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WELCOME TO OUR INAUGURAL *MILLIMAN ERM BULLETIN*, WHICH IS DESIGNED TO PROVIDE YOU WITH THE LATEST DEVELOPMENTS ACROSS THE RAPIDLY EVOLVING FIELD OF ENTERPRISE RISK MANAGEMENT. FOR INSTITUTIONS ACROSS THE INSURANCE, BANKING AND SUPERANNUATION INDUSTRIES THAT ARE REGULATED BY THE AUSTRALIAN PRUDENTIAL REGULATION AUTHORITY (APRA), NUMEROUS RECENT DEVELOPMENTS IN PRUDENTIAL STANDARDS HAVE KEPT EVERYONE EXTREMELY BUSY. ALMOST A YEAR HAS ELAPSED SINCE THE NEW STANDARDS TOOK EFFECT, AND EXECUTIVES ARE NOW REALIZING THAT EMBEDDING THE RISK MANAGEMENT FRAMEWORKS THAT UNDERPIN THESE STANDARDS, AND THEN LEVERAGING THE FRAMEWORKS TO DELIVER REAL BUSINESS VALUE, WILL PRESENT SIGNIFICANT CHALLENGES. FROM RISK CULTURE THROUGH OPERATIONAL AND STRATEGIC RISK TO EMERGING RISK, RISK MANAGERS STILL HAVE THEIR WORK CUT OUT FOR THEM.

NEIL CANTLE
PRINCIPAL AND
CONSULTING
ACTUARY



This publication begins with *Gaining insight on customer behaviour risk*, an article that explores the modelling of the dynamic customer behaviour which is a critical element of any organisation's strategic and risk management frameworks. By combining expert opinion with current and historical data, Bayesian network models are capable of providing a powerful tool for analysing this risk.

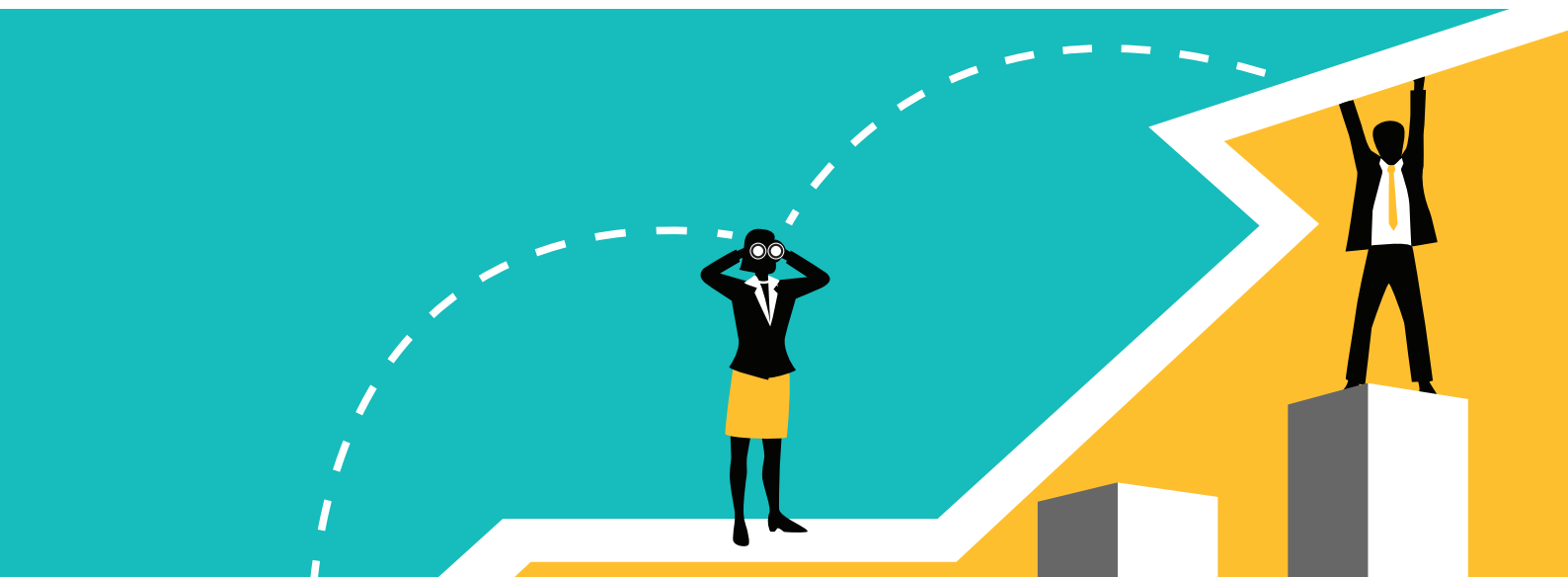
Our second article, *Predictive analytics for risk management*, outlines when and how predictive analytics techniques can be used to provide insight into risk-related problems. Critically, the combination of predictive analytics and complex systems techniques is providing deeper insights into many risk problems characterised by dynamic changes, imperfect information, and a lack of relevant quality data than limits pure data driven approaches.

Keeping the forward-looking assessment of an undertaking's own risks and systems of governance in mind, we offer *A new perspective on risk culture*, which studies risk culture and the quantification and setting of risk appetite. We have gathered some valuable insights from the work of anthropologists, and we hope you find the implications for risk culture interesting.

In our last article, *Developments and innovations in operational risk*, we outline how causal modelling approaches are now being used to link and integrate operational risk models into the causal drivers which the business cares about and bases decisions on. These approaches provide not only measurements of operational risk and capital, but explanations as to what is driving them that people can more readily engage with.

I hope you enjoy this first issue of the *Milliman ERM Bulletin* and find the articles insightful.
–Neil Cantle

GAINING INSIGHT ON CUSTOMER BEHAVIOUR RISK



The risk posed by adverse customer behaviour, in particular the risk of a positive correlation between adverse customer behaviour and other risk factors, is a long-term strategic risk, the impact of which can persist far into the future. Failing to recognize the long-term impact can lead to inadequate capital levels or missed opportunities of strategic importance. Understanding the way customers might behave in different circumstances will inform many aspects of management of a company, such as how to sell products, what options and guarantees will be perceived as valuable by customers, and how to price products and measure their profitability. For financial services organisations, it will affect investment management strategies, as it can significantly impact the duration and valuation of liabilities as well as the amount of capital set against risks. Monitoring emerging trends in customer behaviour should be an important part of an organisation's risk management framework.

In this article we provide an overview of the methods which can be used for understanding and modelling customer behaviour.

RISK OVERVIEW

Adverse customer behaviour is a complex risk which is particularly characterised by its interactions with other risks.

Examples include:

- For general insurance companies, an increase in premium rates on reviewable policies due to unexpected and poor experience can lead to an increase in lapses and/or lower renewals.
- For life insurance companies, poor investment performance can lead to higher surrenders on unit-linked and participating business.
- Adverse media coverage resulting in reputational damage, whether justified or not, can lead to the loss of new and renewal business.
- For banks, reducing interest rates can lead to increased refinancing activities for fixed-rate mortgages, which changes the net duration position of the bank's balance sheet.

- For energy retailers, increases in electricity prices can cause customers to leave or reduce future demand by moving to energy efficient products, changing consumption behaviours or by installing local energy generation such as solar panels.

Customer behaviour is driven by many factors at the macro and the micro level: Behaviours are influenced by macroeconomic and capital market parameters; company-specific characteristics, such as reputation, quality of management and distribution methods; and product-specific parameters, such as the presence of guarantees and surrender penalties. Finally, the personal preferences of individual customers will affect their attitude to products, for example their level of risk aversion, rationality, and social and cultural influences.

Levels of customer persistency and new business volumes are also influenced by the practices of competitors. This is typical for developed markets where the level of 'genuine' new business is not very significant—one company's new business is often another company's lost existing business (an effect known as 'churning').

