Practical Disciplines for the 21st Century Mind

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'Creativity' covers a broad spectrum of ideas



• Artistic

Creativity paradox new ideas are stimulated by constraint and disciplined process

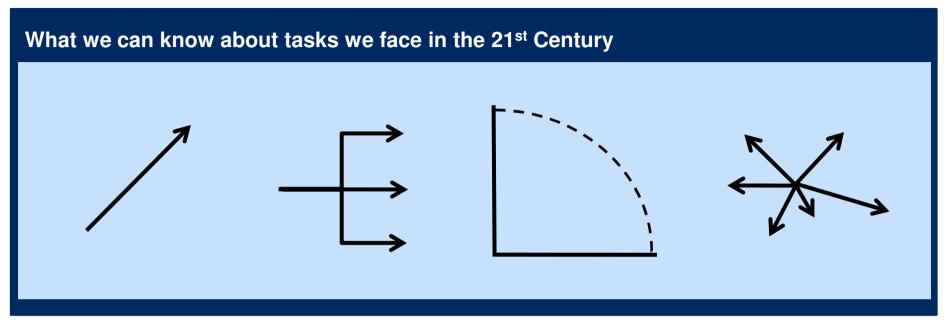
Practical and Inventive

- Dealing with challenges and opportunities the world and life presents
- Finding new, inventive and original solutions
- Scientific

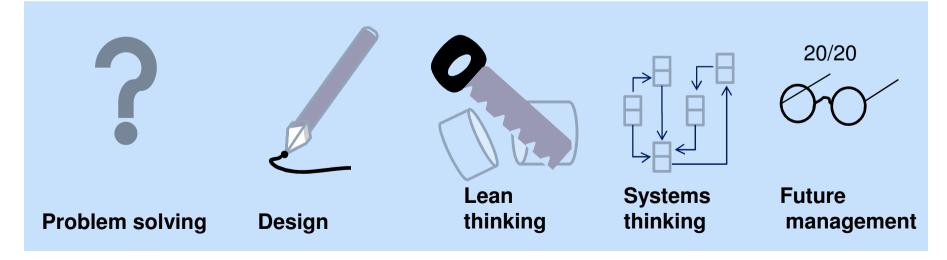
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Teaching is a form of time travel





Practical disciplines for mastering the tasks of the 21st Century



Time travel or what we can know about the future

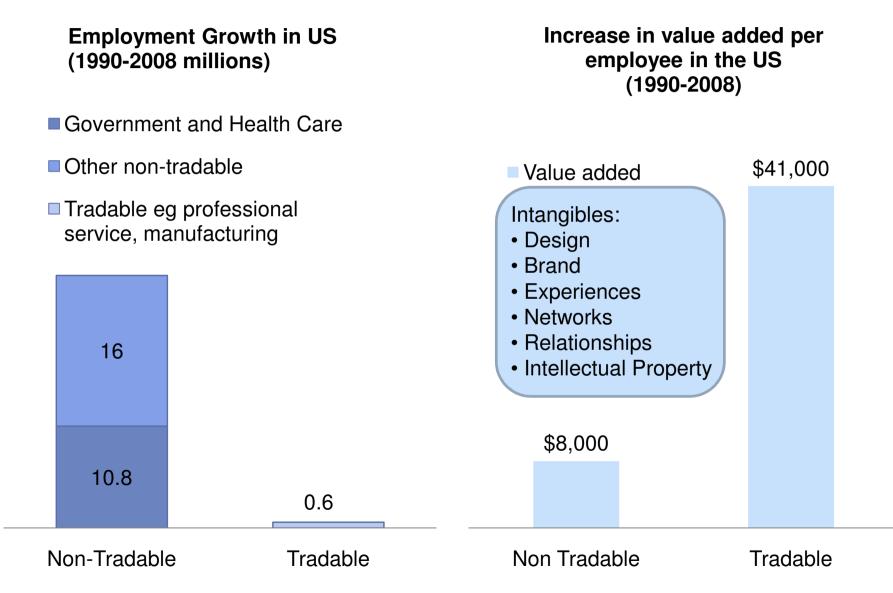
1. A clear enough future	2. Alternative futures	3. A range of futures	4. True ambiguity
 A single view of the future 	 A limited set of possible future outcomes, one of which will occur 	 A range of possible future outcomes 	 Not even a range of possible future outcomes
 Population growth Relationship between population growth and resource consumption 	 Elections Regulatory changes Wars between states Takeovers 	 Rate and impact of climate change Evolution of non-state conflicts 	 Major social, technological or economic discontinuities
			K K

Tasks of the 21st Century

•The Quest for Intangibles

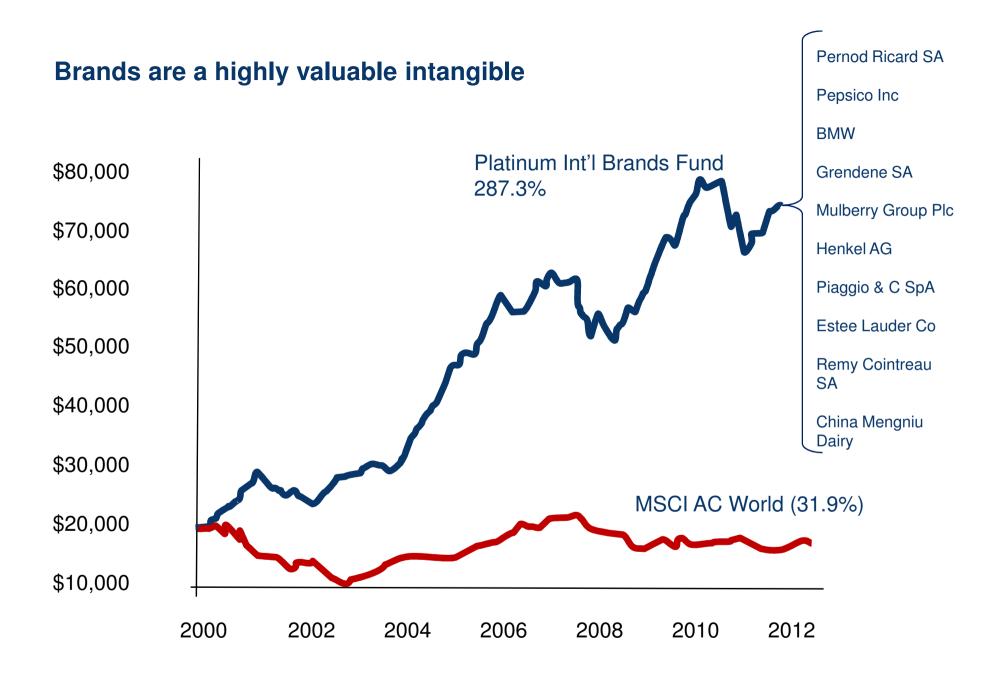
- The Management of Scarcity
- •Navigating the Re-centring of the World
- Preparing for the Arrival of the Black swan

