Risk Management and Complexity Theory
The Human Dimension of Risk

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See also: **A Simple View of Complexity in Project Management**
https://mosaicprojects.com.au/PDF_Papers/P070_A_Simple_View_of_Complexity.pdf

The Meaning of Risk in an Uncertain World
https://mosaicprojects.com.au/PDF_Papers/P040_The_Meaning_of_Risk_in_an_Uncertain_World.pdf
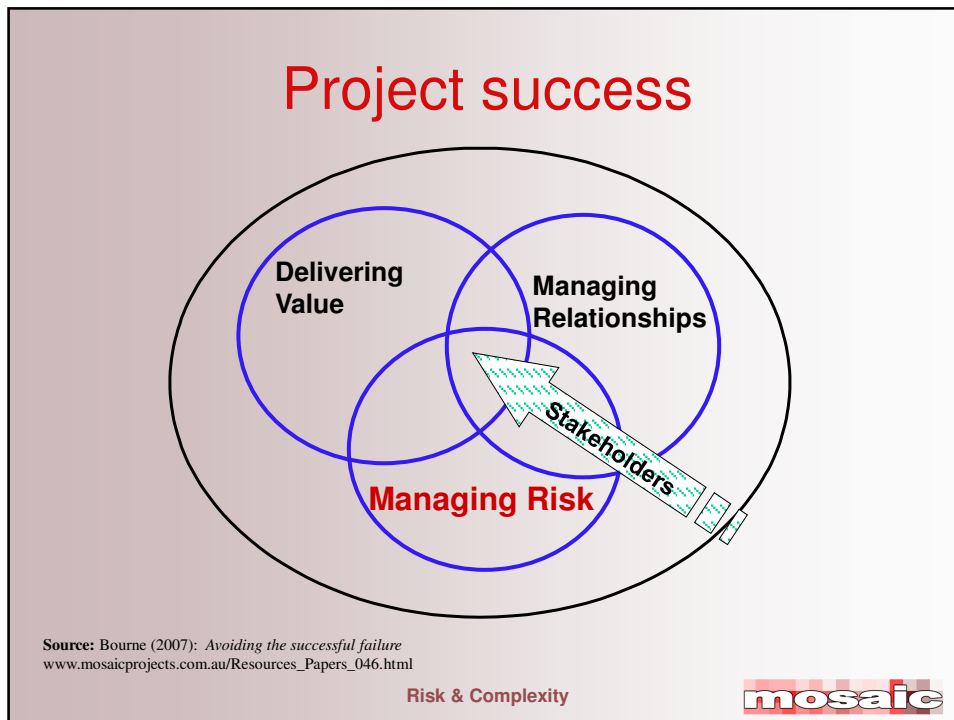
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Agenda

- Risk and Types of Uncertainty
- An Introduction to Complexity Theory
- Tying Complexity to Risk
- Conclusions

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Project success

Delivering Value

Managing Relationships

Stakeholders

Managing Risk

Source: Bourne (2007): *Avoiding the successful failure*
www.mosaicprojects.com.au/Resources_Papers_046.html

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Risk & Uncertainty

- A risk is: "**an uncertain event or condition that, if it occurs, will have a positive or negative effect on a project objective**"

- Uncertainty = lack of knowledge about future events

- Risk = uncertainty that matters

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Risk & Uncertainty

- Sources of uncertainty:
- The 'natural world'
  – Weather, Governments, etc.
- Variability in processes
  – All processes contain random variations
- Variability in people
  – The primary focus of this paper

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Risk & Uncertainty

- Dealing with the 'natural world'
  – Known unknowns (we don't know when)
  – Change project or
  – Calculate contingencies
- Variability in processes
  – The focus of Quality Movement
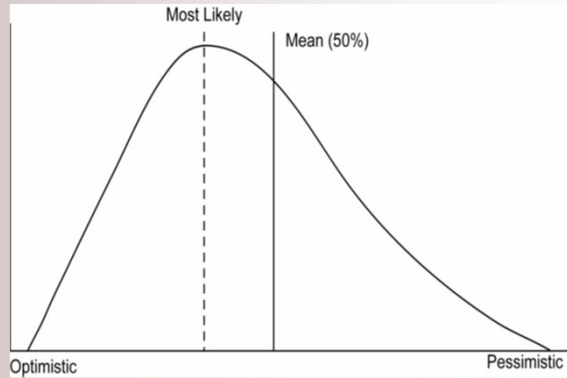 – Calculate safety margins
  – Based on data

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Variability

- ## Beta/Probability Distribution –
  effect on cost and time

Most project
estimates
are skewed
towards
a pessimistic
outcome

Most Likely

Mean (50%)

Optimistic

Pessimistic

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Variability

- ## Monte Carlo Simulation

00004 - Chimney rebuild : Finish Date

100%	17/Mar/05
95%	11/Mar/05
90%	09/Mar/05
85%	08/Mar/05
80%	07/Mar/05
75%	06/Mar/05
70%	05/Mar/05
65%	04/Mar/05
60%	03/Mar/05
55%	03/Mar/05
50%	02/Mar/05
45%	01/Mar/05
40%	28/Feb/05
35%	28/Feb/05
30%	27/Feb/05
25%	26/Feb/05
20%	26/Feb/05
15%	25/Feb/05
10%	24/Feb/05
5%	23/Feb/05

