RISKPOST

2018 - EDITION 1
February 2018

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A WORD FROM THE CHAIR...

As the first edition of RiskPost for 2018 arrives, 2017 is already becoming a distant memory. It is a time of change as we start recruitment to replace our outgoing Executive Officer Tim Jago, who is moving on to other challenges.

The annual Management Board elections are underway and having served for six years, Deputy Chair Brian Potter will stand down at the end of February 2018. Please join me in passing on sincere thanks for his help and support throughout this period.

The Management Board is continuing to look for ways to increase member value and benefits. In addition to the lunchtime seminar programme which commences on 6 March 2018 we are planning a risk practitioner day (title to be decided) later in the year.

A WORD FROM THE CHAIR…

RiskNZ is seeking access to more risk-related publications and articles to inform members about the latest risk related thinking. In this edition you will find links to the Risk Maps for 2018 by Control Risks who supported last year's RiskNZ Conference. The maps make interesting reading and could also prove useful when planning overseas travel and holidays in foreign climes.

If you read any articles or publications which you believe would be beneficial to the wider membership, please let us know (including as much information as possible). We will try to get permission to publish, or to provide links on the RiskNZ website and in RiskPost. As always, we would greatly appreciate articles from members on risk related topics and their experiences in this field.

For me, the two most interesting developments this year are the soon-to-be-issued, revised ISO 31000 Risk Management Standard, and the myriad short and long-term challenges and practical responses to climate change. While it is still debated by some, recent weather extremes and sea level changes across the world leave me to believe that we are past the time for debate and should now be focussing on clearly understanding and acting to manage this complex risk.

I hope this year is successful and rewarding for all RiskNZ members and I hope that I will have the opportunity to meet and talk with many of you at RiskNZ events during the year.

NIGEL TOMS – *Chair, RiskNZ*

RiskNZ gratefully acknowledges the support of our premier sponsors JLT and SAI Global

FROM THE EDITOR

SALLY PULLEY - *RiskNZ Management Board Member*

Welcome to the first edition of RiskPost for 2018, and to the new Editor.

I am following in the footsteps of Miles and Geraint who have each implemented changes in the layout and formulation of RiskPost.

I need to thank Miles for his assistance as I 'pick up the reins' of RiskPost, and Geraint for collating some content.

There will be four Editions of RiskPost in 2018. The intent is to include a variety of articles and content that not only provide reference materials, but will also be thought provoking, and perhaps trigger new thinking. You may agree with articles and opinion pieces, or you may not. Your feedback is welcomed.

In this edition we have introduced some long reads, which have sunk to the back of RiskPost. Please let me know if you consider that these articles are too long.

As the Convenor of Conference 2017 I must thank RiskNZ's principal sponsors JLT and SAI Global for their support in developing the Conference, and their ongoing support to RiskNZ. The Conference theme 'Repositioning Risk Management' was chosen because change is now a constant in our lives and work places, and risk practitioners must adapt and evolve in order to keep abreast of change and to remain effective.

One particular area of thinking RiskPost will explore is Risk and Opportunity. RiskNZ has received questions about how people and organisations should discuss the effect(s) of uncertainty on objectives in ways that allow opportunities to be identified, and managed to advantage. Different approaches appear to be in play; with some approaches working well, and others not so well.

Two questions to be answered are; what guidance material is available, and are there lessons that can be shared? For those wanting to contribute thoughtful and insightful pieces on this topic – this is your chance.

CALL FOR CONTRIBUTIONS

RiskPost Edition 2 will be published before the AGM, with Editions 3 and 4 being published circa August and November.

During the year, RiskNZ will issue a reminder email prior to each Edition, including the cut-off date for the submission of articles.

As always, RiskNZ is waiting to hear from any member with insights into risk management, whether that be their own or reflecting on what others have written or said.

✉ *Please send me an email: editor@risknz.org.nz*

RISKNZ STANDARDS UPDATE

KRISTIN HOSKIN - *RiskNZ Management Board Member*

Recent activities on the Standards front include that comments on *IEC/ISO 31010 Risk Management - Risk Assessment Techniques* are due in by 16 February.

Paul Dickenson has previously advised RiskNZ members of this via RiskNZ email of 19 January: **Draft IEC31010 Risk Assessment standard**.

