Managing the Risks of Risk Management

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Figure 1. Consequence Chain for Risk Management

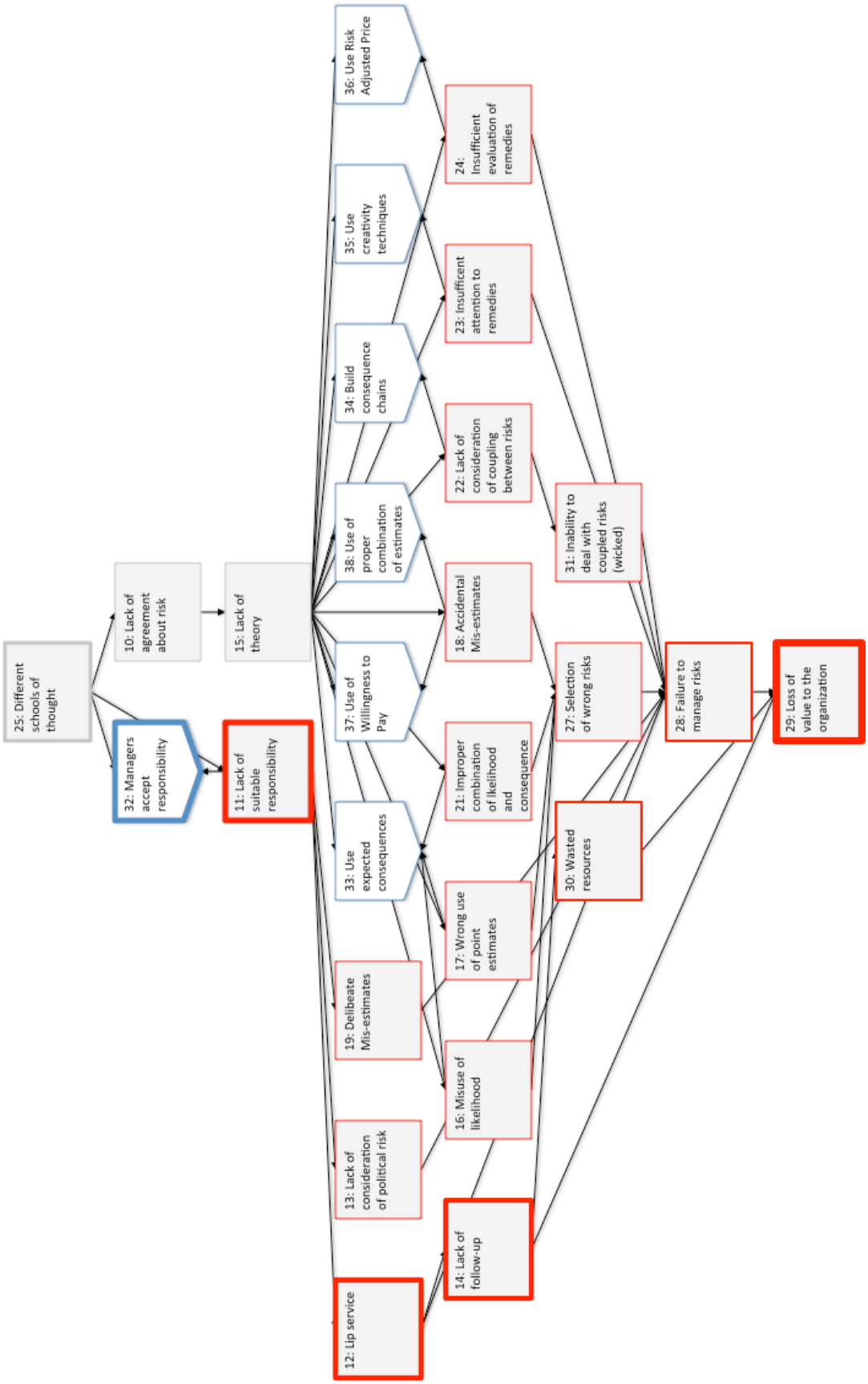
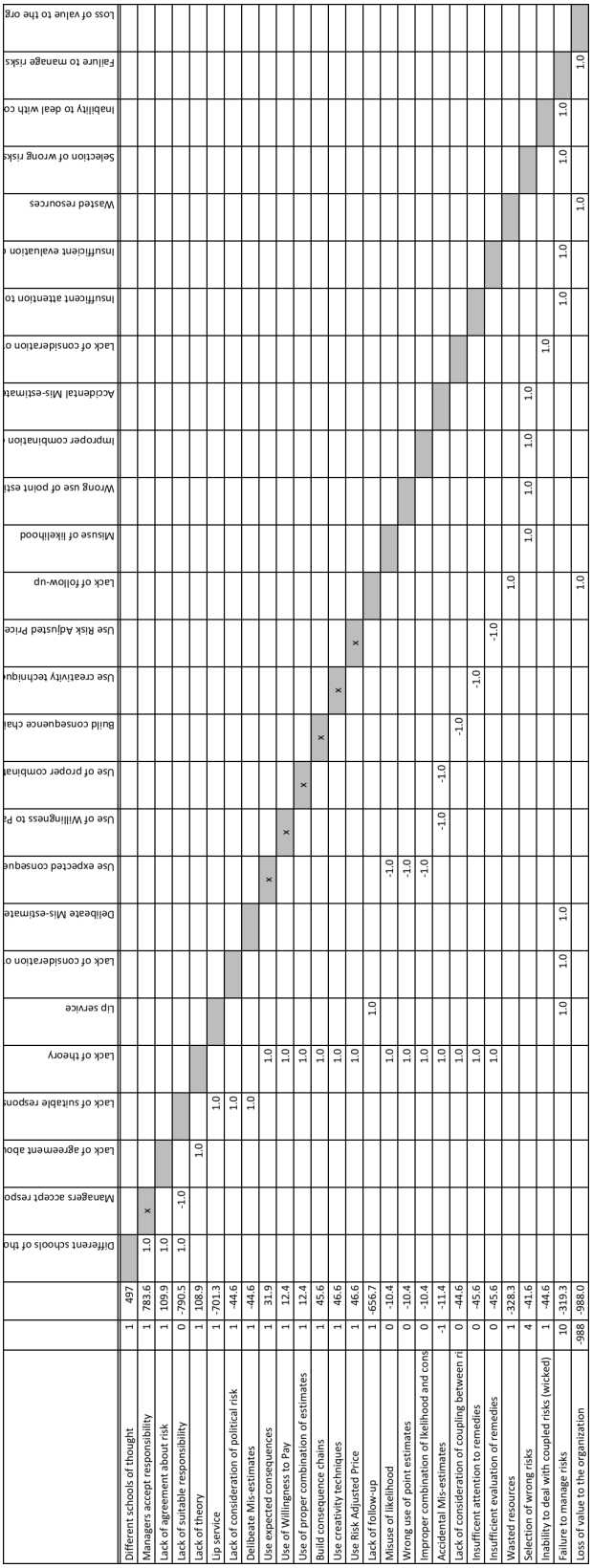