Intangibles are where the value lies





Apple's intangibles: design, experience, networks, intellectual property



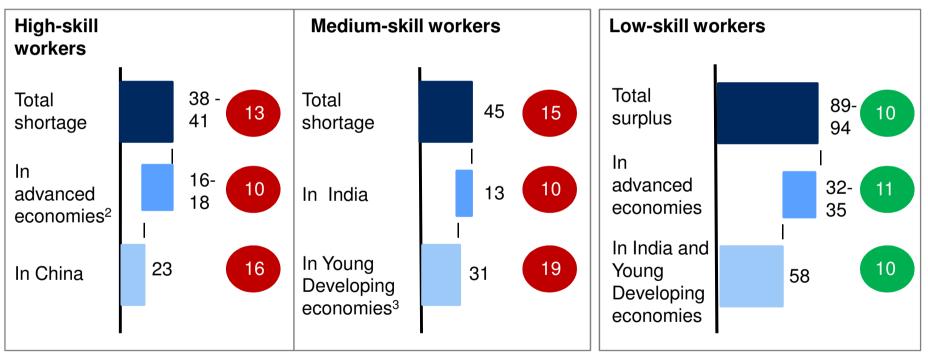
On our current trajectory the world is not educating enough people

Gap between demand and supply of workers by educational attainment, 2020E Million workers

Shortages

% of supply of skill cohort
% of demand for skill cohort

Surpluses



SOURCE: McKinsey Report The World at Work: Jobs, pay, and skills for 3.5 billion people | McKinsey Global Institute analysis

1 Low-skill defined in advanced economies as no post-secondary education; in developing, low skill is primary education or less.

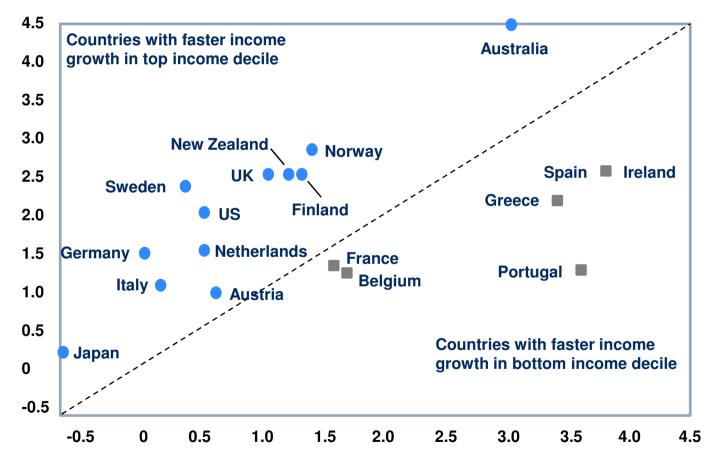
2 25 countries from the analysed set of 70 countries, that have GDP per capita greater than US\$ 20,000 at 2005 purchasing power parity (PPP) levels in 2010.

3 11 countries from the analysed set of 70 countries, from South Asia and sub-Sahara n Africa, with GDP per capita less than \$3,000 at 2005 PPP levels in 2010.

Countries who are globalising more successfully are also becoming more unequal

Average annual change in real household income, mid-1980s to late 2000s %

Top decile of households



Bottom decile of households

SOURCE: McKinsey Report The World at Work: Jobs, pay, and skills for 3.5 billion people | McKinsey Global Institute analysis Organisation for Economic Co-Operation and Development (OECD)

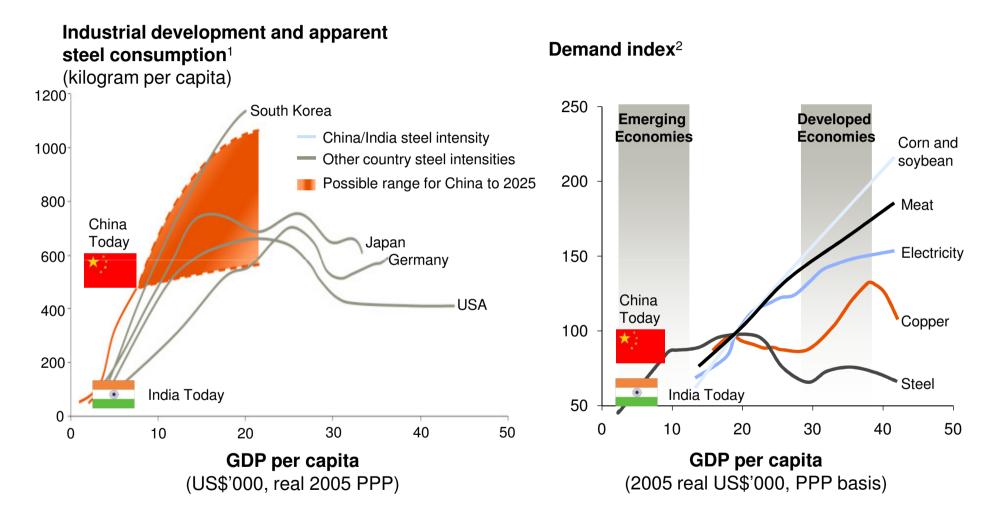
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As incomes grow demand for all resources inexorably grows