Discussion of comments received will take place in April before it goes to Final Draft International Standard (FDIS). This document is a technical revision and will replace the 2009 (first) edition. You can contact Paul in the first instance, or myself for further information.

For those members with interests on both sides of the Tasman, Round 16 of Standard's Australia Project Prioritisation and Selection Process opens on 5 February. Information on proposing a standard to Standards Australia is available on their website.

The OB-007 Risk Management Committee met on 13-14 November in ACT. At the meeting a number of initiatives were progressed:

- Liaison between OB-007 Committee and SF-001 Safety Management Committee was advanced. Liaison with MB-025 Security, and QR-005 Dependability are also in place.
- *HB436 Risk Management Guidelines Companion to AS/NZS ISO 31000* was discussed with a project proposal expected in the latter half of 2018.
- Progress on the *AS/NZS 5050* project was discussed. *(HB 292 Guidance for managing disruption related risk* has been put on hold until completion of 5050).
- A new working group to develop a *Handbook for Guidance for implementing ISO 31000*. Australia has nominated two members to WG5 Management of Legal Risk. The project under this working group may replace *HB 296:2007* (which is being reconfirmed).
- A new terminology coordination group (TCG 1) has been formed.
- The third draft of *HB167 Security Related Risk Management* is likely to be presented to OB-007 in April (current version is 2006).
- *HB192 Guide for Managing Risk in Motor Sport* is up for consideration.
- *HB294: 2006 National post-border weed risk management protocol* is to be withdrawn.

The next OB-007 meeting is in Sydney on 22-23 February. I will be attending that meeting and will issue the next update on Standards after that.

Standards NZ is establishing a new development committee to identically adopt *ISO 45001 Occupational Health and Safety Management – Requirements with guidance for use*. The committee is likely to be confirmed in February. The formation of this committee comes out of the scoping workshop that I reported on last year.

If any member has an interest in a particular risk related standard, or Standards Australia/Standards New Zealand activity, and wants further information please do contact me at kristin@risknz.org.nz

THE WELLINGTON NETWORKING FORUM

The Wellington Networking Forum, also known as the Wellington Breakfast Meeting, allows for the risk related discussions to be wider and more abstracted than the usual operational, strategic, sector or business-related subjects.

The meetings are relaxed and collegial, and are a great environment for both experienced and newer risk practitioners to interact.

Please join us at the next Wellington Networking Forum. The discussion topic is:

'Challenges and ways forward for developing a mature risk management culture'

The meeting will be facilitated by Miles Crawford who finds this topic very interesting, especially the fragility of organisational risk maturity.

Developing a new work culture is challenging, let alone developing a risk management culture where the benefits are uncertain and often intangible.

Challenges in developing a mature risk management culture include: building engagement in a high turn-over environment, varying risk perceptions, and concentration on more salient business objectives. Considering this, the next Wellington Breakfast Networking Forum will focus on what other risk maturity challenges we face, and how we as risk managers have, or could overcome them to develop a more mature organisational risk management culture.

WHAT YOU NEED TO KNOW

DATE Wednesday 7 March 2018

TIME 8:00am - 9:00am (arrival at 7:59 for 8:05 start)

VENUE NZTA Head Office – entrances at 50 Victoria Street and also the arcade off Chews Lane (next to Habitual Fix). The glass doors open at 8:00am and reception is on Level 2

RSVP by sending an email to miles@risknz.org.nz by Friday 23 February 2018.

PLUS!

We are looking for a new bunch of facilitators with risk related topics. Your involvement is what has made this such a well-regarded networking forum, so volunteers please step up!

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RECENT PUBLICATIONS AND LINKS

(i) CONTROL RISKS

At Conference 2017 Carla Liedtke, Director, Control Risks provided an exclusive briefing on key issues to keep on your risk radar. RiskNZ is very pleased that Control Risks have now given permission to share some of the Control Risks' RiskMap links with our members.

