Institute and Faculty of Actuaries

Risk Management: Beyond Protection

Andrew Howe

Areas we'll cover

- The world's first CRO on the ABC of ERM
- Some doubters
- Potential gaps – and how to bridge them
- Risk management: the full Monty

- One type of bridge: 5 analytics examples – practical recipes

- **Be brave** – we'll have some votes / interaction
- **Any experts here?** Protection? Risk management?

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Lam on risk management

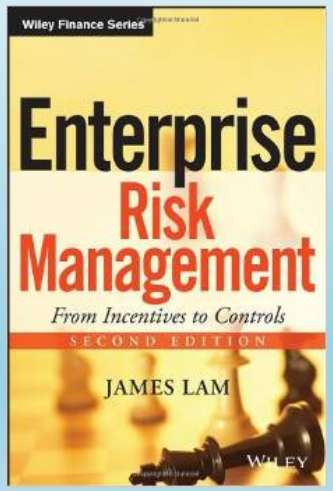
" There are three major business applications of risk management:

a) loss reduction
b) uncertainty management
c) performance optimisation

The combination of all three is enterprise risk management."

James Lam – the world's first Chief Risk Officer

Have you read it?



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Others go beyond loss reduction too

" *Enterprise risk management is the discipline by which an organization* ***in any industry*** *assesses, controls, exploits, finances, and monitors risks from all sources* ***to increase the organization's short- and long-term value to its stakeholders.*** " US Casualty Actuarial Society

" *The product of a fully realized ERM programme is the optimisation of enterprise risk adjusted return.*" Professor Harry Panjer http://bit.ly/1IqIc86

But there are alternative perspectives...

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Doubters

Some don't:

1. believe we've explained "value from risk management"
2. see the "hard" value in risk management – "sleeping at night"
3. think we can get at it in practice – "everything's grey"
4. want to do it

- **Voting time: where are you?**
- One foot in (1), (2) or (3)? This presentation aims to help *
- Let's get back to James Lam's a-b-c

* (4) is a different ball game and out of scope today! For (1) see Panning, quoted in an Appendix

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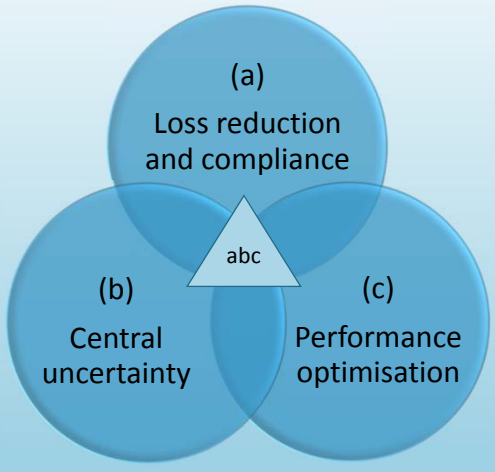
Roadmap and roadblocks

- Natural order: a-b-c as per Lam
- It is possible to focus mainly on (a)
- Ironically such companies often fail
  - => unimaginative approach
  - => operational and strategic risks
- e.g. Tesco, RBS and even Banker's Trust
- All darlings!



- **Various ways** to deliver a-b-c
- **This presentation:** assessment and analytics => a-b-c

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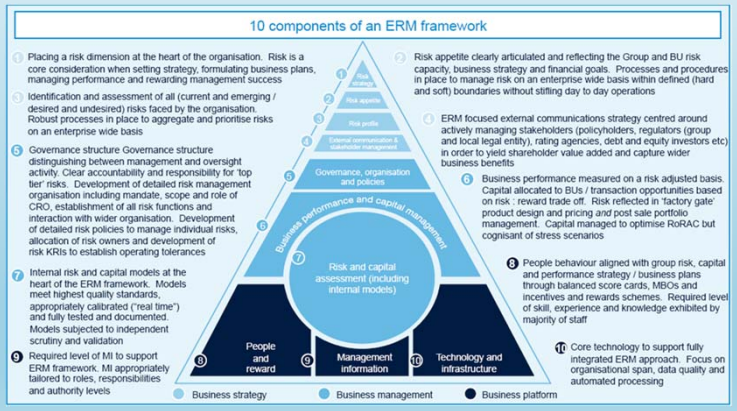
SuperCRO + SuperFramework + on top of Solvency II

"ERM is the discipline by which an organization … assesses, controls, exploits, finances, and monitors risks from all sources" US Casualty Actuarial Society



Is that it?