Figure 2. Consequence Chain for Risk Management (AnnL Format)



Risks of Risk Management

There are many descriptions of risk management. However, most are unaware of, or indifferent to, the risks of risk management.

Different Schools of Thought

There are three types of Risk Managers, each with their origin in mediaeval times:

- The royal whipping boy – project risk, strategic RM
- Prognosticator or reader of entrails – financial, risk and insurance
- Seller of Indulgences – GRC, enterprise RM; ethics, regulatory compliance

Each school has its own view of risk. They insist that their view is the One True Way (although there is a coming together of some adherents, forming a United Church). To some, risk is all about detailed analysis of possible death or disaster. To others, it is about threats to project success or opportunities for new markets. Yet others speak of hazard and failure analysis in detailed operations, compared with those who speak of strategic or enterprise risk.

These different schools regard risk differently, in definition, techniques, and applications. Their schisms lead to diffuse development of theory and practice.

Lack of Agreement about What is Risk

An uncertain definition

One of the major risks of risk management is its name. Or rather, what people think what the name means. The Standard defines 'risk' to be "the effect of uncertainty upon objectives", where "An effect is a deviation from the expected – positive or negative".

In my view, this definition is nonsense. How can an abstract noun have an effect on anything? How does vagueness or lack of knowledge lead to deviations from the expected?

The previous definition given in AS/NZS 4360 of risk is the "chance of something happening that will have an impact on objectives". "Something" might be unspecified but at least it indicates a concrete noun or behaviour.

What is uncertain is the extent of the effect – the deviation between expected and the target performance. The uncertainty does not lead to the deviation; it is a measure of what we know about the extent of the deviation and of the causes of the deviation.

The other uncertain aspect of the current definition is the meaning of 'objective'. This term is not formally defined, only mentioned in a note to the definition of Risk, but it seems that "objectives can have different aspects" that include financial, safety, or environmental goals. (hence confusing the usual separation between objectives and goals). It seems that objectives are the same as what others would call requirements, constraints, or even values.

Risk and Control

Actually, I think risk is the deviation between expected future performance and target performance. The deviation can be negative, representing a shortfall (in safety or finances, perhaps) in desired performance. The deviation can be positive, where future performance exceeds the target, resulting in an opportunity. The target can be better than now, so that even a deviation from it can still be an improvement.

This definition treats risk as part of control, where control is ensuring that the performance of a system stays within set limits. Unfortunately, many people – and the Standard - use 'control' to mean a "measure that is modifying risk" or a risk treatment. This definition is in conflict with the discussion of risk management as the basis for governance, which is the direction and control of the managers of an organization.

The concept of 'positive' risk is contentious. There is argument that risk always involves loss and it is different from opportunity, which involves gain.