The overall RiskMap 2018 content and analysis can be found at *www.controlrisks.com/riskmap-2018*

All of the maps for 2018 can be accessed through this page *www.controlrisks.com/riskmap-2018/maps*

(ii) THE MINISTERIAL REVIEW -

'BETTER RESPONSES TO NATURAL DISASTERS AND OTHER EMERGENCIES IN NEW ZEALAND'

The Ministerial Review is published by the Ministry of Civil Defence & Emergency Management (MCDEM), please click on link below:

https://www.dpmc.govt.nz/publications/ministerial-review-better-responses-natural-disaster-and-other-emergencies

REVIEW OF THE BETTER RESPONSES TO DISASTERS REPORT RELEASED

Jon (Mitch) Mitchell

The review report on opportunities to improve New Zealand's ability to respond to larger-scale and more complex emergencies, appropriately referred to in the review as "disasters", was released by the Minister of Civil Defence, Kris Faafoi, on 18 January. The review marks the beginning of the most significant update of New Zealand's approach to disaster management since the Civil Defence Emergency Management Act (CDEM) 2002 replaced the outmoded 1983 Civil Defence Act, and attracted submissions from a wide range of response and stakeholder organisations, disaster response professionals, retired incident managers echoing a bygone are, and interested members of the public.

The events of the Port Hills fire and other emergencies have demonstrated that not all agencies have adequately bought into either the comprehensive, all-agencies, risk-based all-hazards intent of the CDEM Act or the New Zealand Coordinated Incident Management System (CIMS) 2nd edition, that the current understanding and application of the "lead agency model" needs review, and that there are opportunities to improve disaster management, coordination and leadership across all agencies.

Key recommendations made by the review are that:

- A "National Emergency Management Agency" be established, with power to direct and coordinate all agencies in readiness and disaster responses.
- The powers of Group and National Controllers to direct and control all responding agencies in declared emergencies be clarified and reaffirmed.

- Mayors retain the power to declare local emergencies.
- A new class of coordinated response be created as a "major incident", signalling the significance of an event to the public and responding organization, with the extraordinary powers available in a declare state of emergency.
- Strengthened CDEM Group-wide response arrangements be implements, particularly in multi-local authority CDEM Groups.
- Iwi be integrated into all aspects and levels of risk and emergency management.
- All emergency management staff roles, including Controllers, meet national professional development standards and accreditation.
- The lead agency model, and roles definitions within it, be reviewed, including ensuring that the statutory the overall control of all agencies in declared states of emergency sits with the respective Group or National Controller(s).
- A cadre of highly experienced and suitably competent disaster response management professionals, including intelligence analysis and strategic communications, be recruited into a cadre to act as "fly-in teams" to support responses at all levels.
- The New Zealand Coordinated Incident Management System (CIMS) 2nd edition be adopted, consistently trained for, and applied by all emergency response organisations.
- A fit-for-purpose 24/7 all-of-government National Crisis Management Centre, with monitoring, science-informed intelligence, alerting, and warning capabilities be established.

Minister Faafoi and his staff are now working with other key ministers and their staff on developing a plan of actions in response to the review's recommendations. Future RiskPost articles will explore the areas of the review most relevant to risk management and provide analysis of the proposals for implementation of the review to build better responses to disasters in the future.

Some of the actions are relatively easy to achieve and plans for their implementation are being developed now. Other though are more complex, intractable – particularly in relation to cultures within agencies involved, or more expensive.

More time will be required to develop actions in response to those recommendations, including putting together businesses for reallocation of multiple-agency funding and human resources or request for additional funding in future budgets.