TRADITIONAL METHODS

Traditional methods used to model customer behaviour within the insurance industry typically rely upon historical data to measure past surrender rates, often with policy duration as the only driver. In this traditional analysis, decrement rates are assumed to follow stationary distributions, which hint at the major drawback of this traditional method. Decrement rates are derived from time series which span different economic conditions, different competitive conditions, different products and changing marketing strategies, which makes it difficult to understand whether fluctuations in experience arise as a result of a genuine movement in the best estimate rate because of the changing conditions, or just because of natural statistically random fluctuations in customer behaviour.

However, bringing more drivers into the analysis will lead to an inevitable loss of credibility, as splitting the data into more granular categories means that the exposure bases available to analyse a given relationship become smaller.

These traditional methods provide little understanding of customers' decision-making processes in extreme scenarios and therefore of the amount of capital to hold against the risk of adverse experience. Critically, they also provide little robustness for pricing purposes particularly when there are high new customer acquisition costs which need to be recouped over long time periods.

DYNAMIC CUSTOMER BEHAVIOUR

Modelling customer behaviour dynamically is required under certain regulatory regimes, such as the draft Solvency II rules which apply to European insurance companies. It usually captures expected changes in customers' behaviour for a given level of interest rate movements, as for significant numbers of insurance products, changes in interest rates will affect the value of guarantees

embedded in the product. A linear function is the most popular form of modelled relationship between the driver and the assumed surrender or lapse rate. Whilst a linear relationship can be considered reasonable in moderate conditions, in extreme conditions (which could drive high levels of surrenders or lapses) a different type of relationship may be required. When deciding on the form of relationship between the driver and customer behaviour, the level of customer rationality is typically taken into account, as customers may not understand the true economic value of the option. Also, the level of rationality of customers may depend on the moneyiness of the option itself, which can increase significantly as the value of the option materially increases.

PREDICTIVE MODELLING

Predictive modelling uses statistical techniques to understand interactions between factors influencing customer decisions. It has the advantage that it can capture a greater number of risk factors that might drive customer behaviour and can account for correlations between them. For example, predictive modelling can help insurers determine the interaction between policyholder income and age, and the impact it has on lapse rates. For banks it can help determine the degree of financial stress someone might be experiencing through their spending behaviour, which could lead to defaults on personal loans. Predictive modelling makes optimal use of available data, by avoiding segmentation and grouping, which can result in a loss of credibility. Notwithstanding that it typically produces better results than traditional methods, it can still fail to capture the rich structure of causal influences and non-quantitative factors (e.g., emotional and social factors) that influence customer decision making. Furthermore, predictive modelling relies on historical experience to predict future experience. Consequently, it is not very reliable in predicting future experience when there is a fundamental change in the environment which has not been seen in the historical data.

COMPLEXITY SCIENCE

Complexity science studies how relationships between parts give rise to the collective behaviours of a system and how the system interacts and forms relationships with its environment.

Complexity science uses a holistic approach to understanding the emergence of a risk and can account for the non-linearity and complexity of the system from which it emerges. It can better take into account human bias when expert judgement is expressed and can help understand how future experience might change when there is a fundamental change in the environment.

Bayesian networks are a powerful tool of complexity science, which enable the combination of 'prior knowledge' with the new data to get updated model estimates—for example, when a new product is launched and an estimate of future lapse or retention rates are needed. Bayesian networks are a useful tool when some data exists, but not enough for a complete statistical model, or when it is necessary to incorporate some expert judgement/background information into a model.

Building a Bayesian network model will, in itself, help to better understand customer behaviour risk, its main drivers and interrelationships. It also can provide better understanding of the tails of the risk distribution. That is, how customers might change their decision-making process in extreme conditions. These behaviours in extreme scenarios will be the main drivers for capital required to be held against this risk, but companies usually do not have data on this and therefore models calibrated using historical data can be misleading. This is particularly relevant when considering liquidity risk capital for banks under the Basle III framework. Bayesian network models can incorporate macro parameters such as macroeconomic conditions, micro-level parameters such as product-relative value propositions, as well as making use of behavioural economics, social/cultural theories, and insight into how human bias can affect the decision-making processes.

Reverse stress testing of Bayesian network models can give insight to the likely state of model drivers in an extreme scenario, such as a '1-in-200' likelihood event. In a model of lapse behaviour we built for a notional product, a 1-in-200 event represented a significant deterioration in lapse rates, but this was driven by relatively small changes in a number of drivers rather than a large change in one. This shows the non-linearity of the relationship between the drivers of lapse behaviour; slight simultaneous changes in, say, economic conditions and the quality of sales processes can lead to disproportionately large increases in lapse rates. This is because customers who have been sold products or policies they did not really need (the number of which increases due to poorer sales processes) are more likely to not renew or lapse their policies if investment performance is poor or if they become unemployed (both of which are consequences of unfavourable changes in economic conditions).

Bayesian network models can also help companies identify the drivers to which customer behaviour is most sensitive and therefore understand where to focus their limited resource budgets in an effort to improve lapse and retention rates.

CONCLUSION

The risk of adverse customer behaviour is complex. It is highly correlated with many other risks and affects many areas of a company's day-to-day operational and longer term strategic management. There are many different ways to understand, model and monitor this risk, which vary in their complexity and predictive power.

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PREDICTIVE ANALYTICS FOR RISK MANAGEMENT



Much has been said about predictive analytics (PA) and big data over recent years, but its role in enhancing all aspects of business performance, as a key element of the enterprise risk management framework, has received much less attention than its use in sales targeting, for example. In this article, we outline when, and how, PA techniques can be used to provide insight into a range of important risk topics.

WHAT IS PREDICTIVE ANALYTICS?

Predictive analytics attempt to predict the likelihood of a specific future outcome based upon detailed analysis of the past behaviour of the system. In particular, the goal is to identify a set of data items which provide reliable cues about the likelihood of seeing the outcome of interest. Typically such techniques combine a number of elements, including a learning phase, where data scientists attempt to identify the factors which seem to most reliably predict outcomes in a historical 'training' dataset; a testing phase, where the candidate predictive formula is tested against further historical data and its predictive power assessed; a predictive phase, where the algorithm is used 'live' to make predictions as new data is observed; and a learning phase, where the algorithm is challenged to see whether refining its formula would

improve its predictive power in the light of this new data. This constant predicting and learning loop happening in real time is what makes predictive analytics so powerful—new trends are identified quickly, as they occur, and incorporated into the algorithm.

Initially, the approach was little more than a correlation analysis on datasets that perhaps no one had previously structured properly, but recent innovations in preparing data for assessment and the ability to conduct analysis on a truly vast scale have enabled new types of 'unstructured' data to be brought into consideration. Such data can include images, audio, text or any media that can be 'understood' by a machine and tagged. This has revolutionised the field as it permits insights to be obtained from information that has been stored but not yet organised. It can also be combined with data not even held within the company (e.g., social media, news, external studies, etc.). The ability to start analysing the data straight away without having to organise it over lengthy time periods means that companies can start taking advantage of it much more quickly than in the past, and the breadth of data that can be included means that complex outcomes become much more 'predictable'.

Using these types of techniques, data scientists are readily able to reveal relationships between a wide range of observable factors and determine which

most often predict the outcomes you are interested in. Applications include fraud detection, servicing optimisation via workflow prediction, criminal hotspot predictions, crowd control strategy planning, medical diagnostic support and, of course, customer behaviours which are attracting significant attention.

UNDERSTANDING THE NATURE OF THE 'SYSTEM' TO WHICH THE PROBLEM RELATES

Unfortunately, despite the incredible power of predictive analytic techniques, they cannot solve all problems, and it is important to know when they are not the right tool and when their predictions are not valid. Predictive analytics work best when there is a stable underlying 'rule' governing the outcome which is too complicated to be elicited directly by sight, but which persists in a broadly similar form for a period of time. It also works well when you only need predictions about the immediate future. They start to lose some of their power when you try to predict medium or long-term outcomes of complex adaptive phenomena, where the small errors in prediction compound rapidly over time due to non-linear effects and render the estimates quite inaccurate—just think how bad long range weather forecasts usually are! They are also unable to directly explain 'why' the prediction might be true, merely the fact that it is. Many business

performance and risk management tasks require a combination of near- and longer-range optics and a degree of explanation as well as prediction, so it is highly advantageous to take a 'complex systems' view of the situation and deploy predictive analytics as part of a suite of tools rather than using it as a single 'black box' solution.