Lack of Theory

At the moment we have standards for Risk Management but not much theory. Perhaps we have enough theory but it is scattered over the different schools of Risk Management, with different terms and concepts, so the commonality of the theory and the consistency of its application is missing.

Although there are many books and articles about how to carry out Risk Management, there is little about why we should use this process – apart from the obvious hope that it helps.

There is little concrete evidence so far that Risk Management makes a difference. That could be because it is hard to see such evidence if it exists. If it works then we have no risk but would we have had any risk anyway? Is it Risk Management specifically that helps us to avoid or reduce risk or just good management in general?

Risk Management does make use of some analytical techniques that have their own (extensive) theoretical treatment. ISO 31010 contains an extensive list of techniques, some developed by experience in finance or systems engineering and some are built upon decision analysis theory. However, these techniques are only about analysis. There is no use of theory underlying the development or use of techniques for generating remedies – mainly because there is no mention of techniques for generating remedies. The Standard mentions one technique for evaluating treatments but it is cost-benefit analysis, which is out-of-date.

There is little use made of cybernetics or of systems theory. These disciplines can or should be of use in developing principles, of the sort given in the Standard, and for establishing Risk management processes.

The process itself is not well supported by theory outside the use of financial or insurance instruments. Theory points to what works in which circumstances; it helps to show if the process is complete and coherent.

Lack of Suitable Responsibility

What we should have is the Wise Ruler, aided by the Mentor. The Mentor helps to counsel and to suggest ideas tried in far off lands, new elixirs beyond the experience of the rule, and acts as diviner of signals beyond the ken of the ruler. The Mentor advises; the ruler acts.

Really, Risk Management should not exist. It only exists because managers do not know to do their job. They cannot plan properly; they cannot solve their problems. So, a discipline has been invented to provide someone to blame when results are late, too costly, or of poor quality. The professional scapegoats are called Risk Managers.

Every manager – every person, really - is responsible for risk. It is a mistake to label someone as a Risk Manager. That just gives other managers the chance to delegate problems to this poor unfortunate whipping boy.

Control is the responsibility of every manager. It is regarded as either essential responsibilities of management (Fayol) or the essence of management (Stafford Beer).

Directors or Managers are part of a governing body, controlling other managers. Managers control resources. Risk is part of control: Risk is part of management.

A risk with a likelihood of 1 (or we are at the Then time and there is a deviation that is worth attention) means we have a problem. Problem-solving is one of the major tasks of management, according to many well-listened-to advisers such as Henry Mintzberg or Peter Drucker. It is not the responsibility of just some managers.

Lip Service

Although Risk Management is becoming more widely adopted, in too many cases it is undertaken because ‘the book says so’. The identification of the events is cursory; the Risk Register is completed but not used to direct any effective change.

One of the drivers for this risk in the use of Risk Management is the lack of responsibility and involvement of senior managers. If they do not care – or show that they care – about risk management then no-one else will care. Those with some responsibility, such as Project Managers, do the job that they are asked to do. That is, if they are asked to prepare a Risk

Register, because it is part of an organizations procedures or because that is what they have been trained to do, then they will prepare a Risk Register – and that is all they will do.

Lack of Consideration of Political Risk

Traditionally, managers have had to deal with risks within the 'iron triangle' of time (date), cost (dollars), and quality (demand). These days, they face an 'iron square', as compliance with legislation and internal policies have become more and more important.

As well, managers do not act alone. They depend upon the success of other managers in providing services or resources that they need. In turn, they contribute to the success of other projects that form the programme of projects, leading to portfolio risk.

This linkage between projects can be complicated by politics. The priorities for the projects, within a programme or portfolio, determine the resources allocated to the projects; and these priorities are often influenced by politics.

An additional complication comes from the presence of "internally generated risk". These risks arise from inadequate skills within the project team, unsuitable organizational relationships, and lack of guidance from the rest of the enterprise. Such risks are evident in several reports about poor governance, including the abrogation of their responsibilities by steering committees. Often project managers are blamed for failures arising from this type of risk - even though it is beyond the control of the manager.

These risks can be driven by organizational culture, managerial behaviour and a lack of attention. Such risks entangle the other risks; politics or managerial power-plays can lead to limited resources or over-tight deadlines tightening the iron square.

Lack of Follow-up

Risks never die; they just change. The extent of a risk might reduce, as pressures change or as remedies have their effect, but they do not go to zero. If they have serious consequences then the risk must be monitored to see if they could reach sufficient levels of exposure to warrant action again. Unfortunately, there is often the expectation that once a risk has been treated then we can go on to other things.

Rarely will a risk mitigation or treatment action remove risk completely. There should always be a cycle of continuous improvement in designing better processes or practices as part of risk management, requiring managers to constantly check for risks and to remedy them.

The remedies can introduce their own risks of implementation. If they involve changing work practices, for example, then there could be new risks arising from the fear of change. The remedies could involve the re-design of systems, which might not be able to be realized by the available staff. It is important to check that the risk of a remedy is less than the risk continuing.