JON (MITCH) MITCHELL

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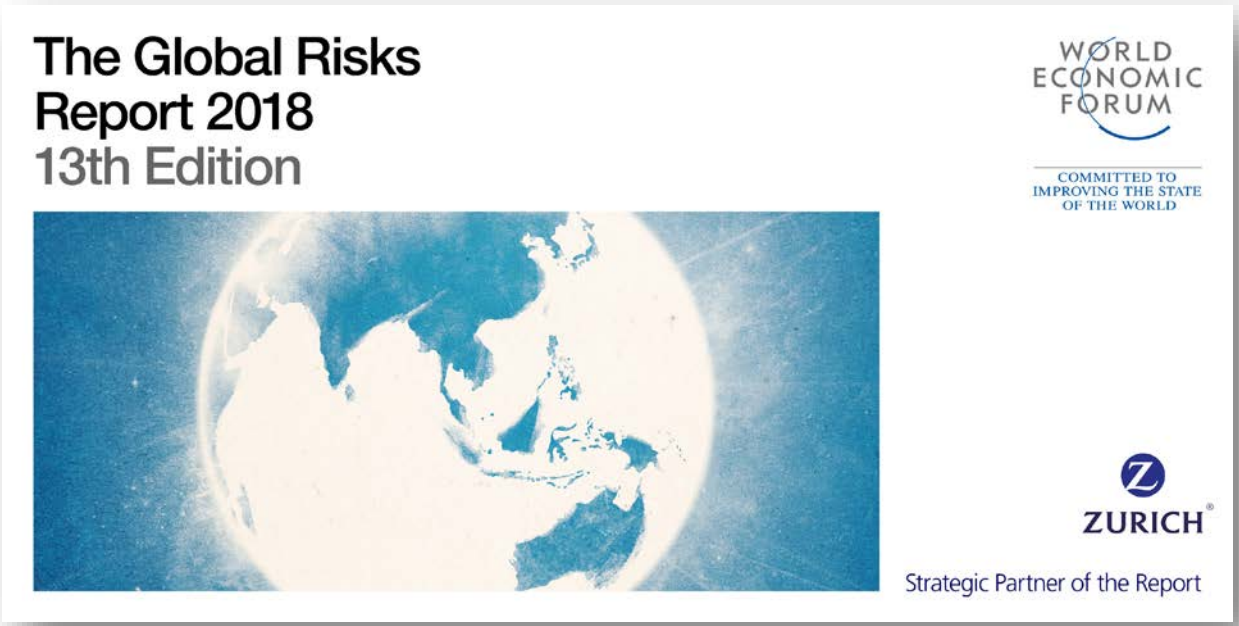
Programme Manager, Project AF8
Capability Development Advisor, Joint Centre for Disaster Research, Massey University-GNS Science
Programme Coordinator. CDEM Controller Development Programme
Former Manager and Alternate Group Controller, Canterbury CDM Group
Disaster risk and emergency management consultant

(iii) THE GLOBAL RISKS REPORT 2018 WORLD ECONOMIC FORUM

The World Economic Forum published the 13th edition of the Global Risks Report in January this year. The online report reader tool makes it easy for busy people to read the report as a series of small digestible pieces.

This year's report introduces three new series: Future Shocks, Hindsight and Risk Reassessment. See the Risk Reassessment page for insights about developments in the understanding of risk: Resilience in complex organizations, and Cognitive bias and risk management.

https://www.weforum.org/reports/the-global-risks-report-2018



RESEARCH EXCERPT - RISK MODELLING

MILES CRAWFORD - *RiskNZ Management Board Member*

Miles has been an emergency manager and risk manager for over fifteen years. He has been a member of RiskNZ for over ten years, is a past RiskPost editor and currently sits on the RiskNZ Management Board. Miles is completing a PhD on how risk informs policy and procedure within New Zealand local government – this article is an excerpt from a small part of his research.

RISK MODELLING AS A TOOL TO SUPPORT NATURAL HAZARD RISK MANAGEMENT IN NEW ZEALAND LOCAL GOVERNMENT

> *'Sometimes it does us a power of good to remind ourselves that we live ... where two tectonic plates meet, in a somewhat lonely stretch of windswept ocean just above the roaring forties. If you want drama – you've come to the right place' (Sir Geoffrey Palmer).*

New Zealand is an island nation in which events such as earthquake, volcanic activity, tsunami, flooding, storm, and landslide occur with sufficient intensity that substantial damage and loss of life results. Given the severity of natural hazard risks, it is an increasingly important focus for national and local government to ensure natural hazards are understood and managed effectively. However, local government understanding and management of natural hazard risk is fraught with challenges, including uncertainty over how natural hazards should be managed, scarce data on natural hazards, and limited appreciation of natural hazard risks. One option for hurdling these challenges is with the use of risk modelling. Many types of risk model are applied to different frameworks and guidance; however, this article focuses on how risk modelling is used as a software application, based on a risk assessment framework, to assess the consequences of a natural hazard event. Risk modelling is important for local government natural hazard risk management because understanding the impacts and consequences of a natural hazard event is an essential building block for community resilience.