Hits

Cumulative Frequency

80

64

48

32

16

0

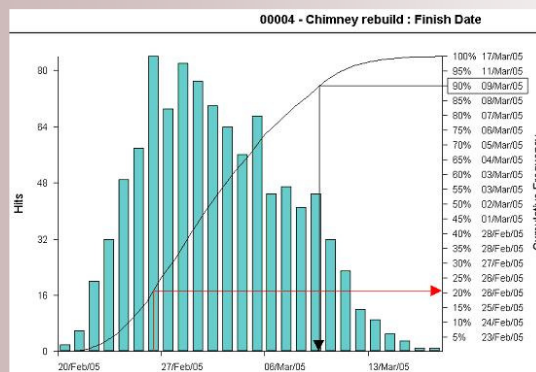20/Feb/05   27/Feb/05   06/Mar/05   13/Mar/05

Diagram produced by PertMaster

Monte Carlo simulation
involves running the
project many hundreds
(if not thousands) of
times with different
values selected for each
element based on the
range of options defined
by the SMEs for that
element. This example
looks at time. A similar
analysis can be done
for costs.

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Underpinning Assumptions

1. Uncertainty can be reduced by 'better data'

2. Adequate data allows risks to be assessed and managed

3. Reasonably reliable calculations are possible

4. The past is a reasonable guide to the future

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Risks Can Be Calculated

• Probability - Impact Matrix

Probability	Threats					Opportunities				
0.9	0.09	0.18	0.36	0.63	0.81	0.81	0.63	0.36	0.18	0.09
0.7	0.07	0.14	0.28	0.49	0.63	0.63	0.49	0.28	0.14	0.07
0.5	0.05	0.10	0.20	0.35	0.45	0.45	0.35	0.20	0.10	0.05
0.3	0.03	0.06	0.12	0.21	0.27	0.27	0.21	0.12	0.06	0.03
0.1	0.01	0.02	0.04	0.07	0.09	0.09	0.07	0.04	0.02	0.01
Impact	0.1	0.2	0.4	0.7	0.9	0.9	0.7	0.4	0.2	0.1

The high impact, high probability (red) sector can be described as the 'Arrow of Attention'
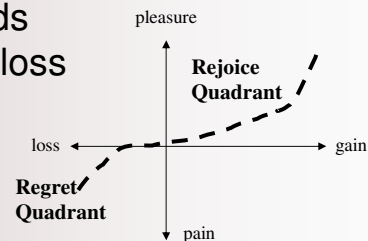
• This is the basis of modern civilisation!

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Utility Theory

- Utility theory describes the change in the tolerance for risk as the amount at stake (AaS) rises.
  - Reaction to risk depends on views of damage of loss or benefit of gain.
  - Reaction to outcome depends on original expectations

pleasure

Rejoice Quadrant

loss ← → gain

Regret Quadrant

pain

Source: Piney, C Applying Utility *Theory to Risk Management*, PM Journal, September 2003 pp26 - 31

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Utility Theory

- Reaction to risk depends on the stakeholders view of the potential damage caused by the loss -v- the benefit derived from the gain
- People are more inclined to accept a risk (gamble) to avoid a certain loss than to increase a gain (**most people are loss averse**)
- Risk seeking -v- Risk Averse

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Utility Theory

- The people dimension of risk is generally to seek 'certainty'

- Immature organisations seek 'absolute certainty' (this is impossible)

- Mature organisations expect to be able to 'manage risk' and make 'proper provisions'

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Thoughts from Complexity Theory

- The 'Tipping Point' described the way natural systems can absorb influences with minimal (or predictable) change until the 'tipping point' is reached and then there is a sudden catastrophic change

- **How close is the 'tipping point'?**
  (you don't know until it has been reached at least once)

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Thoughts from Complexity Theory

- The 'butterfly effect' describes the situation where minute changes in the starting condition can have major and unpredictable consequences
- Nonlinearity suggests that you can do the same thing several times over and get completely different results - all human relationships are non-linear

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Thoughts from Complexity Theory

- Complex Responsive Processes of Relating' (CRPR) puts emphasis on the interaction among people and the essentially responsive and participative nature of the human processes of organising and relating

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Thoughts from Complexity Theory

- The future seen from a CRPR perspective is, therefore, under perpetual construction by the movement of the human action itself

- The 'team' is oriented towards an 'unknown future' that it is in the process of continually creating

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Conclusions

- The future is not predictable
- Risk planning will not change many aspects of what will actually happen
- The key skill is in preparing for the most likely eventuality (traditional risk management) and….
- Reacting quickly to the unexpected

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Conclusions

- 'Strange Attractors' from complexity theory recognises the way 'nature has a habit of repeating itself'
- BUT '**only for the most part**'

- Project management needs to re-focus on the reality of uncertainty

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Questions Please

More risk management papers see:
https://mosaicprojects.com.au/PMKI-SCH-045.php

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