Similarly, too often there is little follow-up of the remedies, to see if they actually have reduced the risks as expected – or hoped. The Standard recommends monitoring be carried out, not only of the Risk Management process but, more importantly, the 'benefits realization' of the remedies.

Misuse of Likelihood

According to several common discussions of risk, it is measured in terms of likelihood and impact. So, it is important that the concept of likelihood is clearly understood. Unfortunately, it is often not. The prevalent misunderstanding of likelihood can lead to inappropriate managerial action.

Uncertainty about uncertainty

There are at least four types of what could be called uncertainty. These are:

- imprecision - where the estimates of performance are not known precisely, but within an accurate range of levels;
- unreliability - where performance estimate varies over different judges or by the same judge over different times;

- variability - where the performance of the system changes over time; for example, because of wear and tear - sometimes to the point of failure;
- alterations - where performance changes because of things going wrong, through the impact of external forces, with uncertainty in both the likelihood of a driving event and in the level of its consequence.

The first two types come from the measurement; the second two come from what is being measured. It is uncertain which type of uncertainty that is meant when defining risks. Presumably, it is one or both of the latter two types.

Two many likelihoods

Actually, there are two forms of likelihood in risk. One involves the uncertainty of an event happening. The other is the uncertainty of the consequence of the event if it happens.

A risk 'event' is a set of circumstances or conditions, including stakeholder concerns, that trigger or influence a consequence of interest. As this event might or might not happen, depending upon other circumstances influencing it, so there is a likelihood (or uncertainty) that this event will actually happen. As the effect of predecessor conditions can be uncertain, so the extent of their consequences can be uncertain.

The second use of likelihood is 'expected consequence'. That is, it is an estimate of the probability that various levels of consequence will occur given a specified event has occurred. We are uncertain about the exact extent of impact, so we use an estimated range of effects.

Expected consequence is familiar to financial analysts or statisticians, as the mean value. A mean is the point estimate of a set of outcomes multiplied by the probability of each outcome.

Risk Managers tend to use only one view of likelihood and they confuse the different types of likelihood. When they calculate the extent of risk or the 'level of risk from likelihood x consequence then they are assuming that there is only a single estimate for the consequence rather than a possible range of extent of consequence.

There are some advisers to risk managers, such as Broadleaf, who do get it right: risk is characterised by considering the likelihood of consequences, not the likelihood of events.

Wrong Use of Point Estimates

More astute risk analysts know that point estimates of likelihood or the extent of impact are over-precise (and even inaccurate, see later). They use three point estimates (low, likely, high) to represent the uncertainty in their judgement of these parameters. Then they use a formula to combine these estimates into a single figure that is used is subsequent calculations. Unfortunately, they use the wrong formula.

Traditionally, the composite formula has been (Low+4 x Likely + High)/6. The formula has been derived from the properties of a normal or Gaussian distribution.

Regarding likelihood or consequence as a fixed estimate rather than a band of estimates does not matter much, as long as the distribution of possible values is symmetrical around a point on the scale. As well, if the range of likelihood is within a single scale point used in the qualitative approach then its spread has no effect upon estimating risk exposure. We need to be aware of the assumptions underlying the estimates so we are careful in the consideration of the results: better still, we need a technique for dealing with risk that avoids making these assumptions.

Where we run into difficulties is when the estimates are not uniform and, especially, if the underlying distribution of actual performance is not normally distributed. Taleb's popular book about "Black Swans" has brought attention to the situation where the underlying distribution of the frequency of event is a power function not a normal function. That is, there are a very few extreme events and very many small impact events. In this situation, using estimates based upon a normal distribution (as in the three point estimate above) can lead to misleading results.

Another difficulty in estimating likelihood of events occurs when we are dealing with a chain of events or several events influencing the one consequence. In these situations, the estimate should not be based upon a simple multiplication of conditional probabilities. It should be

the result of Bayesian analysis. This nicety is rarely acknowledged (although it is mentioned in ISO 30010).

Accidental Mis- Estimation

The studies of human judgement have found that there are many sources of error or bias in judging the likelihood or extent of the consequence of events. People are overconfident in their ability to judge; tend to favour positive, concrete events as being more likely; ignore negative evidence; and are biased towards avoiding loss rather than gaining reward – to list just a few of the "heuristics and biases" identified by Kahneman and Tversky, Hogarth, Bannerman, Gigerenzer, and many other researchers into human judgement. Trained judges, those who have calibrated their judgements against known events, are fairly good in their estimates. Untrained judges – the majority of managers and other professionals – are very poor indeed.

In essence, the current practice of using likelihood x consequence involves incorrectly multiplying a poor guess by another biased guess. Ay resemblance to reality is purely co-incidental.

