers, new or novel risks.
- Any project with an open-ended budget, or a budget over \$1b
- Examples of Complex Megaprojects
 - Sneferu's Pyramids – Three different Pyramids at the same time, each different
 - The Manhattan Project – they had to invent so many new technologies
 - Large Hadron Collider – they had to invent a new branch of science and maths
 - Fusion Reactors – science is known, but the technology needs to be invented



Remember this

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Project category determination has nothing to do with dollar value

- a project can be a minor value (\$1m) project and be incredibly complex.
- a project can have a large value (\$900m) and be simple.

Project category determination should be based on the following:

- Risk of achieving the project (not risk to the organisation)
- Complexity



Organisation Project Categories

The PCAT (Project Category) system used by within Australian Government:

- PCAT 5 projects – minor works
- PCAT 4 projects – traditional projects
- PCAT 3 projects – traditional project within a highly political environment
- PCAT 2 projects – complex project
- PCAT 1 projects – highly complex project

They use project complexity to determine the category but again it is better, but not accurate.



Project category determination should be based on the following:

- **Category 4 – Projects that have been done before, organisation has the skills, experience and frameworks to support project delivery.**
- **Category 3 – Components of the project have been done before, but new technology, new partners, etc add an element of risk.**
- **Category 2 – Completely new technology, systems, processes, that haven't be done, or used before. Everything is new and needs to be created from scratch.**
- **Category 1 – A new theory, or design that has a basis in science, or fact. Something that is possible, but has never been done before.**



Questions?



Contact Details

Emu Head Consulting

Project Advisory, Auditing and Consulting

Phone : +61 497 864 225

Email : rmcmartin@emuhead.com.au

LinkedIn : www.linkedin.com/in/robmcmartin