So the first critical step to undertake before applying a PA technique to a problem is to ask *'What type of system am I dealing with here, and what question am I trying to answer?'* It is also important to know what 'the data knows' and ask *'Do I have sufficient past data that appropriately describes the full behaviour of the system in the future, or do I need to include other insights from outside the data?'* If the system is a simple or random one, then the use of traditional mathematical and statistical techniques can be used to characterise its behaviour quite reliably from studying historical behaviour. If the system is a chaotic one, then statistical techniques are ineffective and instead the use of chaos theory is required (which is beyond the scope of this article).

Some of the techniques for complex systems can, however, be used to detect the onset of 'order' much earlier than is otherwise possible, and can help the organisation to obtain an early mover advantage as things recover. If the system is a complex stable one, then the use of PA techniques is entirely appropriate, although the timescale over which predictions are valid would need to be tested against the nature of the non-linearities in the system, and how quickly small inaccuracies are amplified to noise. If the system is a complex adaptive one, then there is a need to blend PA methods with complex systems science techniques, so that novel signals are recognised early and predictions don't have to rely only on those which have properly developed in the data.

So what do we mean by a 'complex' system and a 'stable versus adaptive' system? Well, a complex system is characterised by a web

of many-to-many relationships between its agents and resources, such that there are non-linear and possibly counter-intuitive relationships between inputs and outputs. Ecosystems and organisations are good examples of complex systems. If the relationships between its elements (agents, resources, processes, internal and external drivers, etc.) are stable over time, then the structure and behaviour of the system can be described with some accuracy. However if these relationships change and adapt to an evolving internal and external environment, as most organisations do, then it is a complex adaptive system. Critically, for complex adaptive systems, the past description of the system is necessary but insufficient to predict its future behaviour. Blind application of PA techniques can be difficult at best and misleading at worst when applied to such systems over anything but the near term.

Even though we may not be aware of it, every time we choose to limit our historic data sample to the recent past, we are formally recognising the importance of the dynamic nature of the system, and implicitly assuming that recent dynamics will continue to apply into the near term future. It is thus really not all that surprising when such models turn out to be misleading when the system dynamics eventually changes.

PREDICTION WITH EXPLANATION

When it comes to the problems most risk managers face, many of them relate to understanding, predicting and ultimately managing the future behaviour of complex adaptive systems. To date, most risk management effort has focused on the prediction element of this—for example, quantifying uncertainties and negative tail outcomes such as those required for regulatory capital assessment purposes for financial services organisations. However, in order to embed risk management into the business to pass the 'Use Test', pure prediction using opaque black box techniques is not helpful. Instead, we need

the ability to explain the results in terms of the underlying causal factors that drive the outputs. These are the factors that business unit and functional managers think about all the time. By tying together these factors, understanding their collective inter-relationships and how they relate to outputs, we are extremely well positioned to not only explain our predictions, but also to actively manage the risk associated with desired outcomes.

Unfortunately, this is not easy. It is the reason why experienced professionals are hired to do the jobs they do, as the 'system' they are managing appears too complex and dynamic in order to understand it in any structured, systematic way. However this is now changing, as the combination of complex systems science and predictive analytics is shedding new light on this difficult area.

The science of complex systems tells us that in a complex and dynamic environment, past data is helpful in explaining how a system arrived in its current state, but it is only of limited help to us in spotting emerging trends since they are likely to be novel and previously unseen. Increasing the length of past data usually doesn't help unless there are some persistent, but infrequent states of the system that might be replicated in the future. New techniques born out of this area of science are now being successfully applied to a range of risk problems that require the capturing of evolving system dynamics using a blend of data driven and cognitive approaches.

Cognitive mapping techniques are ideally suited to capturing and structuring expert opinions on the dynamics of business drivers, and Bayesian network techniques are capable of robustly integrating new opinion based information with existing system dynamics. When used to prime certain PA techniques, they are much more likely to be able to sniff out weak emerging relationships that otherwise are not statistically strong enough for PA techniques to find until the onset of that trend is in very close proximity.

BECOMING MORE COMFORTABLE WITH DATA, JUDGMENT AND UNCERTAINTY?

It is undeniable that there is value to be derived in leveraging the expanding databases that modern businesses are currently generating and the external data being generated at a rapid pace by society at large. This value takes two forms: obtaining better predictions of future outcomes of business drivers, and assessing and understanding the uncertainty around them. As risk managers, there is a core need to become better acquainted with the tools of PA and how they can be used to derive understanding and insight, as well as better indicators of outcomes and uncertainty for use in our risk frameworks. A crucial component of building and maintaining a resilient organization is the ability to react, and this, in turn, crucially requires you to identify the onset of change. The use of PA as part of an intelligent risk framework provides that additional warning time that can prove essential.

Risk managers also need to become more comfortable dealing in areas where judgment, opinion and intuition, all play an important role—it is simply not always possible to quantitatively describe and model the systems about which we want to answer risk based questions. We view the risk manager's role as a critical one in which they can integrate these two viewpoints and information sets, according to the degree to which each is a valuable and appropriate representation of the system to which the problem, issue or question relates. As discussed above, this will vary depending upon the nature of the system to which the problem relates, the level of maturity in understanding it and the quantity and quality of observational data gathered to date and captured in the ongoing data collection process.

CASE STUDY: CUSTOMER RETENTION

Let's look at customer retention—the risk that future business from existing customers declines or stops. Given the relatively high cost of acquiring new customers relative to selling to existing customers, this is typically a very material risk for most businesses. PA techniques are typically used to mine customer level data to develop likelihood scores for whether individuals are more or less likely to stay or leave. However, what if the time period used to train the PA algorithm hadn't seen a recession, a period of heightened competition or a new product? In these cases, customer behaviour is at risk of materially changing. In this situation, the PA learning process can tell you that things have changed, but unless the information it needs to be predictive in the new regime is within its datasets, it cannot help you until you update it. What is needed is the ability to integrate expert opinion as to the likely impact on customer dynamics under various possible conditions, with the ability of predictive analytics to derive the relationship structures from the past state of the system.

Using PA techniques to uncover the predictive relationships under a subset of conditions (system states) seen in the past data is the starting point. The use of cognitive mapping techniques can then be used to capture the dynamics of how experts believe customer retention might be impacted by other causal factors that may have occurred in the past but not captured in the dataset, or those that may occur in the future. The PA predictive relationships results are then reflected in a Bayesian network that captures the conditional system states to which they relate and the uncertainty involved, and combined with expert opinion on how these might evolve under alternative states of the system (e.g., recession, competition). The Bayesian network then provides the causal explanation framework to the predictions made by the PA models, reflecting the inherent uncertainty involved from which risk management questions can be addressed. New evidence, both data- and judgement-based, can then be integrated into the Bayesian network over time as the system evolves and observations are made, thus bringing the PA informed risk management framework alive to inform real-time business decisions.

RISK MANAGEMENT APPLICATIONS OF PA

In addition to the customer retention case study above, other examples where incorporating PA techniques into risk management problems can create value include:

- Assessing customer behaviour related risks: persistency/lapse/retention, new business sales volumes, price sensitivity/elasticity
- Assessing distributor behaviour risks such as churning
- Assessing credit risk based upon a range of underlying credit risk factors
- Identifying, constructing and monitoring risk indicators and their linkage to business drivers and outcomes
- Assessing operational risks such as fraud, anti-money laundering, rogue trader, mispricing, valuation errors, malfunctions and breakages in physical systems
- Assessing supply chain dynamics and supplier risk
- Assessing operational risk drivers using data on employee behaviour and processes
- Understanding and assessing the information network of the organisation, and combining this with the social network to understand and assess key person risk, employee behaviour and risk culture

CONCLUSIONS

To date, financial services firms have been targeting PA in areas where they already have a lot of data. This is certainly hugely valuable. However, by putting PA into context and seeing it as one of the tools available for understanding and managing complex systems, organisations have a new opportunity to spot complex patterns earlier and capture value by being more efficient in targeting their resources to those areas more likely to need attention. The key to unlocking the potential of PA and the other techniques we have discussed is not having too narrow a view of what 'data' you have at your disposal. By combining all the different information sources which relate to your 'system' you now have the opportunity to identify what data you actually need (in addition to what you have), in order to make sense of it all and substantially improve your ability to see what is coming and thus manage risk more effectively.