Deliberate Mis-Estimation

There are many reports of optimism bias and downright dishonesty in claims made in business cases for projects. These claims are not, usually, fraudulent in that the advocate receives a personal benefit. It is usually wishful thinking that a proposal will work to the extent expected.

The UK Government, based upon the research by Bent Flyvbjerg now of Oxford University, has had to take particular action to counter optimism bias in proposals for new developments. The judgements of the consequence of actions – the benefits of projects – have to be compared with actual figures from similar previous projects.

Deception also occurs. There are many cases where the parameters of a project (cost, benefit, time) are fudged so that it passes the business case or other gate reviews. Sometimes these estimates are genuine mistakes, especially when overlooking the effect of rework upon the timing of projects, but often they are the result of ploys to get approval.

People play games to find out what is really going on when evaluating or negotiating tenders. Because of opaqueness built up through procurement guidelines or the need to have 'competitive pressure', tenders/ contractors have to undertake lobby action or present strawmen in order to find out what evaluators/ negotiators are really thinking. Often, the evaluators have to play games to get around political interference or the games that the tenderers are playing. All of these games are attempts to reduce the uncertainty about what is really wanted or what is really in the mind of the opposite side – or even competitors.

Improper Combination of Likelihood and Consequence

There are four 'usual' ways of combining point estimates of likelihood and point estimates of consequence into an estimate of risk extent or exposure. All of them have risk of providing misleading results.

The first way, we have already seen. It is the formation of a Risk Exposure Matrix, as shown in Figure 3. This translation between likelihood and consequence and managerial attention depends upon the choice of the underlying scales.

Figure 3. Risk Exposure Matrix using Absolute Numbers

			Rare	Unlikely	Likely	Certain
			1	2	3	4
			0.0001	0.001	0.01	0.1
Critical	4	100000000	10000	100000	1000000	10000000
Severe	3	10000000	1000	10000	100000	1000000
Moderate	2	1000000	100	1000	10000	100000
Low	1	100000	10	100	1000	10000

Often the words used to express the scale levels show that they are distributed exponentially. It is a mistake to treat these scales as if they are equally appearing intervals and multiplying them to determine the risk exposure result, as shown in Figure 4. The results can be unbalanced: unlikely x moderate (2 x 2 in the scale but $1,000 in effect) has the same scale result as certain x low (4 x 1 but $10,000 in actual effect) or rare x critical (1 x 4 or $10,000). In the translation into 'extent of required managerial action' (shown in the colours) then these three combinations lie in different bands when using absolute numbers but the same band when using scales, depending upon where the cut-offs lie.

Figure 4. Risk Exposure Matrix using Ratings

			Rare	Unlikely	Likely	Certain
			1	2	3	4
			0.0001	0.001	0.01	0.1
Critical	4	100000000	4	8	12	16
Severe	3	10000000	3	6	9	12
Moderate	2	1000000	2	4	6	8
Low	1	100000	1	2	3	4

What should be done is to add the log likelihood with the log consequence and then use the anti-log of the addition to determine the risk exposure result. Of course, these calculations are not actually made but the look up table should reflect these effects.

The second way is the most common when using the so-called quantitative approach. All you do is multiply likelihood by consequence on an interval scale, such as 0-10, yielding a result between 0-100. Alternatively, you multiply the likelihood (0-1) by the dollar value of the consequence, to give a dollar amount (as in Figure 3). In both cases, you compare the result against a limit established by the risk criteria process, reflecting the risk culture/ attitude of the enterprise. This result is influenced by the errors underlying the estimates and the assumptions of the distribution of the estimates.

Some practitioners determine likelihood and impact both on a 0 – 1 scale and then they combine the scales by using the formula: likelihood + impact – likelihood x impact (which is a conditional probability approach). In this case, they are treating likelihood as if it represents the chance that an event will happen and the chance that the consequence is at the given level. Again, it comes back to the difficulties of using point estimates to represent what is a range of estimates. If the true underlying distributions are not symmetrical or not normal then the combination can be misleading.

Lack of Consideration of Coupling between Risks

Risks do not occur alone. They come entwined with other risks; with several circumstances leading to several consequences, which trigger further consequences.

There are some activities that involve a simple balance between cost, time, and quality; using the traditional, static risk management to handle the linear relationships. Other activities consist of interdependent problems, which need to be managed through systems thinking.

Messy risks or problems (risks that have occurred) involve technical complexity. There are considerable links between the components of a system at risk, between the drivers of the risk, and between the consequences of the risks. The remedies for such risks involve reducing the complexity by sub-dividing the complicated problems into simpler ones; decoupling through cedes such as standards, buffers, or slack resources.

'Wicked problems' involve social complexity and technical complexity. In particular, they involve non-linear feedback loops. Because of this extensive entwining of influences, they do not have a single given solution. Interventions in one aspect can lead to more problems elsewhere, which is a situation familiar to many project managers. Solutions to this type of

problem – remedies to this type of risk – also involve interceding in the feedback loops, particularly the positive ones.