Mind the gap! Getting to ERM 2.0

Risk function

- Risk governance
- Risk framework
- Risk policies
- Risk process
- Risk appetite

(a) Loss reduction

(b) Central uncertainty

(c) Performance optimisation

Business functions

- Strategy
- Pricing
- Product devt
- Distribution
- Underwriting

For those not at the presentation

- A reviewer questioned the position of the circles
  - Loss reduction (a) sits more obviously with the risk function (perhaps!)
  - Risk management which focuses on (a) can lose the connection to (b) and (c)
  - (b) and (c) are more naturally connected
  - (b)=>(a) may be easier than (a)=>(b)
- ERM 1.0 focus: the consistent admin and measurement of risk types
- ERM 2.0 focus:
  - all of ERM 1.0 plus …
  - connect together (a), (b) and (c)
  - risk and business functions work in an integrated way

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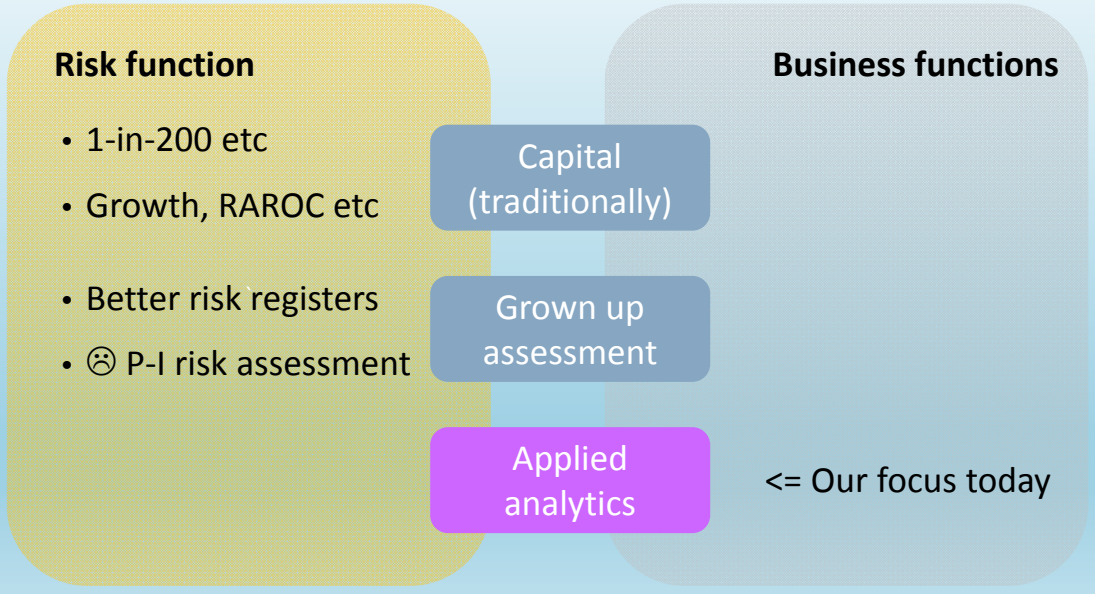
Mind the gap! Building bridges



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Making progress – a scenario

- You want to explore Lam's (b) and (c)
- Others need to be convinced <= two tools
  1. **Game show example:** "risk thinking" => better decision making
  2. **Commercial examples:** analytics in individual protection insurance

- (1) is a short, sharp shock "in principle" approach
- (2) is more realistic but takes longer

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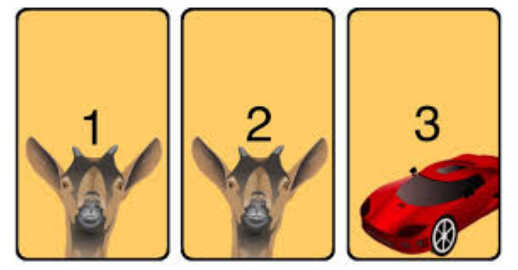
How can understanding risk add value? Short, sharp

Monty Hall **set up**

- Three doors: all initially closed
- Behind one (3 here) is a £300K car
- The host knows which door
- Both the others hide a goat



- You select one door, which remains closed
- The host opens one of the **other** doors, revealing a **goat**

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How can understanding risk add value? Short, sharp

Monty Hall **question – and vote**

- **Question:** Do you want to switch? (How much would you pay to do so?)
- You can't phone a friend (you're an actuary after all...)

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How can understanding risk add value? Short, sharp

Monty Hall **solution**

- Proof 1: http://www.bbc.co.uk/programmes/p00wj3bd - nice video
- Proof 2: pick door 1

Door 1	Door 2	Door 3	Stick strategy	Switch Strategy
Car	Goat	Goat	Car	Goat
Goat	Car	Goat	Goat	Car
Goat	Goat	Car	Goat	Car
			1 car	2 cars

- Value = better decisions (in this case you switch)

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Risk management value: insurer analytics examples

1. Bad debts (agents)
2. Non-disclosure (agents – smoking status, medical)
3. Mortality, (predictive mortality), business mix
4. Underwriting development (data driven)
5. Take up rate: underwriting decision and its speed

- **Analytics** => risk factors beyond rating factors – **practical definition?**
- **Desired outcome:** reconnect (a)-(b)-(c) – probably done together
- **Practical:** what am I looking for? Am I prepared?