Natural hazard risk modelling involves combining hazard impact scenarios with exposure data and vulnerability functions. The output is an estimate of loss, depicted in various ways including economic cost; human casualties or fatalities; building damage states; societal disruption; and other types of consequence given the severity of the hazard. Demand for natural hazard risk modelling has significantly increased over the last few decades. Researchers, policy-makers and practitioners across the world are increasingly using risk modelling to scope the consequences for hazard scenarios they know people are exposed to but have little historical information about. Three key benefits from risk modelling are:

1) A clearer overview of geographical concentrations of natural hazard risks, across different frequencies and magnitudes;
2) Quantification of potential physical damage, business interruption and casualties; and
3) Identification of key risk drivers.

As such, a clearer, more comprehensive picture of the uncertainties and consequences of natural hazards provides policy-makers and decision-makers with a better starting point to communicate and decide on how they manage the cost and benefits of risk reduction measures.

While the risk modelling process has been a focus of natural hazard science for many years, less consideration has gone into how practitioners perceive and apply such tools. A better understanding of how practitioners use and apply natural hazard risk models is important because it can then inform how these models are developed for greater usability, use, value and effectiveness. Considering this, focus group sessions were held with councils across New Zealand to understand how practitioners

perceive the use of risk modelling. Results show that practitioners are interested and engaged in its use, seeing beneficial outputs relating to:

- Communication to the public and decision-makers
- Real-time event response
- Contingency planning
- Generic plans such as land-use and civil defence plans
- Policy development such as Regional Policy Statements

Yet, while practitioners recognise a definite benefit for how natural hazard risk modelling can be used to better inform policy and procedure, it is not used. Risk modelling remains a 'nice-to-have' within New Zealand local government, occasionally being used by outside organisations contracted to local government. The practitioners listed a number of reasons for why this is the case, including:

1) A complicated legislative environment for natural hazard risk management combined with limited guidance from central government, resulting in confusion over which council role leads on understanding and applying natural hazard risk management.
2) Limited organisational understanding and application of risk management frameworks outside of strategic planning and asset management functions.
3) A tenuous connection between science and policy for developing knowledge-informed policy and procedure, driven by a haphazard structure for internal and external scientific advice, limited information dissemination and information management, differing time-frames between research and practice, conflicts of interest between organisations, and deprecation of the value of social science.
4) Uncertainty over the benefits that would result from investing in risk modelling, especially in the local government environment where resource is spread thinly, and where decision-makers are constantly reacting to more urgent resource requirements.
5) Limited funding and capacity for natural hazard risk modelling, resulting in scarce natural hazard data, data in formats and resolutions that are not appropriate or collaborative, limited capability to develop vulnerability/fragility models, and limited ability to present useful results.

Given these challenges, establishing risk modelling within New Zealand local government can only happen through a greater appreciation of natural hazard risk, and greater value in risk management as a proactive framework for reducing the consequences of hazard events. I recommend the following options to help this be realised:

- Legislate greater mandate for how natural hazard risk management is achieved in New Zealand local government, with risk-based policy and clarity on which local government natural hazard role is the lead for the function.
- Enable greater capacity and capability building for collecting, managing and using natural hazard risk data so that it is well known, available, and usable, where its value is obvious to policy and decision-makers through collaborative risk modelling approaches.
- Support and enable the movement of knowledge for natural hazard risk management through the development of shared mental models via 'knowledge broker' roles that give greater connectivity, advocacy and significance to natural hazard management initiatives across different council roles.

In conclusion, given the severity of natural hazards in New Zealand, it is important for local government to be able to understand and manage them effectively. Risk modelling is a tool that can help support local government to do this through communicating natural hazard risk to better inform policy and procedure. However, research on the perception and use of risk modelling is scarce, and what has been researched sets out a challenging environment for its use in local government. Nevertheless, with mutual partnership and ongoing engagement across the science-policy interface, along with the recommendations listed above, the value of natural hazard risk management and risk modelling can be better appreciated. With risk modelling effectively used, local government natural hazard risk management policies will be better informed, enable better procedures, and result in better community resilience to natural hazards.