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A NEW PERSPECTIVE ON RISK CULTURE



In recent weeks, the subject of risk culture has been the topic on everyone's lips. How to measure it, how to improve it, and even how to control it! This is particularly the case in the Australian financial services industry given the new regulatory requirement in CPS-220 for boards to establish and maintain a sound and appropriate risk culture across their organisation. But while it is easy to make broad-brush statements about the need for a 'good' risk culture, few people can define quite what they mean, let alone root their ideas back to a sound theoretical underpin.

When people talk of risk culture, what they typically appear to be referring to is the behaviour of the people in their organisation towards risk taking.

DEFINITION OF CULTURE

The definition of culture is the obvious place to start. Rather than make up a definition, we look to the discipline that concerns itself with the study of culture: anthropology.

One early definition of culture was given in 1897 by Sir Edward Taylor:

Culture or civilisation taken in its broad ethnographic sense, is that complex whole which includes knowledge, belief, art, morals, law, custom and any other

capabilities and habits acquired by man as a member of society.

Of course, this definition of culture is arguably much wider than many of us mean when we use the term culture. We are often more concerned with the status and relationships between humans in our working environment and how this contributes to decision making. While the wider society (civilisation even) that we inhabit will doubtless have an impact on the culture of our workplace, it feels beyond the scope of what even the most ardent CEO could hope to change. At the harder end of the spectrum, personnel changes or recruitment in other areas may be the obvious solution. Such difficult decisions require a broader consensus of agreement at senior management level and a CEO who is seeing value in the risk and uncertainty narrative enough to make some hard choices or release budget to recruit new skills to the organisation.

There is, however, a sub-group of the social anthropology community that talks more to the types of issues that concern us from the perspective of the risk management of organisations. It is their focus on the diversity of positions and perspectives within a social group that makes their skill set useful to us in understanding organisations.

RISK MANAGEMENT FRAMEWORK

Chief risk officers (CROs) often come to think about risk culture as they design the risk management framework. Risk culture is often portrayed as a coloured box to be found in a multi-coloured schematic from a consultant providing a (their) particular flavour of risk management framework.

But these graphical representations can be misleading and can often almost seem to suggest that risk culture can be done to an organisation. Done in the sense that, as long as a work-stream is kicked off with a project manager, a Gantt chart, some milestones and a small army of contractors or consultants, risk culture will happen.

From our experience of working with anthropologists to understand the nature of culture, we don't agree that an effective risk culture will be created using this type of framework.

There are two misconceptions around risk culture that we would like to address in this article before we move onto discuss some of the practical things that you can actually do as a risk manager to understand, assess and influence risk culture.

CULTURE AS THE INDIVIDUAL OR THE COLLECTIVE

The first common misconception we address is the idea that the individual is the central unit of study in a culture. This misconception is reinforced by some papers and presentations on risk culture that, in our view, make this important mistake.

The definition we shared above from Sir Edward Taylor talks to the complexity of the interactions between individuals, and it is from this complexity of interconnections, and the flow of information along those interconnections, that an overall culture emerges.

Of course, most individuals will propagate the culture through their actions, whilst some will directly affect the culture more than others—and in return the culture will impact the individual. So what we end up with is a complex symbiotic relationship between the individual and the culture in which he or she is embedded.

What we have in essence is a complex system—technically a complex adaptive network. One thing science knows about these networks is that you cannot understand them just by looking at the behaviour of the individual elements—you need to look at the emergent behaviour of the system as a whole.

HOW MANY CULTURES ARE THERE?

The next misconception we address is that there is only one culture within an organisation. The consultant presentation risk culture box can suggest that there is just one of these and that it can be uniquely identified—somehow—maybe even using a highly subjective real number disguised as a risk culture index.

In reality, we find, our clients find and social anthropologists find that there are multiple diverse cultures within an organisation.

We know this in reality of course if we reflect on our own experience. Some parts of organisations feel hierarchical, some

more entrepreneurial. On the more negative side, we have probably also all seen cliques developing in organisations, or some people or groups suffering alienation—and not just in our work organisations.

We also see that, when things go wrong in an organisation, good intentions to cooperate and work in harmony can turn into a blame game, especially between groups that see the world in very different ways.

The pervasiveness of patterns such as hierarchy, entrepreneurship and cliques throughout the social structure of humankind means that this has been very well studied, and we find that social anthropologists already have well-developed theories for explaining these patterns and their interrelationships.

We make the point, therefore, that there is not one homogenous culture to the organisation (particularly a sizeable organisation) and that an organisation will—inevitably—be a collection of subcultures. Understanding the organisational culture—let alone doing anything about it—therefore requires a recognition that this diversity exists and a way of recognising the recurring patterns that have been identified by the social anthropologists.

IS THERE EVEN SUCH A THING AS RISK CULTURE?

We've discussed culture so far, but before we move on it is worth pausing to think carefully about whether there is such a thing as risk culture at all, as distinct from culture per se.

We note that senior managers often refer to their organisational culture and struggle to separate out a risk culture from the organisational culture. But there are other types of culture we can identify too that have equal validity and may also struggle to be seen separately from organisational culture.

There are parts of our organisations where innovation and creativity is the most valuable commodity—product design, strategy and marketing are the obvious examples. Professionals and academics

concerned with the generation of new ideas and products are prone to refer to the innovation culture within an organisation. By this they mean the ability of organisations to innovate new products and come up with new ideas. We could describe this as 'the ability of an innovation narrative to operate and influence the decision-making process of the organisation'.

In this framing, we can think of risk culture as the risk (or uncertainty) awareness within the organisation. Using a description analogous to the one above, we could define risk culture as 'the ability of a risk and uncertainty narrative to operate and influence the decision-making process of the organisation'.

We therefore argue that risk culture and innovation culture are two emergent properties of the overall organisational culture.

RIGHT CULTURE IN THE RIGHT PLACE

Picking up on the concept of these two quite separate subcultures, we could consider the idea that the organisation culture is a portfolio of subcultures. We don't just note this in a passive way (a fact of organisational life); in fact, we argue that this portfolio of subcultures is actually essential to the well-being of the enterprise.

From a naïve point of view, one might suspect that risk managers should see their objective as ensuring everyone in the organisation is thinking about risk in everything they do. Surely then they can truly be said to have done risk culture to their organisations.

But we would argue that this path of good intentions could also lead to an adverse outcome if the avoidance of risk becomes an objective in its own right. Such an outcome might take the form of slow decline in run-off or acquisition by a consolidator, rather than the loud pop of a high-profile corporate insolvency.

Let us take the example of the product design team. Having a team of over-cautious risk managers as your creative epicentre is likely to result in a distinct lack of creativity.

An area such as product design will want to promote creativity and will necessarily be less focused on risk and downside. They will focus on upside potential, opportunity and how to move real options into the money.

However, the risk function most certainly does need to uncover all the risks in the product design and express its view on what could go wrong.

There are other parts of organisations where an innovation culture can be quite destructive. The finance team at Enron was infamously creative—operating as a highly innovative profit centre and applying their creativity to financial accounting. Disaster was the ultimate consequence of this inappropriate subculture. Instead, an internal control culture is more likely to be a desirable characteristic for an accounting team.