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[1] Bad debts – prediction

- **Example:** p/h lapse, agent disappears, insurer loses 250K in clawback
- **Worse:** a case of 8m+ may have happened (my speculation)

- **Scenario 1:** High pressure sales
  - high volumes
  - high lapses
  - eventually bad debts
  - **how to predict?**

Benefits?
- Improve bad debt results
- Cost-benefit basis
- Worst offenders first

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[1] Bad debts – prediction

- **Scenario 1:** High pressure sales – how to predict?

Adviser	Take up %	Cancel from inception (CFI) %	Year 1 lapse %	Total cases	Credibility measure
1	#	#	#	#	#
2	#	#	#	#	#
…	…	…	…	…	…
All	#	#	#	#	#

- **The problem:** bad ethics => bad sales techniques => bad debt

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[1] Bad debts – prediction

- **Scenario 2:** day-1 commission pays first year's premium
- This has happened in the UK
- Check out low lapses in month 1-12

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[1] Bad debts – prediction

- **Scenario 3:** "smart" agent:
  - Pays premiums
  - Arranges "reasonable lapses"
- **Are you prepared?**

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[2a] Non-disclosure – smoker status

- **Gmail catches spam.** Can we catch non-disclosure? **Vote.**
- **Concern:** adviser steers smokers to say they're non-smokers
- **Adviser smoker proportion < 10%:** non-disclosure or good mix? (oldie!)

	Disclosure
Adviser	Smoker (A)
XYZ	N #
XYZ	Y #
XYZ	Total

Benefits?
- Manage / optimise mortality
- Credit with reinsurers
- Central risk management - not just tail
- But can start with worst non-disclosure

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[2a] Non-disclosure – smoker status

Simplistic reporting **Simple** analytics

	Disclosure
Adviser	Smoker (A)
XYZ	N #
XYZ	Y #
XYZ	Total

Reporting or analytics?

	Disclosure	Social class							Calc
Adviser	Smoker (A)	C1	C2	C3	C4	C5	C6	C7	Smoker (E)
XYZ	N	#	#	#	#	#	#	#	#
XYZ	Y	#	#	#	#	#	#	#	#
XYZ	Total	#	#	#	#	#	#	#	#
All	N	#	#	#	#	#	#	#	#
All	Y	#	#	#	#	#	#	#	#
All	Total	#	#	#	#	#	#	#	#

- Last column = expected smoker proportion
- % NS by class: population -> all (insured) -> XYZ
- In practice use age as well as C1-C7

Look for low A / E

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[2b] Non-disclosure – **single** medical disclosures

- Heart instead of smoking disclosures – same technique

	Disclosure	Social class							
Adviser	Heart	C1	C2	C3	C4	C5	C6	C7	E
XYZ	N	#	#	#	#	#	#	#	#
XYZ	Y	#	#	#	#	#	#	#	#
XYZ	Total	#	#	#	#	#	#	#	#
All	N	#	#	#	#	#	#	#	#
All	Y	#	#	#	#	#	#	#	#
All	Total	#	#	#	#	#	#	#	#

- **Again:** age dropped for tabular simplicity
- Can extend to other conditions

Benefits?
- Manage non-disclosure
- Manage mortality
- Imagination overflow!

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[2b] Non-disclosure – **multiple** medical disclosures

One approach:

- A = actual UW decision
- E = % expected std (etc)
- **Look for high A / E (std)**

		Social class							
Adviser	**A**	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**E**
XYZ	Std	#	#	#	#	#	#	#	#
XYZ	Rate	#	#	#	#	#	#	#	#
XYZ	Post	#	#	#	#	#	#	#	#
XYZ	Decl	#	#	#	#	#	#	#	#
XYZ	**Total**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**
All	Std	#	#	#	#	#	#	#	#
All	Rate	#	#	#	#	#	#	#	#
All	Post	#	#	#	#	#	#	#	#
All	Decl	#	#	#	#	#	#	#	#
All	**Total**	**#**	**#**	**#**	**#**	**#**	**#**	**#**	**#**

- Disclosures should make sense relative to social class
- Age effect omitted to simplify table (model)

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[3a] Business mix: simple gender example

- Test Achats => gender mix risk (indiv)
- This analysis is trivially easy
- **Unlike [1] and [2] the agent is fully disclosing**

	Gender		
Adviser	**M**	**F**	**Total**
1	#	#	#
2	#	#	#
…	…	…	…
All	**#**	**#**	**#**

- Simple: risk analytics => risk management
- For the “worst”: why is the male % so high and what to do?

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[3b] Business mix: socio-economics

- **Mortality:** is the mix what we aimed for?