It is a pity that these interactions between components, drivers, and consequences are neglected in the identification of risks.

Flat registers

Usually, risks are listed individually, line by turgid line, in Risk Registers. These Registers are mostly 'weary, stale, flat, and unprofitable', completed as part of the lip service described earlier.

Often the risks are a mix of levels of detail. High-level risks directly concerning business impacts are mixed with low-level risks about the availability of infrastructure.

More importantly, the Registers tend to be flat lists of risks, with no organization except, perhaps, a categorization by type – operational, reputational, project. These lists miss the interactions between pressures driving risk, between the events linked to impacts, and between the impacts.

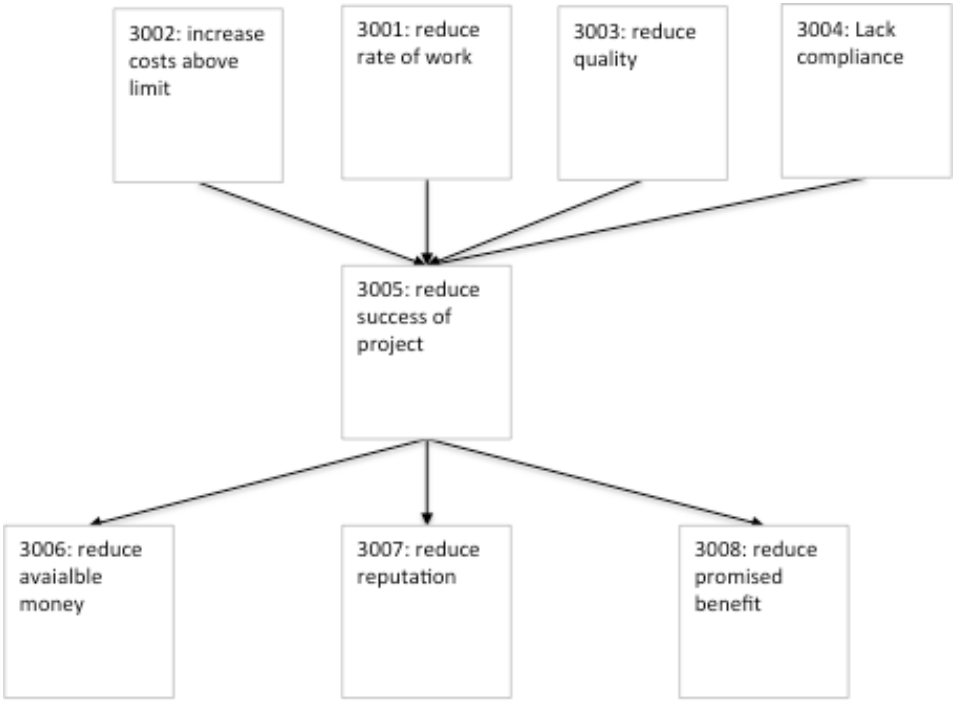
Bow-Ties

Managers need to be able to deal with a wide range of risks that can interact with each other. That is, they need to be able to deal with risk events with more than one driver, such as several hazards, or threats, or pressures. A risk event usually has more than one consequence, be it technical or behavioural.

Techniques, such as bow-ties, as shown in ISO 31010 or AS Handbook 89: 2012, have been developed to show these multiple cause and effect. In a bow-tie, fail-safes – or 'preventative controls' - are needed for most, if not all, of the drivers and there must be safe-fails – or 'reactive controls' or interceding actions - for each consequence of concern.

In the example shown in Figure 5, the drivers are at the top and the consequences are at the bottom (the picture fits on the page more easily that way). The drivers are internal conditions, supposedly under the control of the managers, so they should be able to do something about reducing the extent to which they influence or have an effect upon the event of *reduce success of the project*. They also should be able to do something to reduce the effect of this event or trend, such as use *contingency funds* to *reduce available money*.

Figure 5. Example of a bow-tie for a hypothetical project



Bow-ties are better than flat registers but they often are still too limited in their guidance for managerial action. A bow-tie is often not enough to represent the full richness of the coupling between drivers, events, and consequences. A shortfall in the performance of resources has a consequence that becomes a driver for a risk event that has a consequence that leads to further risks. That is, in complicated conditions the managers are faced with a chain of bow-ties.

Similarly, there are dependencies between remedies. A low-level remedy might not have much effect in itself but it could enable other remedies, so acquiring their priority.

Insufficient Attention to Remedies

The whole point of risk management is to do something about risk. It is not enough to analyze ad identify risks. What is important is to know how to remedy risk.

Traditionally, in the many descriptions of risk treatments, there are four alternative ways of reducing risk. Unfortunately, these descriptions are usually only a page or so – in total, not each.