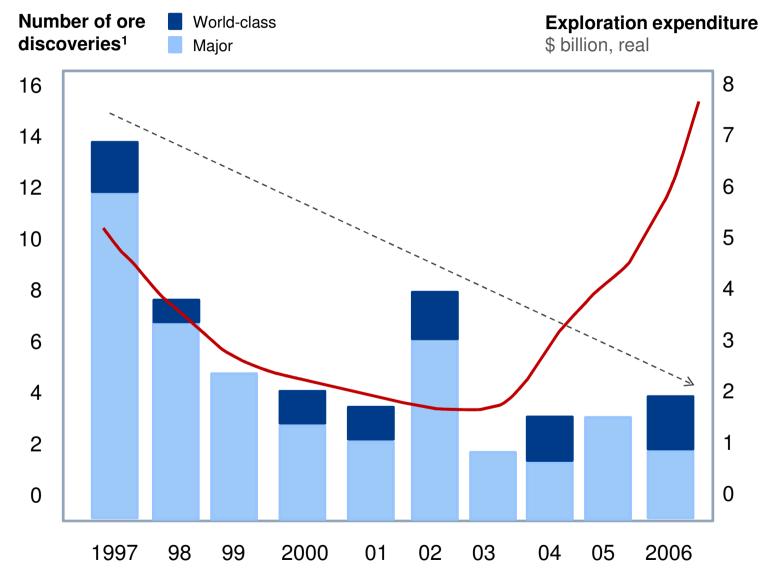


Source: McKinsey Global Institute Report | McKinsey Sustainability & Resource Productivity Practice CISA; WSA; Global Insight; JBS; BHP Billiton Source: World Bank; Brook Hunt; CRU; IISI; Global Insight; CISA; world steel; JBS; IEA; BHP Billiton analysis.

- 1. Steel consumption on a crude steel equivalent basis.
- 2. The demand intensity index represents the volume consumption per capita consumption, 1968 as 100 for each of the commodities, based on the USA experience.

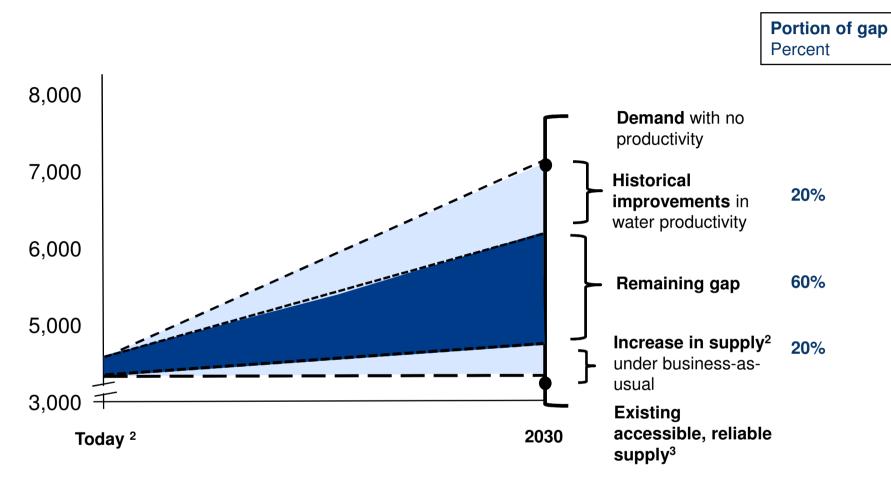
Alberto Calderon, Chief Executive Aluminium, Nickel and Corporate Development, 10 February 2012

Supply is constrained: resources are harder to find and more expensive to obtain



SOURCE: BHP Billiton; USGS; MEG Minerals 2009, McKinsey 1 All metal and mining materials; latest data available to 2006.

The same picture is true for water



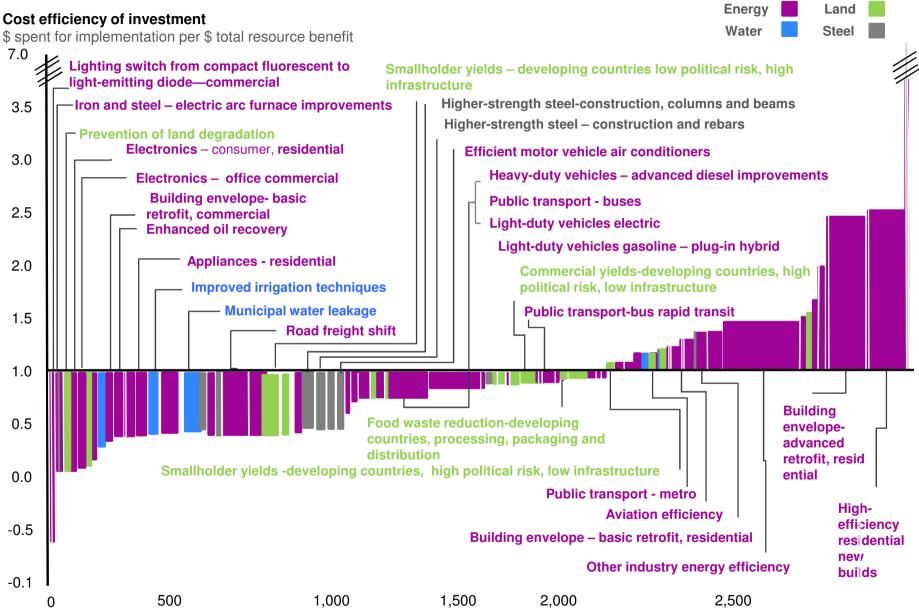
1 Based on historical agricultural yield growth rates from 1990-2004 from FAQSTAT, agricultural and industrial efficiency improvements from IFPRI

2 total increased capture of raw water through infrastructure build-=out, excluding unsustainable extraction

3 Supply shown at 90% reliability and includes infrastructure investments scheduled and funded through 2010. Current 90%-reliable supply does not meet average demand.

SOURCE: 2030 Water Recourses Group-Global Water Supply and Demand model; (IFPRI; FAOSTAT

Scarcity has to be managed on many fronts



1 McKinsey Global Institute Report | Resource Revolution: Meeting the world's energy, materials, food, and water needs | McKinsey Global Institute | McKinsey Sustainability & Resource Productivity Practice Based on current prices for energy, steel, and water at a discount rate of 10 percent per annum. All values are expressed in 2010 prices. SOURCE: McKinsey analysis 1 Tasks of the 21st Century