Having said this, an innovation culture directed at more efficient systems and processes is clearly to be encouraged within a finance function—which rather underlines the difficulty we have in neatly packaging up what is good culture and bad culture. Ultimately, it is about having appropriate subcultures in each area of the organisation.

DEFINITION OF CULTURE

But how do these different cultures interact when it comes to decision making? We argue that the risk culture vs. innovation culture dialogue needs to take place in the debating chamber of the boardroom where the opportunities for innovation can be compared and contrasted with the risks and dangers of such innovation. The important point is not what the decision is—as this is subjective and will depend on the risk appetite of the board and of the executive. The important point is that the facts and uncertainties as they are known are laid out for the board and executive to see and understand.

A key component of a successful risk culture could therefore be seen as the ability of the risk and uncertainty narrative to be given equal prominence at the

boardroom table to other perspectives such as the innovation and opportunity narrative. However, as the influence of the board and executive only penetrates so far down into the depths of large organisations, it is also critical that appropriate risk cultures are established and maintained within each functional and sub-group.

WHAT CAN YOU DO?

So what can you do as a risk manager to influence the risk culture of the organisation?

We will look at two things you can (and for Australian financial services organisations now must) be doing in order to get some handle on the culture in your organisation, how it treats the risk and uncertainty narrative and how you might start to think about shifting the risk culture—should that be the appropriate course of action.

We will look at:

- Measurement of risk culture
- Changing the (risk) culture

CASE STUDIES

But first an aside on case studies. We are told by some CROs that examples of what has worked in other places before—case studies—are what can help most. We certainly don't deny that case studies are instructive, but we note that case studies show what worked (or didn't work) for a particular organisation in a particular situation at a particular time. While there are common themes emerging from case studies which are useful, we don't believe you should start operating until the physiology of the particular patient in question has been studied and diagnosed. After all, what is appropriate for one may not be appropriate for another.

Complex adaptive systems (as we argue cultures are) have a knack for kicking back with unintended consequences—so we argue that the more information the CRO has about the cultural map of his or her organisation, the better armed the CRO will be to make or propose changes that could influence the culture in the desired way.

MEASUREMENT AND DIAGNOSIS

The first thing to do is to try and measure or diagnose the culture of the organisation. This sounds incredibly hard and time intensive—and indeed it could be made so. But it is in fact possible to get useful insights into the cultural map of an organisation from an online questionnaire using very little of employees' time—if, of course, one knows the right questions to ask and how to interpret the answers.

One way to make rapid progress is to sample staff's perceptions of the way different activities are carried out in their part of the company. This can be achieved by asking people to indicate whether activity tends towards either of two statements, such as 'there is a well-established process which is used to regularly identify risks' vs. 'the time that is spent identifying risks is governed by the nature of our work and the timescales for completing it.' Framing the questions in this manner enables you to elicit an understanding of the emergent behaviour of groups and sub-groups within the company rather than the inherent individual motives, and to diagnose the cultural behaviours rather than simply judging them. This type of granular approach helps to uncover cultures within sub-groups which are somewhat different to the norm, and can help CROs (and indeed has helped some of our CRO clients) to diagnose particular areas, or sub-groups, where there is a clash between the way people like to work and the things they are being asked to do.

CHANGING RISK CULTURE

The next thing that a CRO might want to undertake would be to change the culture in some way, to make it better reflect the risk and uncertainty narrative.

We argue that the CRO should use his or her cultural map to identify areas of concern where the risk and uncertainty narrative is struggling to be developed—or struggling to be heard in the decision-making process of the organisation.

We also argue that the culture—as enacted through the behaviours of the staff in an organisation—has a symbiotic relationship to the processes within the organisation.

In other words, the processes that are followed by the staff influence the observed culture, and the culture also feeds back to influence the processes that the staff will follow.

The solutions to changing the culture will therefore be multi-faceted and depend on both:

- The existing culture of the organisation as manifested through the observed behaviours of the staff
- The processes that the staff are following
- The company has no appetite for regulatory censure.

Possible changes could be:

- Training of staff
- Amended governance procedures
- Enforcement of existing governance procedures
- Amended processes
- Enforcement of existing processes
- Recruitment of new skills to the organisation
- If all else fails, removal of staff

We used the word current deliberately because we are dealing with a complex adaptive system. We would suggest that the CRO should try one change first and then re-profile the culture to determine how it had (or had not) been shifted.

The feedback loops and complexity can lead to the culture changing in some unforeseen ways. This will help the CRO better understand how the organisation operates and evolve the culture in a more gradual way that doesn't throw up too many unintended consequences.

The difficulty in executing each change will also depend on the task—and the culture of the organisation.

At the easier end of the spectrum, it may involve time investment from different parts of the organisation not currently bought into the risk and uncertainty narrative. In this case, the winning of hearts and minds will be important, and this will mean helping other parts of the business see value in a risk and uncertainty narrative.

At the harder end of the spectrum, personnel changes or recruitment in other areas may be the obvious solution. Such difficult decisions require a broader consensus of agreement at senior management level and a CEO who is seeing value in the risk and uncertainty narrative enough to make some hard choices or release budget to recruit new skills to the organisation.

So to summarise, we argue that culture is split into two dimensions:

- The behaviours of the staff
- The processes they follow

In order to change the culture, we need to consider which of these needs to be (or indeed can be) changed to best effect the desired change in culture.

Where behaviours are deeply rooted and would take a great deal of effort to change—or indeed a change in personnel is required to change behaviours—then a change in the process is a way forward. Practically, this means setting different tasks and altering the process that the staff member(s) follow.

Where processes are more fixed—perhaps due to regulation or the wider organisation—then the behaviours are a more natural area of focus and techniques to help staff members reflect and take a new perspective will be useful.

There will be some extreme instances where behaviours and processes are both rigid, and in these cases more drastic action will be needed, such as changes in personnel (changing behaviours) or winning over stakeholders in the wider business (changing processes)—both of which will be disruptive. Then the question will become whether the desire to change the culture outweighs the disruption.

However, often both processes and behaviours will have some degree of variability and in these cases some relatively easy adjustment can influence the culture in the desired direction.

It is quite common, for example, to find sub-groups within organisations who culturally tend to shy away from rapid disclosure of problems. It is also common to have others who disclose concerns quickly, possibly too quickly. A risk framework relying on front-line disclosures will be inconsistently applied where these cultural sub-groups exist.

A CRO who is aware of this can make small modifications to the framework, such as moving to more evidence-based reporting compared with self-certification, in areas where disclosure is difficult. The important result from assessing culture is to reach an understanding of which processes and which behaviours fit together so the CRO can finesse the framework design to have the best chance of achieving the desired outcome. We argue that it is dangerous to simply 'benchmark' against a mythical gold standard which assumes people all behaving the same way will achieve the best outcome.

SUMMARY

In this article we hope we have convinced you that understanding and changing the risk culture of an organisation needs a different perspective from that we are used to in traditional risk management work. We hope you share our view that tools and lessons from anthropology are appropriate places to start in understanding culture.

We explained our view that organisational culture is a portfolio of subcultures of which risk culture is just one—if an important one. We argued that a successful risk culture was one where the risk and uncertainty narrative had an equal voice at the boardroom table with other important subcultures, such as the innovation subculture.

We shared some ideas for how we have successfully helped some of our CRO clients to understand the risk culture in their organisations using some short questionnaires that their staff members have found easy and quick to complete.

Finally, we shared some ideas for how the risk culture can be altered and how the process needs to follow a step-by-step approach with a focus on one, or both, of the processes and the staff behaviours. We argued that care needs to be taken to attempt cultural change in a step-by-step way, due to the complex interactions that can lead to unforeseen consequences.

For a detailed exposition on how risk culture can be assessed, please refer to our paper that was recently published and presented through the Actuaries Institute ERM Seminar in August 2013, which can be found at: <http://tinyurl.com/k7s8yem>.