The four types are:

- Accept or retain the risk – the 'null option' of doing nothing, no further treatment. In this case, the expected consequence of the risk is deemed to be acceptable.
- Transfer – get someone else to manage the risk, for a price, through outsourcing or insurance.
- Avoid – another form of 'null option', in this case, do not start the activity that leads to risk.
- Mitigate or treat risks by either reducing their likelihood of an event ('fail-safe' or 'preventative' remedies) or reducing the consequence of an event ('safe-fail' or 'reactive' remedies).

The Standard now does add other types of remedies: "taking or increasing the risk in order to pursue an opportunity "(p19) and removing the risk source.

Remedies are the reason for risk management. However, one of the problems with Risk Management is that it spends a considerable time with analysis and not much with treatment or remedy. In most books and Standards, less than 15% of the time is spent in discussing risk treatment and most of these pages are about the choice of treatment. What is missing is the description of from where the remedies come.

Of course, there are counterfactuals to this claim. There are disciplines, such as Chemical Engineering and Safety Science, where the design of mitigations/ treatments is explicitly described. For example, the paper by Le Coze and Dupre shows the use of barriers to prevent the consequence of releasing toxic gases if various sequential failures occur in a chemical production process. Nancy Leveson, in her STAMP model, shows how accidents are the results of inappropriate couples between people, processes, and products that lead to exceeding "safety constraints": risk is a loss of control; hazards arise from flaws in the various components of a control system. Remedies are improvements in the control system (noting that others in the risk game speak as 'controls' being remedies).

If Risk Management is accepted as being problem-solving then there is a large amount of material under "Creativity" in the olden days and "Design Thinking" these days, describing methods for generating ideas for better products or processes.

Little Consideration of Choice of Remedies

As well, most guides give little description of how to chose between remedies. The Standard does provide a useful list of decision-making 'issues' (actually, they are criteria for evaluating options) but it gives only a brief mention of cost-benefit analysis as a basis for determining whether, or which, remedies should be used. Yet there are tens of thousands of descriptions of decision-making techniques in the problem-solving literature, and cost-benefit analysis is just one – and not necessarily the best one – of these techniques.

In practice, the consideration of remedies is even more fleeting. Although many remedies are indeed obvious, in my experience they are listed in Risk Registers with little consideration of

whether they are the best for the circumstances. At times, there is little consideration if the cure is worse than the disease.

Remedies for the Risks of Risk Management

So, now that we know some of the risks of Risk Management, what can we do about them? What are their remedies? How can we intercede in the Consequence Chain given in Figure 1.

Have Managers Accept their Responsibility

There is a remedy that intercedes high in the Consequence Chain in Figure 1 to reduce the consequences of politics and deliberate mis-estimation. The remedy is increasing the acceptance of all managers that risk management is their responsibility.

There are various recommendations in the Standard and other guidelines that organizations should establish a risk management policy that ensures that senior managers are responsible for managing risks. Risk management is part of corporate governance, helping to ensure that the enterprise adds and preserves values. So, the responsibility for risk management should not be assigned to a specialist "Risk Manager" or "Senior Risk Officer". The corporate policy must make it clear that every manager is a risk manager.

Risk specialists can be used, as are Chief Information Officers or Chief Financial Officers, but their role should be the same as Project Management Offices: to collate information that managers need in their risk analysis; to gather and pass on knowledge about managerial problem-solving techniques, through policies and training; and to monitor the effectiveness of risk management, working with the other monitors of performance, such as auditors.

All managers – general or project – must realize that they are responsible for risk management in their area of accountability. They must be given the knowledge that they need to carry out these responsibilities.

These managers must be reassured that they can meet these responsibilities as they (should) already know how to manage risk because they know how to solve problems. The tools and training provided to managers for problem-structuring, creativity, and decision analysis are what they need for risk management. Risk Management should not use techniques that are unique to the analysis and treatment of risks; it should use standard managerial techniques.

Use Better Design Techniques

The consequences of lack of theory can be remedied through the use of some existing techniques: expected consequence, consequence chains, and created cedes.

Expected consequences

There is no need to combine estimates of likelihood and impact into some metric that indicates the priority for attention that should be paid to risks. All that is needed is some estimate of the expected consequences. The extent of the consequence can be shown as a range, representing the uncertainty of the extent to which the consequence will occur in the anticipated circumstances.

That is, the extent of a risk can be measured in terms of the expected range of concern of stakeholders, sometimes reflected as how much they are willing to pay to remove the consequences. This scale of Willingness to Pay is a ratio measure. It reflects the utility value to key stakeholders of reducing the consequences of risks. It avoids the underlying assumptions of the normality of distribution of estimates of likelihood because it does not involve the estimate of likelihood, just the extent of the impact of prior circumstances or conditions.

Calculating expected consequences remedies the risks of too many likelihoods and the improper combination of likelihood x consequence.

Use Willingness to pay

"Willingness to pay" is most useful metric for the expected extent of consequences. This metric can be determined by asking key stakeholders (determining who they are is another

story) how much they are willing to pay to avoid the negative consequences triggered by circumstances or conditions. Another way of looking at it is to ask how much they are willing to pay to reduce their concerns. This metric can be used to show the priority for reducing the risks or to evaluate the worth of implementing remedies.