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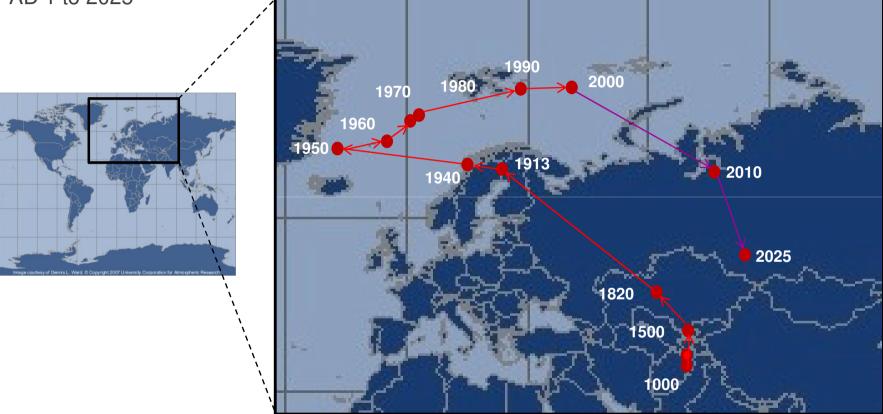
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The world is rapidly re-centring to Asia

Evolution of the earth's economic centre of gravity

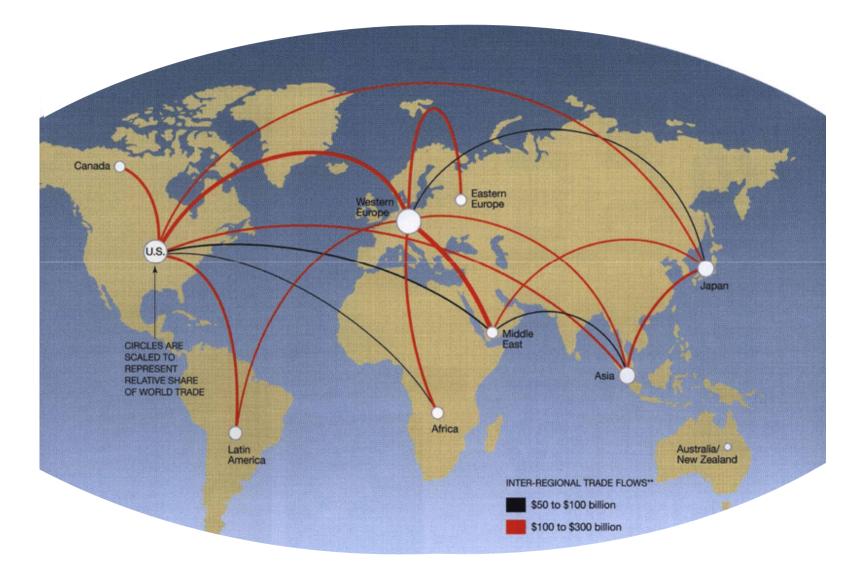




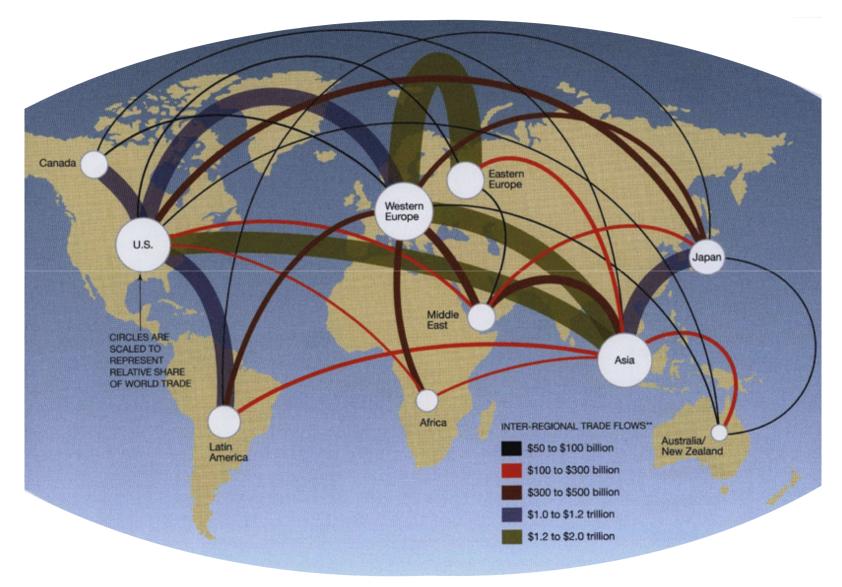
Economic centre of gravity is calculated by weighting locations by GDP in three dimensions and projected to the nearest point on the earth's surface. The surface of the centre of gravity shifts north over the course of the century reflecting the fact that in three-dimensional space America and Asia are not only 'next' to each other, but also 'across' from each other.

Source: McKinsey Global Institute Report | Urban World: Cities and the rise of the consuming class | McKinsey Global Institute using data from Angus Maddison; University of Groningen

Interdependence Global trade has gone from \$2.4 trillion in 1980 ...