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DEVELOPMENTS AND INNOVATIONS IN OPERATIONAL RISK



For many years, operational risk has lived in the dark shadows of organisations, with people commonly too unfamiliar, uncertain or just plain scared of addressing it. However, over recent years, and after an embarrassing number of major operational risk failures, stakeholders such as boards and regulators have turned the spotlight on it, forcing institutions to clear away the cobwebs and think long and hard about what it means to their business. Risk and capital management specialists are now leading the foray into this area, with actuaries also starting to be involved.

Not only do we think that this is a fascinating area that can challenge the limits of the very best risk professionals and actuaries out there, but, given its central importance within all organisations, it also represents a unique growth opportunity for both individual actuaries and risk professionals to expand into non-traditional areas.

This article provides an outline of the recent developments, challenges and innovations that are driving the area forward. Its genesis is the paper *Operational risk modelling framework* by Joshua Corrigan and Paola Luraschi <http://tinyurl.com/meo6xbn>, which was published and presented multiple times at various Australian forums this year.

DRIVERS OF OPERATIONAL RISK DEVELOPMENTS IN AUSTRALIA

There are two primary reasons as to why operational risk is now a focus. First and foremost, the threat of suffering a beating from the regulator's stick for financial institutions regulated by the Australian Prudential Regulation Authority (APRA) has galvanized people's attention. Unfortunately, the downside to this is that for less sophisticated and resource-constrained organisations, this primarily becomes an exercise in compliance at minimal cost. This may be appropriate in some cases where operational risk is not material, but it is somewhat difficult to know this unless you have done the hard work to prove it!

The second reason is the carrot of enhancing risk-adjusted returns to shareholders. This can be achieved in two ways: by minimizing operational risk capital, or by minimizing the downside P&L cost of actual operational risk events.

The former is a particular driver of the major banks, given that operational risk currently represents around 9% of their regulatory capital base, being their second most material risk after credit risk

itself. Spending time, money and effort to reduce operational risk capital can be worth it given the cost of holding such capital.

However, the second is becoming an increasingly important issue for financial services entities as boards and executive management are under pressure to protect and enhance profitability. Indeed, outside of the financial services industry where there are no regulated capital requirements, it is the primary driver of operational risk management. Think of the impact on reputation, employee productivity and operational efficiency of having a poor health and safety environment for an energy company, and the subsequent flow on to profitability it would have. It is thus not surprising to see that the energy, resource and transport sectors are leading the world in operational health and safety risk management. Within the context of a financial services organisation where health and safety risk is significantly less severe, the attention primarily boils down to the trade-off decision between optimizing operational efficiency and building operational resilience, as typically embodied by the relative amount of spare resource capacity.

A PRIMER ON PRUDENTIAL STANDARDS FOR APRA-REGULATED AUSTRALIAN FINANCIAL SERVICE ENTITIES

The following table briefly summarises the heterogeneous nature of the prudential standards for operational risk capital assessment across the various Australian financial services industries. In essence, organisations have the opportunity to use advanced approaches where they and the regulator agree it appropriate and properly executed. Otherwise, standardized approaches must be used.

WHERE IS THE INDUSTRY CURRENTLY AT?

All four major Australian retail banks have been approved by APRA to use an advanced measurement approach (AMA). The general insurance industry currently has at least one company that has an approved internal model, with others following in their footsteps. These models are relatively similar in nature to those adopted by the banks. The life insurance

industry appears less advanced in this area, although life insurance divisions of bankassurers are likely more advanced relative to their standalone industry counterparts. The superannuation industry is at the relatively early stages of adoption, with many organisations adopting the simple proxy of 25 bps of AUM.

Scenario approaches are the dominant methodology in use for those who choose to do something in addition to the basic standardized approach but don't wish to adopt an advanced/ internal model approach. Even for those who have adopted an advanced approach, scenarios play a major role in eliciting forward-looking assessments of likelihood and severity distributions. Advanced approaches based upon the loss distribution approach (LDA) integrate backward-looking internal and external loss data, with current business environment and internal control factors (BEICFs) and forward-looking scenario assessments based upon the judgment of subject matter experts. Significant expertise is required to blend and integrate these sources into a unified statistical framework for each event type, from which capital assessments can be made.

CHALLENGES

Operational risk is arguably one of, if not the, most difficult risk silo to truly assess. Unlike other risk categories that deal with 'simple' systems which are amenable to reductionist examination and relatively robust mathematical/statistical assessment, operational risk is complex. It is complex because it involves the interactions between all the factors of production (in particular, people) and the external environment, all of which are dynamically evolving over time. These complex interactions are characterised by many-to-many relationships between the operational inputs, drivers and outcomes, and the uncertainty around them. This means that reductionist techniques such as simplification and segmentation, and the assumption of stable statistical distributions which actuaries typically rely upon, are limited at best and fundamentally flawed at worst.

These characteristics manifest themselves in the problems with the traditional approaches. The following table outlines some of the most common problems encountered.

The above problems highlight the significant degree of model risk that exists in these approaches, which can lead to significant distrust of operational risk assessment. Potentially more dangerous is the resulting disengagement by the business and stakeholders who struggle to relate to the esoteric statistical concepts upon which they are based. Embedding these approaches in the business so they can pass the 'use test' remains a material challenge.

SOLUTIONS

Despite these significant problems and challenges, solutions are emerging and being successfully applied in this area. The new innovations are fundamentally couched in the language of complex systems sciences, which shouldn't be surprising given that operational risk is typically characterised by such systems.

At the heart of these approaches is an appreciation of the interconnected nature of the causal drivers both within and between the various loss-generation mechanisms. We refer to this as a causal or structured modelling approach, as it attempts to relate

FIGURE: 1

Industry	Standard	Method	Nature	Inputs
Banking	APS 114	Standardised approach	Proxy formula based on size factors, but different for each industry	Balance sheet, P&L items
General Insurance	GPS 118			
Life Insurance	LPS 118			
Banking	APS 115	Advanced measurement approach	Loss distribution approach (LDA)	Internal/external loss data, scenarios, BEICFs ¹
General Insurance	GPS 113	Internal model approach	Flexibility to choose as appropriate	Internal/external loss data, scenarios, BEICFs
Superannuation	SPS 114	None specified-amount must reflect size, business mix and complexity of the RSE ²	Flexibility to choose as appropriate, flawed as 25bps of AUM ³	No requirements

¹ Business environment and internal control factors

² Registrable superannuation entity

³ Assets under management

outcomes to the states of the underlying operational risk drivers that the business cares about and manages on a regular basis. One way in which this is manifesting itself is in the use of structured scenarios, which recognize that the underlying causal drivers are unlikely to material change over time, but rather the states they can be in and their non-linear inter-relationships drive outcomes in a complex way.

For example, consider the operational risk of actuarial valuation/reserving errors. Under a traditional scenario, someone might say, 'Based upon my 20 years of experience, I haven't seen a valuation/reserving error cost us more than \$1 million'. That's nice if we believe it, but it's not particularly helpful to the business. Instead we ask, 'What are the underlying causal drivers of how such losses

might occur in the future, given the current nature of the operational environment'? The answer might non-exhaustively include the following:

- The appropriateness of model methodology (i.e., model risk)
- The quality of data and the calibration process (i.e., data and analytic risk)
- The quality of the actuaries undertaking the valuation process (e.g., expertise and experience)
- The quality of the valuation process
- The availability, capacity, utilization rates and risk culture of the actuaries

- The availability, capacity and utilization rate of actuarial systems, in particular Bob, who knows the process inside out, and who is a key person
- The demands, stress and expected service levels placed on the valuation actuaries
- The effectiveness of the review process and governance framework controlling the valuation process
- The effectiveness of the business continuity plan in case of failure of the operational environment

All of these causal drivers are key elements in the operational valuation process, and the uncertainty associated with their states and how they interact will determine the uncertainty in the outcomes associated with its effectiveness and quality level. The use of cognitive mapping techniques is a very effective way of not only identifying these factors but also of structurally determining the nature of their complex interdependencies. An example of how they might look is show in the following diagram.