	Social class							
Adviser	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	**Total**
1	#	#	#	#	#	#	#	#
2	#	#	#	#	#	#	#	#
…	…	…	…	…	…	…	…	…
All	#	#	#	#	#	#	#	#

Benefits as before
- Mortality management
- Proactive not reactive
- There's no fraud here

- **Challenge:** getting social class measure
- **Output:** weighted average class/mortality factors
- **Action:** compare to insurer's mix assumption

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[4] Data-driven underwriting development

- e-underwriting = underwriters + IT?
- What would Google do?

Disclosure type	**Share**	**Std**	**Rated**	**Post**	**Decl**	**Tot**	**Std/Tot**
Medical	45%	#	#	#	#	#	#
Medical tests	30%	#	#	#	#	#	#
Family history	20%	#	#	#	#	#	#
Others	10%	#	#	#	#	#	#
Total	100%	#	#	#	#	#	#

Benefits
- e-underwriting
- Certainty, auditability
- Data + opinion
- Scalability
- Faster decisions
- Lower UW expenses
- Better take up rate
- Better agent experience
- Higher volumes

- Steer on best "bang for buck" => better project

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[4] Data-driven underwriting medical disclosures

Drill down:

- Top respiratory?
- Asthma c85%
- Then bronchitis
- 90 / 10

Disclosure type	Share	Std	Rated	Post	Decl	Tot	Std/Tot
Respiratory	19%	#	#	#	#	#	#
Circulatory	18%	#	#	#	#	#	#
Mental (e.g. stress)	15%	#	#	#	#	#	#
Back and/or neck	11%	#	#	#	#	#	#
Lumps (e.g. cancer)	10%	#	#	#	#	#	#
Digestive	7%	#	#	#	#	#	#
Genito-urinary	6%	#	#	#	#	#	#
Endocrine	4%	#	#	#	#	#	#
Musculo-skeletal	4%	#	#	#	#	#	#
Other	6%	#	#	#	#	#	#
All	100%	#	#	#	#	#	#

- Use your data – don't leave it to chance / experience

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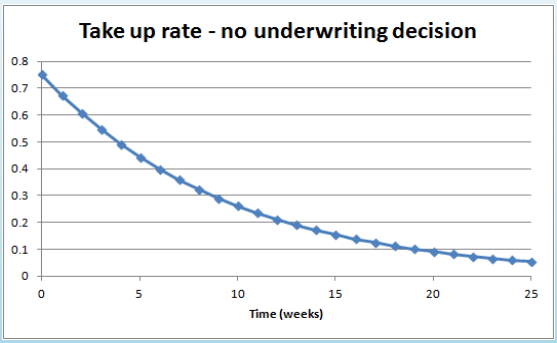
[5] From underwriting to take up

- **Take up rate => profit (esp agents)**
- Expected take up factors:
  - waiting time: underwriting
  - underwriting decision (rated etc)
  - advisory process



- PropnA => PropnB
- Expected effect of UW?
- Reduced expenses
- Volumes +1000% (++)

Stage of underwriting	Days	Expense	Take up	PropnA	PropnB
[1] Basic questions	#	£	%	%	%
[2] Follow up questions	#	£	%	%	%
[3] In house manual assessment	#	£	%	%	%
[4] Phone or FTF contact	#	£	%	%	%
[5] Medical information	#	£	%	%	%

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Insurers and uncertainty: reprise

Examples: (covered here)

1. Bad debts
2. Non-disclosure
3. Mortality, (predictive mortality), business mix
4. Underwriting development
5. Take up rate: underwriting decision and its speed

Where is everyone?

- Leading insurers
- Started c2002
- How about you?

Examples: (not covered here)

- **Strategic challenges for c200 mutuals and friendly societies**
- **Mis-buying:** Park Row closure costs Royal Liver £16m http://bit.ly/1GAo4kA
- **Reinsurers:** see Appendix

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Summary: parody, tragedy and opportunity

- **Parody:** risk management as just loss reduction and compliance
- But understanding and acting on probability / analytics adds hard value
- Risk assessment (and ERM says Lam) should deal with:
  a) Loss reduction
  b) Uncertainty re central (mean) values
  c) Performance improvement
- Much of the above is "under the radar" – good news competitively!
- **Tragedy:** risk management **can be** irritating, intimidating or irrelevant
- **Opportunity:** it **should be** interesting, imaginative and add hard value

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Contact – and further resources

- **Quite simply:** I build and improve things, making them simpler and faster.
- **Background:** An actuary with almost 25 years' experience in product and proposition development, pricing, analytics and risk management.

e: andrew@4arm.co.uk
w: www.4arm.co.uk/healthcare2015 : for enhanced materials, demos (TBC)

4ARM offers:

- **Applied analytics:** especially (but not only) in an insurance environment
- **Risk management:** building, improving, repairing, debugging, embedding
- **Software:** supporting efficient and effective decision making

Take a test drive

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Value for money Appendices – omitted material

1. **Beyond insurers:** Do reinsurers have the life of Riley?
2. **Must do better:** Seeks better explanations and better balance
3. **Beyond protection – the benefits:** Competing "below the radar"
4. **4A risk management framework:** A minimalist framework
5. **A better risk process:** Before and after *
6. **Some risk tools:** How to get more value from the "risk suite"
7. **Risk management maturity:** Professor Panjer
8. **Bridging the gap:** Capital, grown up assessment, applied analytics
9. **Reducing variation:** Why are things more variable than we expect?