PAPER – CONSIDERING THE HUMAN FACTOR

RISK ANALYSIS FOR COMPLEX SYSTEMS WITH HUMAN FACTORS COMPONENT - A HUMAN–CENTERED FRAMEWORK

Cathy Hua, Geraint Bermingham (Navigatus Consulting)

Abstract

The consideration and assessment of risk often requires analysing complex systems where the human is an important component and the consequence of failure can be significant. The challenge of modelling and analysing these complex systems derives from the variability of the human factors and complexity of the relationships among system components or sub-systems and between the system and the environment. Such variability and system complexity are a challenge to many traditional risk management approaches, which are only suitable for simpler systems that have a stronger engineered or logical component and have limited interactions within and beyond the system boundaries. To effectively conduct risk analysis in complex systems where human factors are a component, a new human-centred system model was developed and used in a recent risk management project by Navigatus Consulting. This new model served as a framework for both guiding risk research design and analyses as well as presenting complex relationships at multiple system levels in a concise and focused manner. This article first introduces the rationale and development of human-centred system model on the basis of taxonomy of systems, followed by a demonstration of the application of such a new model in a recent risk management project. Future applications and expansions of this new model are also discussed.

Introduction

The first step in an effective risk-management process is to understand the context, and often, that of a known "problem". Although a description of the "problem" may be available, it may not initially correctly identify the true issue or source of risk. Many risk management studies involve systems with considerable scale and complexity, and/or human factors influence. However, traditional risk management approaches seldom distinguish one type of system from another. This article aims at drawing attention to the unique characteristics of many complex systems, and demonstrates a novel risk assessment framework designed for complex systems where there are strong human factors components.

The following sections first highlight the importance of defining the type of system and the problem. Then taxonomy of systems is introduced to provide conceptual criteria in differentiating different types of systems, especially System of Systems (SoS), and why these pose a challenge to traditional risk management approaches. Next, a novel risk assessment framework based on a recent project is presented. The future potential applications of such approach are further discussed in the conclusion.

The Concept of System of Systems (SoS)

The process of defining a problem within an organisational context is, by its nature, a case of modelling a problem-system and its context through identifying the processes and the elements relevant to that problem, and drawing interactions and boundaries to locate the core of the problem or its true cause. How a "problem-system" is defined and represented largely reflects the "world view" and assumptions of the things and mechanism relating to that problem, and how they should be considered and analysed. Such "problem-system" (often represented by a model) guide the subsequent information gathering and analyses, as well as exploration, development, and testing of solutions. Analyses built on a "problem-system" that fail to capture the correct boundary, relevant elements and relationships will not lead to a true understanding or solution no matter how reliable the associated analyses may be.

A system is an "organised whole in which parts are related together, which generates emergent properties and has some purpose" (Skyttner, 1995, p.58). However, when scoping a "problem-system", besides its parts and purpose, there are three distinctive features to consider:

1) A system may be open to the influence of its environment (physical, political, social, and organisational)? Along this line, there are "**Open Systems**" that interact with and/or are influenced by their environment (e.g., a public road system), versus "**Closed Systems**" that has no or little interaction with the environment (e.g., a turbo engine), (Gershenson & Heylighen, 2005).

2) With regard to the relationships among system components: There are "**Simple Systems**" that may have multiple components, but the relationships among components are more of a linear "action-reaction" fashion that is largely predictable, such as the classical examples in mechanical engineering or physics (e.g., an aircraft). To the contrary, there are "**Complex Systems**" with at least one non-linear relationship between at least one pair of components, and such systems are often Open Systems (Flood & Carson, 1993).

3) A system may be functionally independent by itself, or a complex "**System of Systems (SoS)**" that consists of many disperse and independent sub-systems. In a SoS, the sub-systems are usually developed together evolutionarily and form the "the whole is greater than the sum of its parts" effects in resourcing, performance, and emergent features such as system reliability. Furthermore, there are **simpler types of SoS** in which the sub-systems are developed together to achieve the same operation goal. This may include complex mechanical engineering systems such as nuclear plants, modern aircraft and spacecraft. This counter-intuitive "simplicity" comes from the fact that the inter-dependencies are designed in and understood. To the contrary, there is also **more complex SoS** in which each subsystem is not only independently functional but also has its own culture, value, process and goals (Dogan et al., 2011). Compared with other types of systems, this more complex SoS is in fact more frequently encountered and given the human and societal context, effectively omnipresent. It could be any area of activity such as an industry or sub-sector or endeavour with its multiple stakeholders, internal and external markets, economic and political environment. However, it is also this more complex type of SoS that poses challenge to many existing system models and tools used in risk management as discussed in the next section. Figure 1 below provides a simplified illustration of an airport as a complex SoS with different levels of sub-systems. Note that for simplicity, the external environment and broader social and political system is not included in this illustration.