A Bayesian network (BN) can then be used to explicitly capture the dependent relationships between cause and effect, directly accounting for the multitude of states and uncertainties involved. These relationships are exactly what business managers intuitively spend most of their time thinking about and managing, so all we are really doing is capturing this IP in a structured way, and wherever possible and appropriate, refining it further with predictive and data analytics. Integrating this with any existing LDA statistical models then provides a robust causal-based 'explanation' of different types of outcomes. One of the key advantages of this approach is that it incorporates the full multitude of possible complex scenarios based upon the causal drivers without having to specify them in advance, thus addressing the problems of relevance, sufficiency and bias. Reverse stress-testing of the BN can then directly answer typical management questions about what state the business drivers need to be in, in order for a risk appetite outcome threshold to be breached. Examples of such models can be found in the Corrigan & Luraschi paper referenced earlier.

FIGURE: 2

Problem	Underlying reason
Standardised approach isn't linked to the loss generation mechanism (LGM)	Assumes linear scaling of op risk with business size, which is typically untrue.
Calibrating a tail at 99.5th or 99.9th % is extremely difficult for even one risk event type	The system governing the LGM typically hasn't been observed in a stable relevant state for long enough (i.e., lack of data) for robust statistical calibration. Models are plagued with data relevance and availability issues.
How to calibrate correlations b/w risk event types and frequency / severity distributions?	A priori segmentation pre-supposes independence (typically correlations are assumed zero), but this leaves no natural way of robustly incorporating dependence.
How to account for modal versus tail correlation?	The LGM and causal drivers of modal versus tail outcomes can be completely different and non-linear. Using linear correlation measures to describe this is extremely difficult.
Double counting of some risks	Related to a priori segmentation issue. When dealing with a complex system, you can't start with a reductionist approach, you need to be holistic.
Scenario choice – relevancy, sufficiency, bias	Scenarios only represent single states of the operational system out of a multitude of possibilities and are 100% certain to be wrong. Op risk can't be modelled as a deterministic system or a stable stochastic one.
Bias in use of subject matter expert judgment for calibration	Particularly prevalent in risk register approaches. People are typically not very good at assessing statistical risks, particularly low-frequency ones. Large variances/biases exist among different people.
How to account for emergence, as the next op risk is likely to be different to the last?	Many LGMs are characterised by complex adaptive systems, rather than complex stable ones. This undermines the use of past data and segmentation taxonomies.

Finally, the application of cladistics techniques to historic loss events is now being used to understand the nature of the evolutionary forces at work within an organisation that give rise to emergent operational loss events. By objectively analysing the complex fossil event record, we are now able to derive the relationship structures which drive the emergent characteristics of operational events, thus providing a structured way of addressing emerging operational risks. After all, you have already seen the characteristics of the next emergent risk event, you just haven't seen how they will all combine together to define it. Ignorance is no longer an excuse. Further details of this can be found in the *Emerging risk* paper presented at the Actuaries Summit 2013, and discussed in the August edition of the *Actuaries* magazine.

CONCLUSIONS

Our opinion is that, given the nature of operational risk, we shouldn't get too hung up on trying to finesse an operational risk model to predict the 99.5th or 99.9th percentile more accurately, as we will likely be wrong. Instead, we believe it is much more important to understand and explain risk and capital outcomes in terms of how they relate to the tangible operational drivers of the business rather than pure prediction. In this way, managers, executives and the board will be able to much more readily link operational risks directly to business decisions.

In summary, we think operational risk is a fascinating area, as it touches on many different dimensions of enterprise risk management and it represents a great opportunity for the profession to develop and expand. Addressing the common

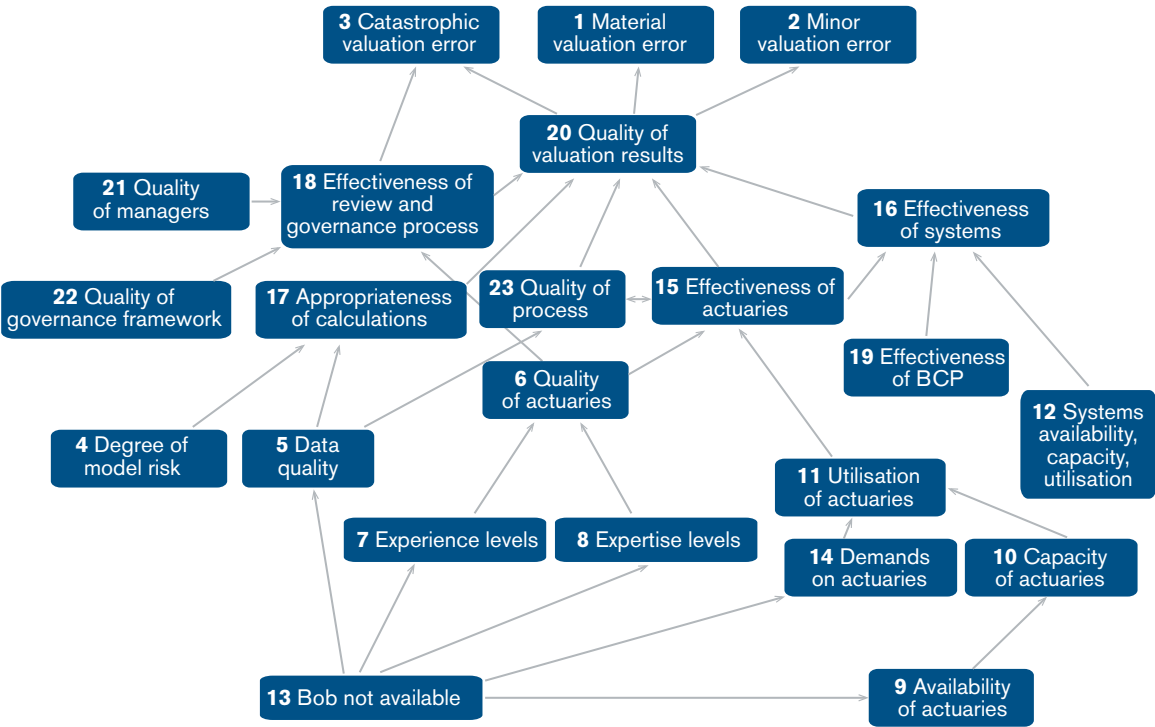
fundamental nature of the problems with traditional approaches is the starting point for this. It requires a change in mindset for actuaries to become more comfortable dealing with uncertainty, complexity, qualitative intuition and subjective judgment. The need is there and the tools are at our disposal—all we need is the confidence to use them.

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This article was originally published in *Actuaries* magazine, October 2013 - Issue 184.

FIGURE: 3



MILLIMAN'S INDEPENDENT THINKING IS BASED ON STRONG THEORETICAL FOUNDATIONS THAT ALLOW US TO DEVELOP PRAGMATIC, IMPLEMENTABLE SOLUTIONS TO TODAY'S MOST CRITICAL ERM ISSUES. THE FOLLOWING EXAMPLES HIGHLIGHT SOME OF OUR RECENT WORK.



Emerging risk assessment is essential for developing a resilient organisation that can adapt to an evolving environment. However, most organisations tend to focus on a small number of single risk factor stresses or simple scenarios that they already know, which leaves them unable to identify the risk scenarios that actually drive material losses and organisational failure. An evolutionary approach to emerging risks can bridge the gap and help organisations more effectively manage risks and allocate risk-related resources.

THE ERM JOURNEY

Milliman has developed universally applicable techniques for analysing organizational structures and processes that can reveal and mitigate the financial implications of risk factors and can help any organization to become more resilient. In this video, Milliman consultants discuss how Milliman's breadth of expertise across the globe can guide organizations on their enterprise risk management journey, from creating an enterprise risk management framework to implementing recommendations, organizing the compliance function and creating reporting tools.

COMPLEXITY THEORY AND ENTERPRISE RISK MANAGEMENT

Neil Cantle, developer of Milliman's CRISALIS™ methodology for analyzing and quantifying enterprise risk, maps out the causes of an oil spill to demonstrate how businesses can identify critical failures that might lead to a systemic breakdown.