* Promised in the pre-conference material, not mentioned in presentation – sorry!

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Appendix 1: Reinsurers and uncertainty – the life of Riley?

- An End to the Life of Riley for Reinsurers? http://bit.ly/1b7lc0m

Small prize

Who can:

1) Name the reinsurance CEO
2) Give the best reason

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Appendix 1: Reinsurers and uncertainty: 3 examples

- **Solutions are beyond pure analytics**

1. **Big Re:** c2003. 25% discount shock. Cost £20m+. Operational risk.
2. **Various Re:** Australia – cost "hundreds of millions"
   - Conflicting targets?
   - Agency effects?
3. **All Re: The winner's curse**
   - Management via (a) pricing strategy, (b) non-pricing strategy, (c) hope for the best
   - A lot of work by actuaries and others e.g. http://bit.ly/1dFQAoo and reinsurers?

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Appendix 2: better explanation required

" ... increasing the organization's short- and long-term value to its stakeholders "

US Casualty Actuarial Society

"Notably scarce, for example, are papers that describe and critique alternative strategies for managing firm-wide risk ***or that define what is meant by 'adding value'*** *and* ***propose ways*** *that this could be* ***implemented and measured*** *in practice* ***or even in principle.***"

Bill Panning: US Risk Management expert – "Managing the Invisible"

- Soft value ("helps me sleep at night") and hard value ("+2% to RAROC")
- Risk value gap => opportunity for (some) companies and (some) actuaries

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Appendix 2: better balance required

Actions
What should Companies do?

- As little as possible at the extremes of the distribution as is necessary to get internal model approval.
- Not believe the results from the extremes of the distribution.
- Concentrate on design, parameterisation and use between the [5th] to [95th] percentile, where:
  - Data is more complete
  - History may be a guide
  - Expertise is more relevant
- It is in the central part of the distribution that models can provide valuable insights and, used correctly, add material commercial value.

Beyond protection…

… of the balance sheet

1. Tail
2. Central uncertainty
3. Improvement

The great 99.5th-percentile swindle - GIRO 2011 – http://bit.ly/1FrBYDS

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Appendix 3: beyond protection – the benefits

Commercial and competitive:

- Obvious(?) value to be had
- Happens "below the radar" – unlike e.g. product development
- Good news for (some) companies and (some) actuaries

Risk-focussed:

- Expertise and embedding – less brainstorming of risks
- Happy regulators, reinsurers and bosses*

* You may need to explain **carefully** to help some bosses "get it" (seriously)

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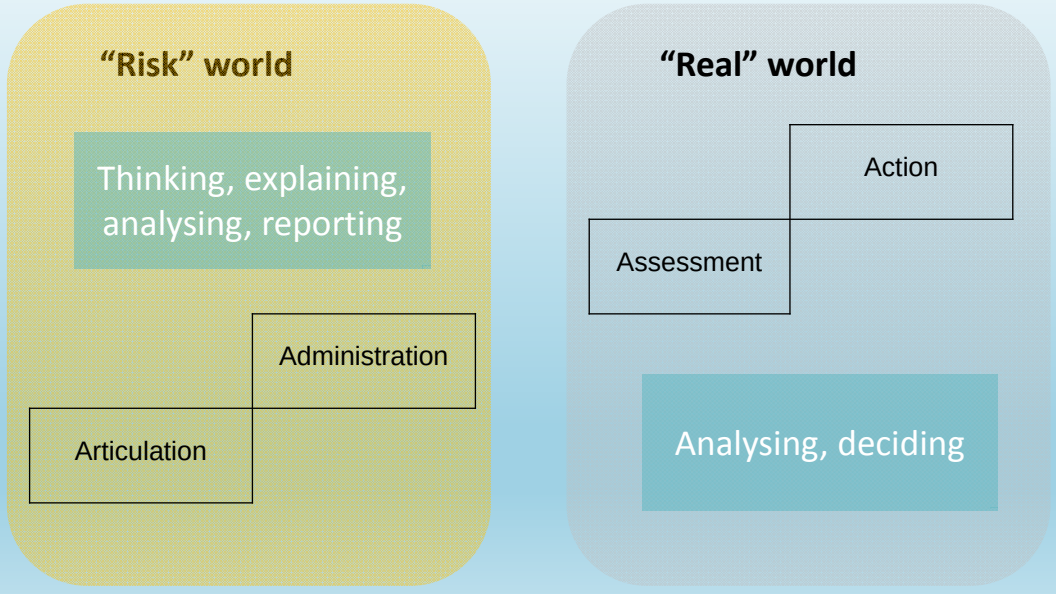
Appendix 4: 4A risk management framework