Use proper combination of estimates

There are better ways of determining the underlying estimate based upon the three points (Low, Likely, High). These ways, using statistical modelling, have found other combinations better approximate the expected single value when the underlying distribution of performance is normal. The formula that is preferred these days is 0.63 x Likely + .185 (Low + High) but, in this case, Likely = the estimated median value, Low = the .05 percentile (ie really low), and High = .95% percentile (really high).

If they are really astute, managers do not use a formula, rather they use Monte Carlo modelling to see the overall effect of the range of estimates. This technique shows the overall distribution of probable performance from the combination of estimates for individual elements in the analysis but it requires special software and it is not transparent to many managers, who distrust 'black box' results (leading to another risk of Risk Management – deriving a solution that no one wants to use).

Consequence Chains

The remedy to the risk in identifying complex or wicked risks is the use of Consequence Chains. They are a series of bow-ties, showing how several circumstances lead to several expected consequences, which each could lead to several further consequences ...

External circumstances (those beyond the control of managers in the system of interest) trigger or influence consequences, shown perhaps as concerns. These consequences influence other consequences; suppressing some through negative feedback and amplifying others through positive feedback.

Risk drivers – predecessor circumstances or conditions – can work conjunctively (A and B) or disjunctively (A or B) to influence the expected consequences. They can influence, to differing extent, different consequences at the same time.

Figure 1 gives an example of a Consequence Chart, with Figure 2 showing a more compact format that is produced by the AnnL software.

The extent of the influence between the links in the chain determines the expected extent of the later consequences. These links are not saying that the later consequences are more likely; they are saying that the later consequences have a relatively higher expected extent.

Consequence Chains overcome the risks of flat Risk Registers. If circumstances include concerns – as they should – then the use of chains can help identify political risks.

Cedes for remedies

Remedies are resources that have the quality or attributes that enable them to intercede in the Consequence Chain. These 'cedes' can be buffers (physical barriers, standard procedures, spares) or re-designs. The use of cedes helps to remedy the risk of lack of consideration of remedies involving mitigation.

Figure 1 also shows cedes (in boxes with pointy bottoms). They are shown as well in the alternative AnnL format in Figure 2. These cedes act to break the links to all of the end consequences.

Cedes help to determine design decisions, to structure the problems. They lead to ideas about how to remedy the risks – to lessen the subsequent consequences.

Cedes are values, describing the required resource that reduces the negative consequence or enhances the positive consequence. It is still necessary to work out how to provide this resource. There are always alternative ways of remedying the risks.

These alternatives can be methods that have worked before, discovered through research or based upon experience. In some cases, they have to be created, using the well-established creativity techniques for designing innovative products or processes.

The Creativity literature can be repetitive, with most textbooks repeating the same set of methods. As well, a considerable number of these methods involve random processes, such as looking for associations between words to trigger ideas and so cannot guarantee ideas on demand. However, there are techniques – based upon principles (as in TRIZ) or morphological analysis (Zwicky) – that can be used to provide designs for remedies on demand.

Risk Adjusted Price of remedies

The final cede for the remedy for the risk of lack of theory leading to insufficient consideration of treatments is the use of Risk Adjusted Prices for evaluating remedies.

You really cannot decide which remedy to put into place until you have compared the cost (tangible or otherwise) of the risks continuing with the cost of the remedies. The most powerful technique for evaluating relative costs of action over time, adjusting for the uncertainty of when costs will actually be incurred, is Real Option pricing. Real Options Pricing (or Probabilistic Net Present Value) provides an approach for both designing remedies that are flexible and for evaluating remedies in a way that accounts for the uncertainty of their pattern of expenditure over time – which is far more relevant to Risk Management than the traditionally recommended cost-benefit analysis approaches.

However, it can appear to be over-complicated and it does not help to compare the risks and remedies fully. It does not help to balance the difference in costs with the difference in the risk continuing and the risks of the remedies, either the residual risk or the risk triggered by the remedy.

The Risk Adjusted Price formula does adjust for the timing of costs and the remaining risks. It uses the Net Present Value (NPV) calculations of actual costs, but with the discount rate for costs in a particular period adjusted by the probability that the costs will occur in that period. It also adds the costs of the remaining risks to the NPV result, where these costs are the willingness to pay to remove the risk x the probability that the risks will not be removed.

That is,

> Risk Adjusted Price = probabilistic Net Present Value + sum of ((1-probability of risk removed) x willingness to pay for removal of each risk)

If there is a need to choose between remedies, as part of a portfolio, then the direct Risk Adjusted Price can be used or the ratio of

> (Probability of risk removed) x willingness to pay/ Probabilistic Net Present Value

with the remedies chosen in the order of this ratio until the budget is reached.