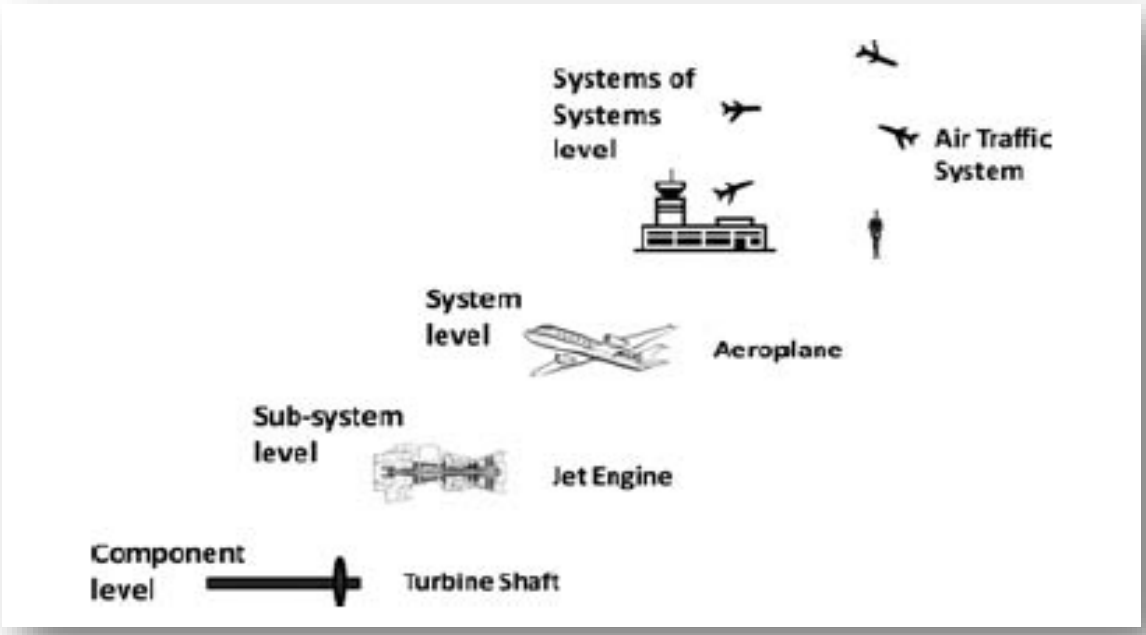


Figure 1. Simplified illustration of an airport as a System of Systems (SoS) with multiple levels (Source: Dogan et al., 2011)

Why some traditional risk analysis approaches may miss the point

With the classifications of systems in mind, it is valuable to look at what it means to the management of risk when facing a complex SoS.

Suppose you were asked to "identify and profile the key safety risks in the small commercial aircraft and helicopter air transport sector", how should the problem be defined?

Instead of seeking first to apply only the methodologies listed in such documents as AS/NZS HB436:2013 or AS/NZS HB 89:2013 (Standards Australia International & Standards New Zealand) or indeed most risk management handbooks, the nature of the system itself must first be examined. Checking against the system classifications mentioned above, it will became evident that the small commercial aircraft sector is a complex SoS comprised of a number of operators (companies) who are facing diverse business resourcing (funding, staffing, etc.), operational environments (location, routes, geographical and meteorological conditions), activity types (passenger transport, air ambulance, etc.), operation systems (air traffic control, pilot scheduling, management structures etc.) and a range of engineered systems (aircraft type, communication systems etc.); there are also the shared broader social and political environments, as well as various stakeholders (tourists, hospitals, regulators and regional and central government agencies). All these elements interact in different ways at different levels to create, essentially, a "mega-system". What exactly should be included in the information collection and analyses stages of a project to understand the risks? How should this large number of variations of system components and relationships be handled?