Interdependence ... to global trade of \$13.5 trillion in 2005

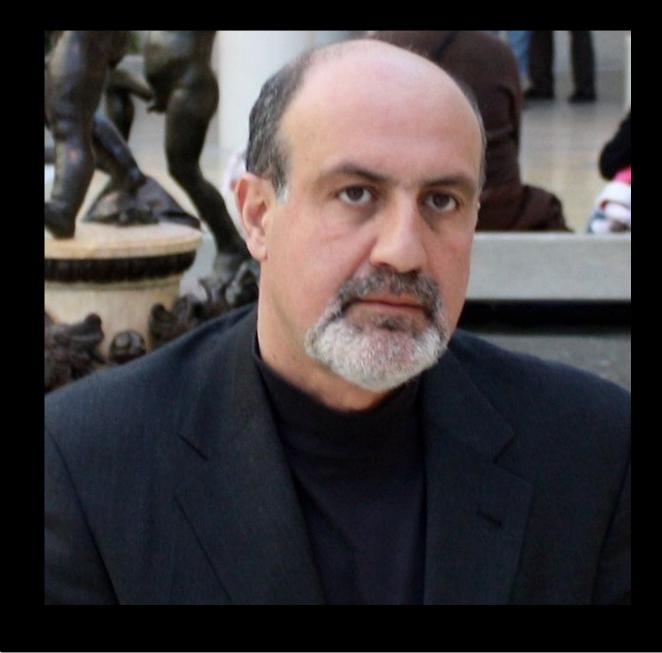


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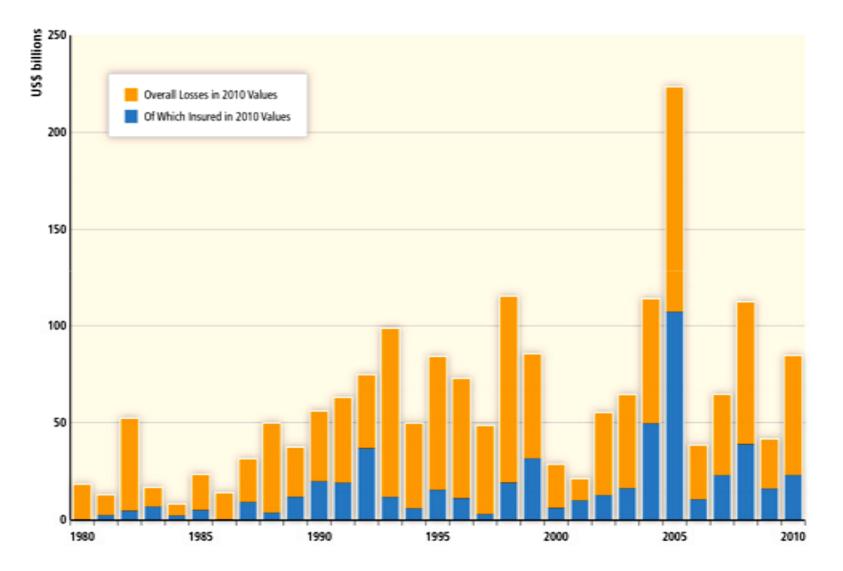
Nassim Talib



A Black Swan: the results of Mohamed Bouaziz's self-immolation in Tunisa

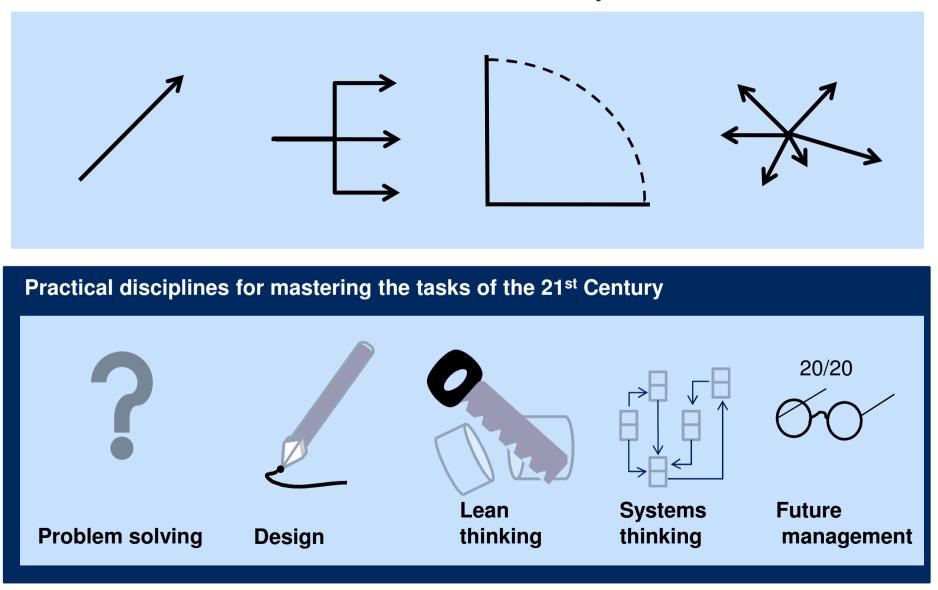


Economic losses from climate-related disasters have increased



Source: IDCC Report | Data from Munich Re, 2011,

What we can know about tasks we face in the 21st Century



Organisations developing the practical disciplines for the 21st Century mind

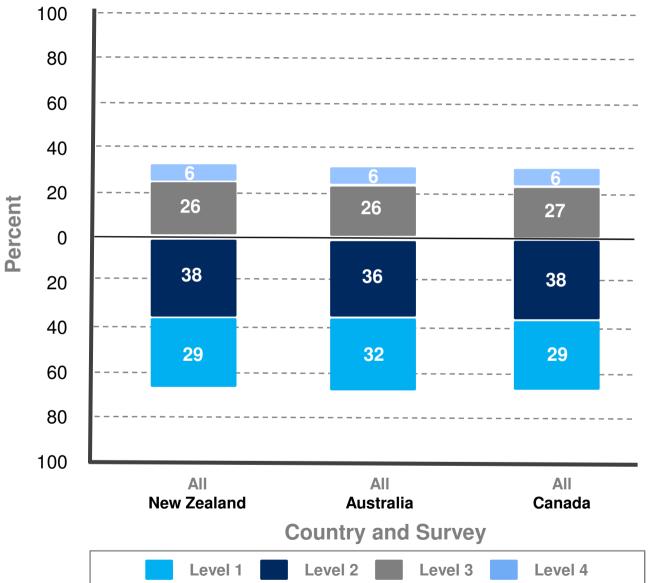


Practical disciplines for the 21st Century Mind

Structured problem solving

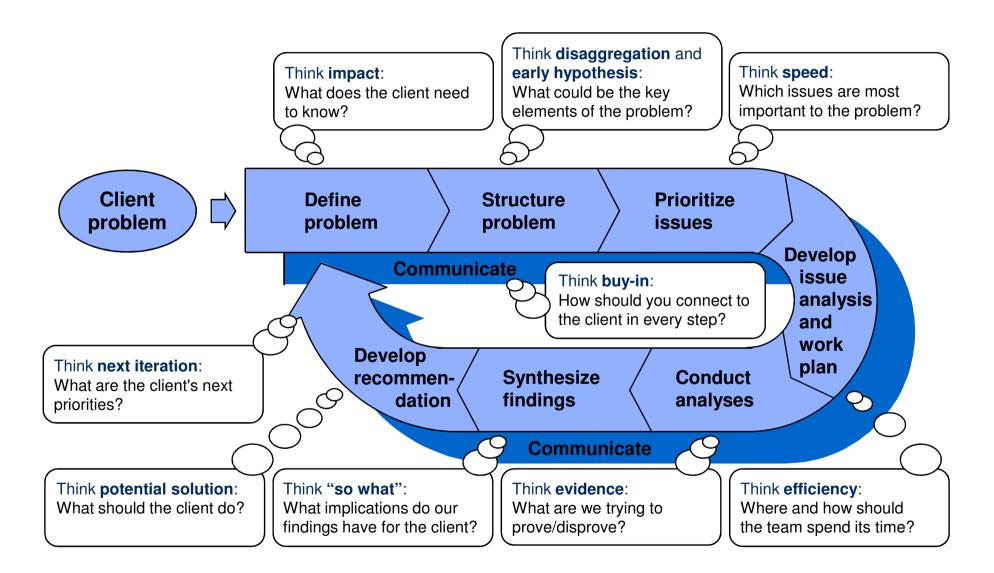
- Design
- •Lean Thinking
- Systems Thinking
- Future management