MAPPING THE ION: MANAGEMENT RISK AND THE INTERNAL ORGANIC NETWORK

Although risks are interrelated and are inherently intertwined with operations, catastrophic mistakes are usually indicative of evolving organizational decline. In short, all risk is ultimately management risk. As complex as it is, management risk can be monitored, analysed, and mitigated. This process begins with an understanding of organizational dynamics. An analysis of the internal organic network, or ION, can shed new light on management risk.

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OPERATIONAL RISK MODELLING FRAMEWORK

Joshua Corrigan and Paola Luraschi,
Milliman research report, February 2013

As it is such a fundamental risk, most organisations are very conscious of operational risk, and many of them are very good at managing and mitigating operational risk. Despite this, however, the field of operational risk assessment is still relatively new, particularly when it comes to its inclusion in capital frameworks. This report investigates existing operational risk assessment frameworks around the world, as well as current methods and emerging practice in this area.

Read the full article:

<http://tinyurl.com/mqvducu>



ENTERPRISE RISK CULTURE: FROM ELUSIVE PHENOMENON TO PRAGMATIC SOLUTIONS

Joshua Corrigan and Hilary Lewis, Presented at
Actuaries Institute ERM Seminar, August 2013

To build understanding of the 'complex whole' of risk culture, a systems thinking approach is taken. The research examines organisation culture theory and ERM practice to develop a pragmatic method to profile an organisation's unique risk culture and combines and balances the postmodernist principles of contextualisation and non-judgmentalism with the modernist principles of categorization and predictability. The efficacy of the approach is demonstrated through two case studies.

Read the full article:

<http://tinyurl.com/k7s8yem>



APPLICATIONS OF COMPLEX SYSTEMS SCIENCE TO RISK APPETITE AND EMERGING RISK

N. Cante, N. Allan, P. Godfrey and Y. Yin,
Institute and Faculty of Actuaries Sessional
Research Meeting, September 2012

This study aims to apply new thinking and techniques from complex systems science to two key problem areas for risk management and governance: risk appetite and emerging risk. Emerging risks can be viewed as evolving risks from a complex system. It is also known that such systems exhibit signals in advance of an observable change in overall performance. Knowing how to spot and interpret those signs is the key to building a scientific and robust emerging risk process. Also, it is becoming increasingly clear that risk appetite and emerging risks are interconnected in many ways, as this research shows.

Read the full article:

<http://tinyurl.com/n8mnu7j>

Neil Cante presentation to Yorkshire Actuarial Society,
November 2011:

<http://tinyurl.com/kpu6ax9>



AN APPLICATION OF MODERN SOCIAL SCIENCES TECHNIQUES TO REVERSE STRESS TESTING AT THE UK PENSION PROTECTION FUND

N. Cante, J-P. Charmaille, M. Clarke and
L. Currie, Presented at the ERM Symposium,
April 2013

A team from the UK's Pension Protection Fund (PPF) and Milliman recently performed a reverse stress test of the fund to identify risks that could result in organisational failure. Across a series of meetings and interviews with stakeholders at the PPF, the team built up a cognitive map using the responses they gathered that showed the routes to failure. This analysis provided the organisation with new insights into its risk profile, the scenarios leading to the PPF's potential "failure" and interactions between these scenarios. This paper discusses the principles and objectives of reverse stress testing in the special case of the PPF and then illustrates the application of complex system science techniques for the purpose of reverse stress testing.

Read the full article:

<http://tinyurl.com/keepyga>

RISK CULTURE WORKSHOPS

MILLIMAN AND SYSTEMIC CONSULT LTD ARE PLEASED TO SPONSOR A SET OF HALF-DAY WORKSHOPS, 'BUILDING EXPERTISE TO RESPOND TO CPS-220'S RISK CULTURE REQUIREMENT'.

WHY ATTEND THESE WORKSHOPS?

Regulators globally are placing more pressure on boards and their risk management teams to be fully engaged with establishing and maintaining a 'sound risk culture'. Developing an appropriate risk culture alongside risk management activities is considered to provide an additional layer of safety and greater engagement, and embeds risk management beyond compliance. Developing a balanced perspective on how to build a risk culture that is commercially valuable, sustainable and appropriate to meeting regulatory requirements is the aim of these sessions.

WHAT WILL THE WORKSHOPS COVER?

These workshops provide attendees with the knowledge of how to assess and manage risk culture. They will cover the basic principles of culture theory and how these can be applied to assess the risk management dimension of behaviour. Delegates are given techniques for building a deeper understanding of the dynamics that nurture their organisation's risk culture. Through discussion of case examples

of both appropriate and inappropriate risk cultures, delegates gain a robust view of how to shape a risk culture and the tools and techniques to do so.

WHO SHOULD ATTEND?

Chief risk officers, senior risk professionals, capital management professionals and actuaries will all gain valuable insights from the workshops.

ATTENDANCE

Each half-day session has been designed so that delegates will benefit by attending either one. However, by attending both sessions delegates will acquire a richer and stronger grasp of the complexities of a risk culture. This will enable them to more effectively take part in shaping and maintaining the appropriate risk culture for their organisation.

LOCATIONS AND DATE

Sydney, CBD	10 December
Melbourne, CBD	12 December

FEES

Either half day: \$600 Full day: \$900

WORKSHOP LEADER

Dr. Hilary Lewis has spent more than 15 years training and mentoring executives on the cultures within their organisations. Her innovative design of courses, engaging delivery style and focus on pragmatic outcomes has enabled managers to deliver successful change management programmes on a variety of scales and within a range of organisations. After gaining industry interest for her research on developing a pragmatic approach to 'measuring' an organisation's risk culture, Hilary was the keynote speaker at the 13th Annual Risk Congress in London this year, as well as presenting papers to the 2012 Life Conference in Belgium and the Actuaries Institute 2013 ERM Seminar in Australia.

REGISTRATION

To register for this course, please contact Siobhan Galal at siobhan.galal@milliman.com or on +61 (0)2 8090 9105

IN-COMPANY TRAINING

If you would like a group of employees from your organisation to benefit from this training, please contact us for a specific program.

DETAILED TIMETABLE OF SESSIONS

RISK CULTURE I – HALF-DAY SESSION

9:00am – 9:30am	Session 1	What factors drive an organisation's culture?
9:30am – 10:00am	Session 2	What do the regulators mean by 'a sound' and 'an appropriate' risk culture?
10:00am – 10:30am	Session 3	Who influences a risk culture more – the leadership or the staff?
10:30am – 11:00am	Break	
11:00am – 11:30am	Session 4	Developing a risk culture profile through six cultural dimensions.
11:30am – 12:00pm	Session 5	Extracting value from a risk culture profile.
12:00pm – 12:30pm	Session 6	Understanding the maturity of a risk culture as 5 distinct phases.

RISK CULTURE II – HALF-DAY SESSION

1:30pm – 2:15pm	Session 7	Activities that pass a risk culture from one employee to another.
2:15pm – 3:00pm	Session 8	Connecting a risk culture to risk strategy and risk appetite.
3:00pm – 3:30pm	Break	
3:30pm – 4:15pm	Session 9	Techniques that create an appropriate and balanced risk culture capable of adaptation and maturity.
4:15pm – 5:00pm	Session 10	Pulling it all together in the risk management framework.

ABOUT MILLIMAN

Milliman is among the world's largest providers of actuarial and related products and services. The firm has consulting practices in healthcare, property & casualty insurance, life insurance and financial services, and employee benefits. Founded in 1947, Milliman is an independent firm with offices in major cities around the globe.

LEARN MORE

Go to:
milliman.com/EnterpriseRiskManagement
milliman.com

CONTACT INFORMATION

For further information on ERM, feel free to contact your local Milliman consultant or:

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This leaflet is designed to keep readers abreast of current developments, but it is not intended to be a comprehensive statement of the law and no liability for errors of fact or opinions contained herein is accepted. Please take professional advice before applying this to your particular circumstances.