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Appendix 4: 4A risk management framework

- "4As" risk management => front of mind – your board can explain
- "4As" risk management => natural embedding in business from day one

1. **Articulation:** Why and how are you doing risk management?
   - For the regulator (PRA/FCA/FRC etc)
   - For internal / external audit
   - To avoid major losses in various forms
   - To maximise risk-adjusted returns for (e.g.) shareholders
2. **Admin:** the process-based part of the "risk world"
   - Better risk process – http://bit.ly/1EI8dy1
   - Better risk assessment in risk registers and beyond – http://bit.ly/1E1pmy8
   - Business benefits of an online risk register – http://bit.ly/1dAfFkK

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Appendix 4: 4A risk management framework

3. **Assessment:** the critical link
   - Get this right and you'll **probably** move to action
   - Get this right and you **are equipped** to make good decisions
4. **Action:** Guard against Dave Ingram's amusing but all-too-possible "risk management entertainment system" – http://bitly.com/10IFII3

Controversial suggestion
The financial services "risk world" is missing a trick. Its risk literature seems to ignore accumulated wisdom from the 1940s+ rather than build on it. Omissions include game theory (+ decision theory and analysis) and various versions of the Kelly Criterion – the gamblers' favourite! This is an opportunity.

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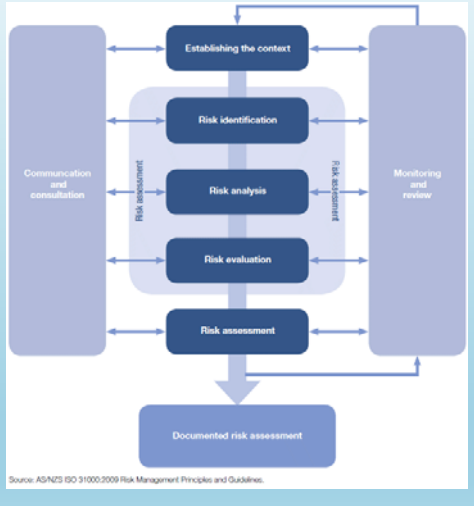
Appendix 5: Risk process – before



Source: http://bit.ly/1F1ug1G

Issues arising

- No link to the organisation's core business/purpose
- Far too many arrows (too much communication)
- Risk assessment in triplicate but …
- … no action http://bitly.com/10IFII3
- Outcome: a "documented risk assessment"
- Little possibility that all this "risk talk" will change any decision to be made
- See http://bit.ly/1FZdZMB for a better alternative

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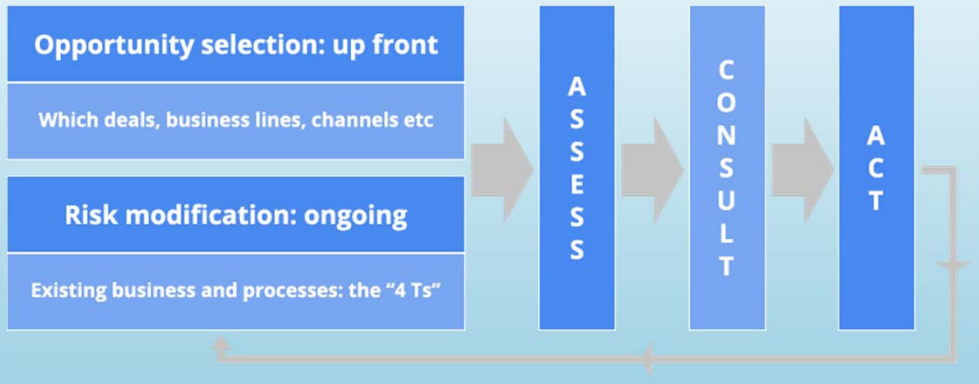
Appendix 5: Risk process – after



http://bit.ly/1EI8dy1 and http://bit.ly/1FZdZMB

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Appendix 6: Getting value from the risk suite

- Four areas we can tap for value (as well as central uncertainty etc)
- Four areas where discipline can sharpen our thinking and actions

1. **Regulators:** the discipline of external review
2. **Policies:** the discipline of having to explain
3. **Risk appetite:** the discipline of quantifying and checking
4. **Risk register:** the discipline of checking and being checked

- Further thinking coming up

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Appendix 6: Getting value from the risk suite [1]

- **Regulators:** value in keeping regulators happy:
  - **Staying open:** regulators can limit you or close you down (rightly so!)
  - **Efficiency:** governance by a few organisations not all individuals
  - **Practical:** without regulation consumers would trust
- We really should welcome the additional external challenge
- ARROW and its children should be much easier than internal challenge