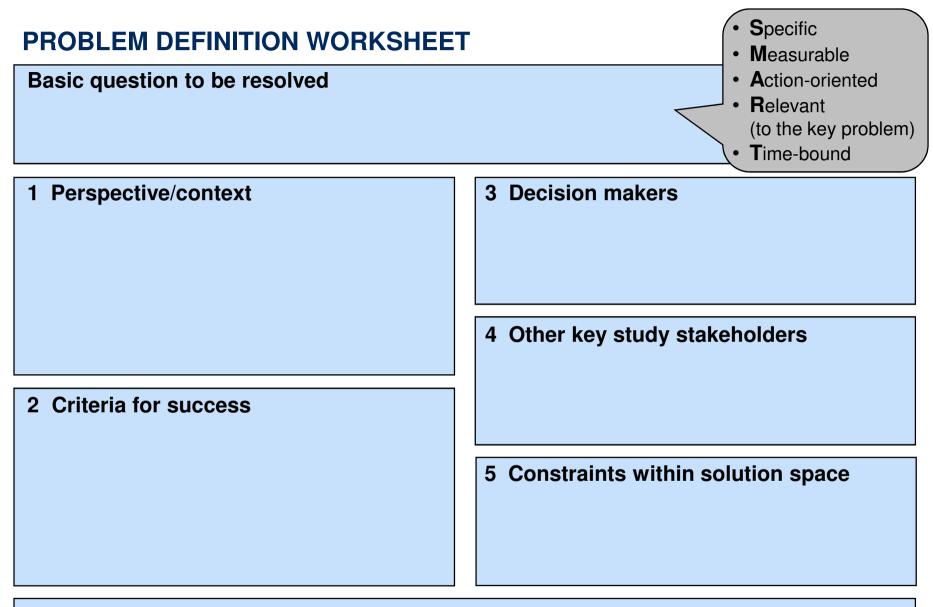
International testing shows improving problem solving skills is a key priority



Source: The Adult Literacy and Life Skills (ALL) Survey: Overview and International Comparisons research Division Ministry of Education New Zealand | Adult Literacy and Life Skills Survey (2006)

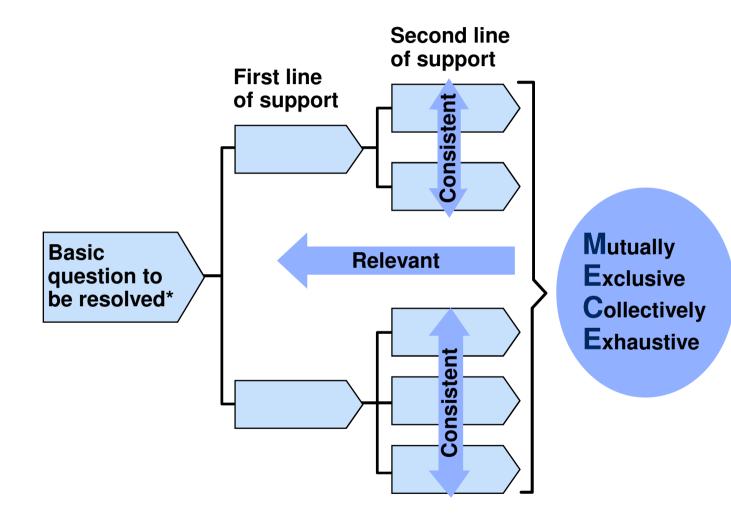
PROBLEM SOLVING LOOP





6 Scope of solution space

QUALITY LOGIC TREES ARE CONSISTENT, RELEVANT, AND MECE



- Consistent: All elements at same level should be of same nature
- Relevant: Elements should be necessary and sufficient for supporting the previous line
- MECE: Elements should not overlap, yet cover all relevant options

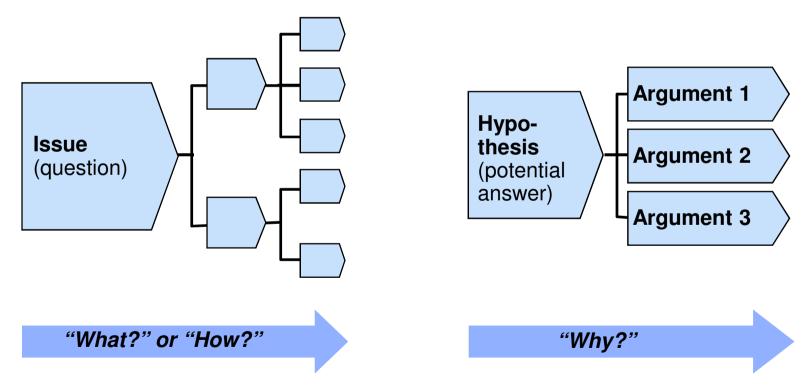
TWO MAIN TYPES OF LOGIC TREES

Issue tree

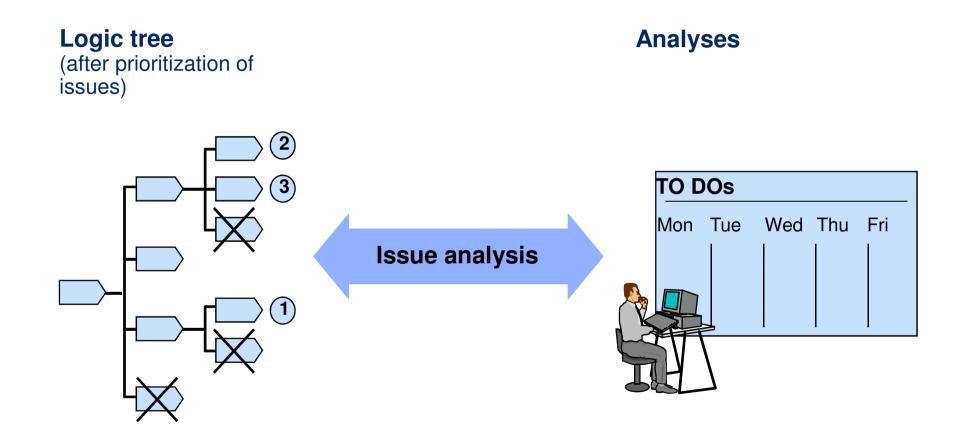
Use when your client's problem is entirely new to you