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Appendix 6: Getting value from the risk suite [2]

- **Policies:** "value in articulation"
  - Primarily "explaining to self"
  - Relatively formal
  - Completely non-bureaucratic
  - Tackle hard questions "a la Buffett": why we do X / why we don't do Y
  - Open these documents up to challenge – does this reflect reality
  - Beware standard templates, instead calibrate content
  - e.g. for market risk: oil and gas >> insurance >> recruitment
  - Your risk process, measurement and management might also differ

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Appendix 6: Getting value from the risk suite [3]

- **Risk appetite:** the regulator's tool to force risk-based thinking?
  - Competence and "sticking to the knitting" versus diversification
  - Distinguish between targets and limits
  - Consider various metrics: solvency, earnings, value
  - Consider probabilities and timescales
  - Seek always to measure and validate
  - **Expected cost** of a risk appetite restriction in PV terms
  - **Expected benefit** of a risk appetite restriction – reduced variation
  - Is it worth it? How would you know?

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Appendix 6: Getting value from the risk suite [4]

- **Risk register:** a missed opportunity
  - Just enough pseudo-science: boards can understand, monkeys can use
  - Typically: assessment is badly flawed, risks are incomplete – and more
  - Outcome: users are possibly being given false assurance

- **Opportunities:**
  - Better assessment – http://bit.ly/1E1pmy8
  - Risk assessment is more than risk registers – http://bit.ly/1EI8IrV
  - Getting hands dirty: simple exploratory data analysis – see next slide
  - Sharing – a web-based approach, wisdom of crowds

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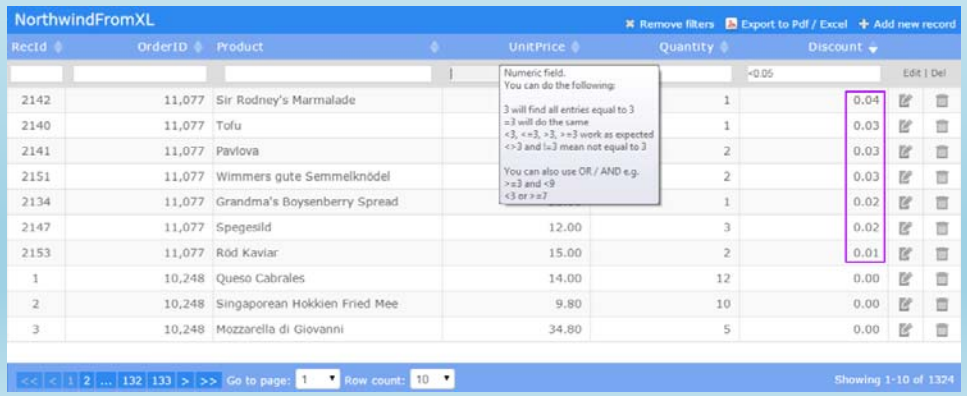
Appendix 6: Getting value from the risk suite [4]

- **Risk register-like database:** exploratory analytics
- We thought sales discounts were only 5%, 10%, 15%
- Extra discounts: (a) financial effect? (b) Do they suggest good/bad culture?



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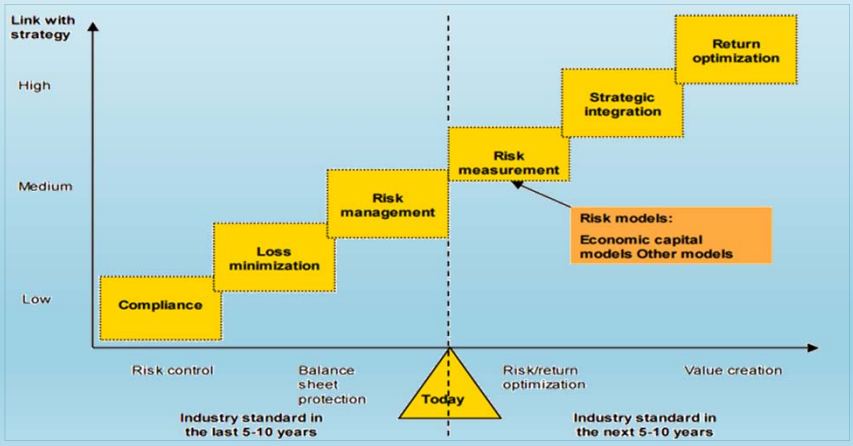
Appendix 7: Risk management maturity – Panjer

" The product of a fully realized ERM programme is the optimisation of enterprise risk adjusted return" *Professor Harry Panjer* http://bit.ly/1IqIc86



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Appendix 8: Bridging the gap

- Main presentation suggested three approaches:

1. **Capital** – a natural and traditional link
2. **Risk registers** – potentially great admin and analytics, "grim" assessment
3. **Real world analytics** – this assessment is already "embedded"