Hypothesis-driven tree

Use when you can propose a hypothetical solution to your client's problem based on experience with the client or similar projects



ISSUE ANALYSIS SETS THE STAGE FOR ACTION



ISSUE ANALYSIS WORKSHEET

Issue	Hypothesis	Supporting rationale	Information/ Analysis	Source/ Provider
Key issue or unresolved question that elicits a "yes" or "no" answer and on which a specific action depends	Statement of the likely resolution of the issue; it includes the reason for answering "yes" or "no"	Arguments that are necessary and sufficient to support the hypothesis	Analyses that should be conducted to either confirm or refute the hypothesis, and thus resolve the issue	Likely location and means of obtaining data for analyses

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• Design

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IDEO Human Centre Design Process

Hear	Create	Deliver	
Step 1: Choose research methods	Step 1: Develop the Approach	Step 1: Develop a sustainable revenue model	
Step 2: Develop an	Step 2: Share Stories	Step 2: Identify capabilities for delivering solutions	
interview approach Step 3: develop your mindset	Step 3: Identify Patterns		
	Step 4: Create opportunity Areas	Step 3: Plan a pipeline of solutions	
	Step 5 Brainstorm new solutions	Step 4: Create an implementation	
	Step 6: Make ideas real	timeline	
	Step 7: Gather feedback	Step 5: Plan mini- pilots and iteration	
		Step 6: Create a learning plan	

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Lean thinking: how to do more with less



Lean Toolkit - examples

То	Use
8 Types of Waste analysis	Finding all the different ways we waste time
Capacity Scheduling	How well matched is our capacity or resources and the use of them e.g. School use
Touch Time Analysis	How much time do we actually spend working on something rather than it sitting around in an 'in tray' or inventory e.g. Admissions
5 S	How well organised is our work place e.g. Emergency rooms in hospitals
Visual Management	Visibly track waste and have conversations about how to reduce it e.g. Kitchen waste
Poke Yoke	Stopping the whole process to prevent errors continuing

8 types of waste

Type of Waste	What it is
1.Overproduction	Producing too much, or producing too soon
2. Over processing	Excessive processing of same item, task
3. Inventory	More work in progress than is required to complete tasks, meet obligations
4. Waiting	Waiting for parts, documents, or a machine to finish a cycle
5. Transportation/ handling	Non-essential transport
6. Correction/rework	Rework, errors, leading to scrap
7. Motion	Excessive motion that does not add value
8. Intellect	Failure to utilize the time and talents of people

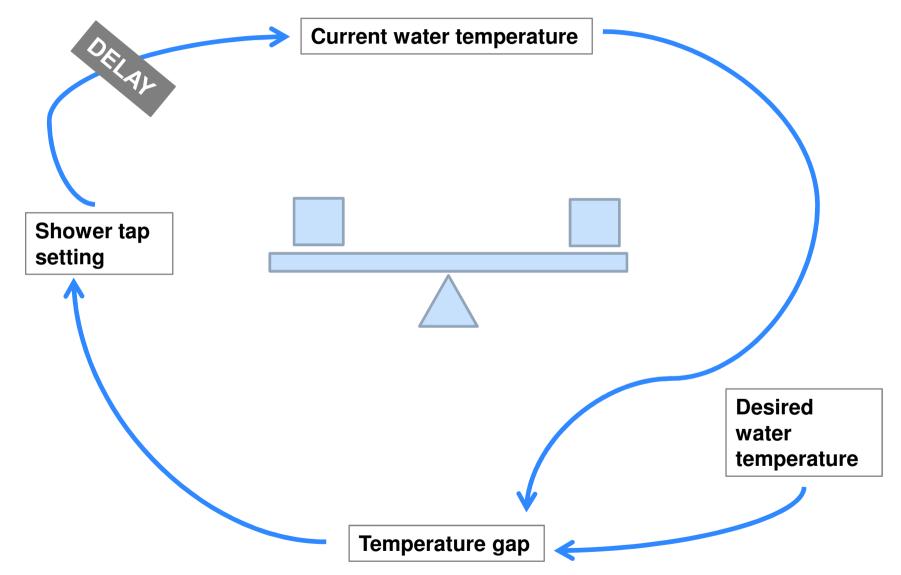
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• Systems Thinking

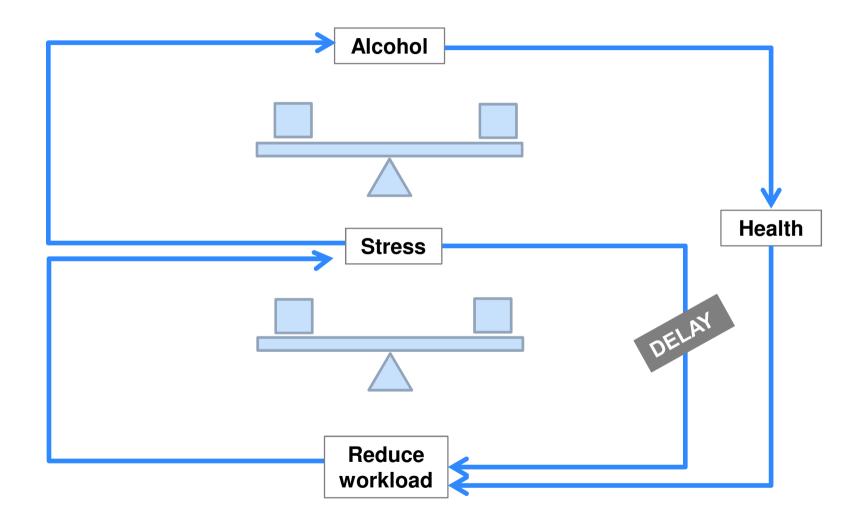
• Future management

We all manage systems everyday

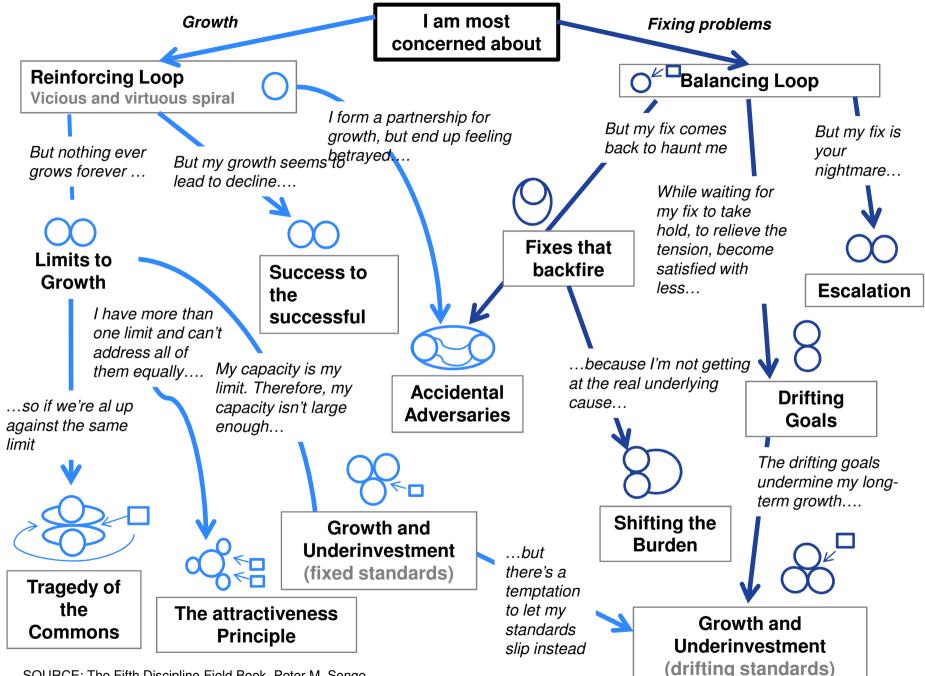


SOURCE: The Fifth Discipline. The Art & Practice of The Learning Organisation. Peter M. Senge

Managing life is about managing systems



SOURCE: The Fifth Discipline. The Art & Practice of The Learning Organisation. Peter M. Senge



Simulations are a powerful way to build systems thinking skills



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• Future management

Determine the type of future

	1. A clear enough future	2. Alternative futures	3. A range of futures	4. True ambiguity
Different types of future	A single view of the future	• A limited set of possible future outcomes, one of which will occur	• A range of possible future outcomes	 Not even a range of possible future outcomes
Situation analysis tools	 Traditional tools: Porter's five forces Market research Cost benchmarks SWOT analysis Core competencies diagnostics Discounted cash flow/ NPV valuation needs 	 Traditional tools plus: Decision or event trees Scenario-planning exercises Game theory Decision-tree ROV techniques 	 Traditional tools plus: Decision or event trees Scenario-planning exercises Game theory System dynamics models Real Option value techniques 	 Working backwards to beliefs that would support a given strategy Analogies and reference cases Management flight simulators
End products	 Point forecasts of key value drivers and how each changes them DCF model to value alternative strategies 	 Complete description of MECE set of scenarios Assessment of how each potential strategy changes probability of each scenario and payoffs to company 	 Complete description of a representative set of scenarios Assessment of how each strategy affects likelihood of outcomes 	 Complete statement of beliefs supporting different strategies Supporting analogies and reference cases Key market indicators
Decision making model	 Choosing strategy that maximises company's objective 	 Direction analysis 	 Qualitative decision analysis 	 Getting comfortable with beliefs that support strategy

Source: Hugh Countey, 20/20 Foresight

Consequence and likelihood determine risk level

Consequence	Fatalities	Casualties	Economic impact \$
5. Catastrophic	1,000+	10,000s	Tens of Billions
4. Major	101-1,000	1,000s	Billion
3. Significant	51-100	100s	Hundreds of millions
2. Moderate	10-50	10s	Tens of millions
1. Limited	<10	<10	Millions

Likelihood	Likelihood of event within 5 years
5. Highly likely	Expected to occur in the time period: roughly 1 in 2 chance
4. Likely	Reasonable chance it will occur in the time period: roughly 1 in 20 chance
3. Possible	Might possibly occur in the time period: roughly 1 in 200 chance
2. Unlikely	Could occur in the time period: roughly 1 in 2,000 chance
1. Remote	May occur only in exceptional circumstance: roughly 1 in 20,000 chance

Risk matrix identifies the risk level

	Likelihood				
Consequences	Rare (1)	Unlikely (2)	Possible (3)	Likely (4)	Highly Likely (5)
Catastrophic (5)	High	High	High	Extreme	Extreme
Major (4)	Moderate	Moderate	High	Extreme	Extreme
Significant (3)	Moderate	Moderate	Moderate	High	High
Moderate (2)	Low	Low	Moderate	Moderate	Moderate
Limited(1)	Low	Low	Low	Moderate	Moderate

Response plans

Risk rating	Action required
Extreme	 Make significant investment of resources to reduce the likelihood Have detailed contingency plans and clear accountabilities and resources that are immediately available to manage the event Have 'stand by' capacity to manage the consequences
High	 Make investment in prevention that is proportionate to the risk Have a detailed contingency plan and clear accountabilities to manage the event Have a specific plan to prioritise existing resources to manage consequences
Moderate	 Make investment in prevention that is proportionate to the risk Rather than a specific event plan, have a resilience plan to ensure a system's normal mechanism for coping with events, as well as the level of harm posed by similar risks in this category Identify any types of threat or harm that the system isn't set-up to deal with that may require specific measures
Low	 Rely on resilience plan for moderate risks Identify any types of threat or harm that the system isn't set up to deal with that may require specific measures

Cognitive biases particularly affect our ability to judge risk

Cognitive basis

- **Misjudging 'long-tail' risks** —people are not strong at accurately assessing highimpact, low-probability risk
- Anchoring—people tend to adjust initial estimates insufficiently from an initial value
- **Discounting** —the significance of future gains/losses
- **Investigating**—people give undue weight to information that is more readily drawn to mind and more prominently displayed

How to incorporate the practical disciplines in our curriculum

Include and evolve rather than add

- In existing subjects include explicit problem solving methodology and complexity thinking
- Make more use of practical projects, which provide greater opportunities for lean thinking and future management tools
- Problem based learning