- This Appendix examines how we can exploit each of the three
- "The 6Ps of Risk Management" acknowledges that the work of business functions is inherently uncertain – see http://bit.ly/1GO4Nt6

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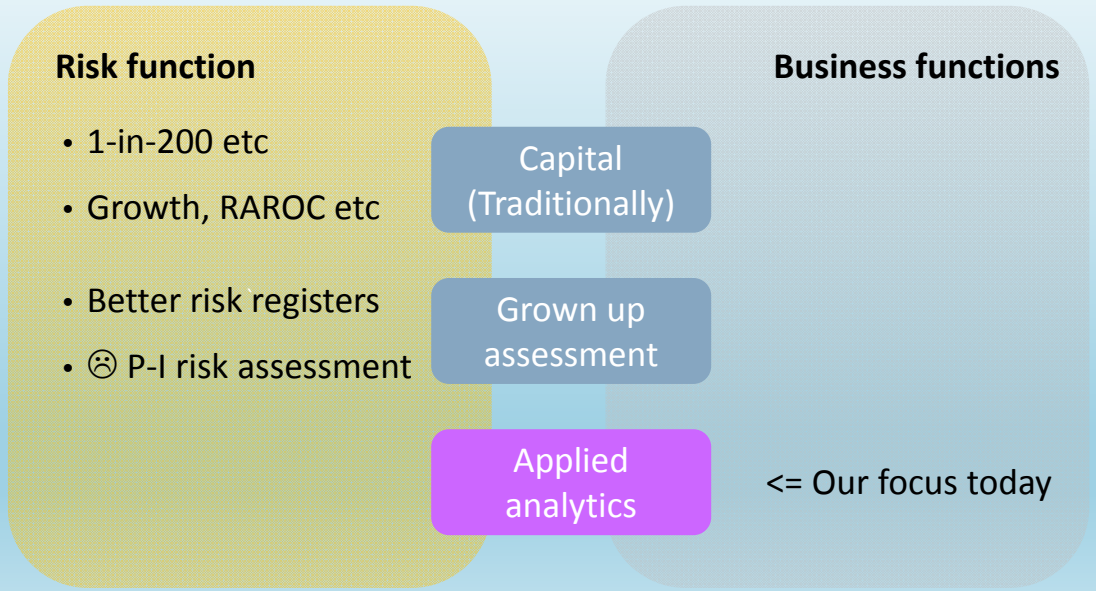
Appendix 8: Bridging the gap



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Appendix 8: Bridging the gap – capital

- Needed to protect policyholders beyond 50/50 (esp insurance & FS)
- Supposed calibration at 1-in-200 and beyond – http://bit.ly/1FrBYDS
- ? Application and comprehension outside (and within?) FS
- Performance assessment based on ROE/ROC (FS and beyond)
- Capital can be optimised for shareholders too c.f. Panning http://bit.ly/1c1xKHZ
- Therefore the link seems natural
- Capital can be used (1) for protection and (2) for growth / optimisation
- But despite RAROC (etc) we still see a lot more of (1) than (2)

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Appendix 8: Bridging the gap – risk registers

- Risk registers: a tale of the good, the bad and the ugly
- **Good:** even at the spreadsheet level potentially superb admin / tracking
- **Good:** like time / project management can be tailored – no one sizes fits
- **Good:** technology exists to make web-based and get shared insights
- **Good:** "hands dirty" analytics e.g. comparisons => real insight
- **Bad:** siren song of risk management – http://bit.ly/1GBrSwD
- **Bad:** too easy to focus on process, not action – http://bit.ly/1Ezh9EM
- **Ugly:** very poor risk assessment (and more) – http://bit.ly/1bLouYf
- **Ugly:** all considered there's a real danger of "false assurance by heatmap"

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Appendix 8: Bridging the gap – analytics

- Often this is often already happening – no need to reinvent the wheel!
- Risk-based thinking can bring more formal insights:
  1. **tail risk** (analytics gives a very specific and "real" way to manage e.g. fraud)
  2. **central uncertainty** (c.f. Bayesian approach to "credibility")
  3. **optimisation** and performance improvement (e.g. via factors)
- "Risk" can also benefit directly:
  - Risk assessment in registers: use analytics to move beyond probability-impact
  - Using corporate projection and valuation models is another way forward

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Appendix 9: Reducing variation

- Risk management often focuses on the tail
- But less serious variation around "central values" is also important
- We often seem "surprised" by the amount of variation we see
- e.g. the normal / lognormal stockmarket model understates tail risk
- Binomial models we (perhaps implicitly) use may also break down
- Random mortality fluctuations and the binomial hypothesis: http://bit.ly/1b6bN9f
- It's not just Bin(n,p) but Bin(n,p=f(a,b,c,...))
- e.g. what's the probability of it raining tomorrow? Of someone dying this year?
- Next time don't think E(p) think E(p), p=f(a,b,c,...) and Bayes!

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