There are a number of ways to scope and describe such systems, but not all are helpful in setting the focus of analyses. An overly complex model that precisely captures all the elements and unique relationships for a complex SoS tends to be overwhelming for human information processing and is thus of limited value and hinders the analysis process. Using a series of traditional risk analysis approaches such as bow-tie analysis, risk matrix, and fault-tree analysis on sub-system components could probably capture some aspects of the SoS, but such tools are often developed based on the assumptions of closed and/or simple systems, and will thus miss both the non-linear relationships in open systems and the emergent property of the overarching SoS system that cannot be found in any component sub-system. One example of such emergent system property is the safety culture within an operator that together forms the overall sector safety culture; another example is a systematic flow of mid-career pilots from the sector into airlines that results in a sector-system-wide experience gap; while a third example is the influence of operators to each other in terms of market competition, benchmarking, and the existence or absence of collaboration that brought in synergy and more efficient learning and resourcing.

To be able to efficiently capture such a complex SoS while maintaining focus and conciseness to guide analysis, a different approach was developed and applied to both the small aircraft and commercial maritime sectors by Navigatus Consulting. The example described in the next section is that for the small aircraft and helicopter air transport sector. This sector is as defined under the Civil Aviation (CA) regulatory model as the "Part 135 sector".

A human-centred model for complex SoS

To effectively model complex SoS to guide research and analyses, the first step taken by Navigatus is to identify the core component that is directly related and most critical to the sectors' safety risks. Once such a core factor is identified, the other components and sub-systems and the multi-level relationships among them were assessed in relation to how they affect this core factor.

In the case of the small aircraft and helicopter air transport sector project, the next step was to identify the key safety risks and profile these – this was initially done on the basis of both aviation safety literature (e.g., Salas, 2010) and Navigatus' deep understanding of aviation safety. It was identified that the core factor for safety viewed from both sub-system level (e.g., single aircraft, single operation, single company) and SoS level (the overall Part 135 Sector) is invariably the 'single pilot'. That is, that in this sector, invariably there is a single pilot making decisions in near-time or real-time as s/he interacts with the environment and aircraft control system. In such a sub-system, the pilot as the direct human factor is both the key decision-making entity as well as the relatively less predictable and more variable internal component compared with the engineered elements. Thus, things in this SoS that will influence pilot decision-making and individual state for stable and reliable performance must be the key focus.

Based on the rationale above, a human-centred model demonstrated in Figure 2 below was initially developed. This working-model was established to serve as the framework of research and analysis, and was thus intentionally designed to be conceptually concise. The model demonstrates a focus on the pilot's decision-making and performance capability, around which influencing human-factors are identified at multiple levels: the first level is within the person; around cognitive state and decision-making capacity relating to multiple cognitive, psychological, and psycho-physical sub-systems, such as knowledge, experience, stress, attitude, motivation, and information and feedback. Then multiple sources external to the person that influence these sub-systems were hypothesised, such as pilot scheduling (that could influence pilot stress and fatigue), company safety culture (that could for example influence pilot attitudes), safety procedures and rules, and management decisions. Another example is information and feedback, which could come which could occur in the immediate real-time (seconds, minutes), medium-term (hours / days), or long-term (weeks, months years) from the operation system or other people in training or supervision to the pilots, but also include mechanisms that allow the pilots to provide feedback about issues, concerns, questions, and their performance. Therefore, sources of influence to a particular item in the pilot-centred core circle could come from sources existing at multiple levels across different sub-systems and over a range of time frames.

Once the sources of influence to the core factor were identified, these sources were classified along two dimensions: First, it makes practical sense to view the "sources of influence" as being within or outside the operator (company), as these are the immediate higher-level systems that provides unique operational environment and resource to the pilots. Such a dimension helps distinguish which influences are within an operator's control. Next, the aviation industry sector was considered as a second dimension, so as to both acknowledge the emergent qualities across operators and the interactions between sector-wide components, as well as distinguish influences that are within the sector's control versus those macro-level factors beyond the sector's control or influence. Along these two dimensions, the sub-systems of this Rule Part 135 SoS are classified into four groups shown in Figure 2.

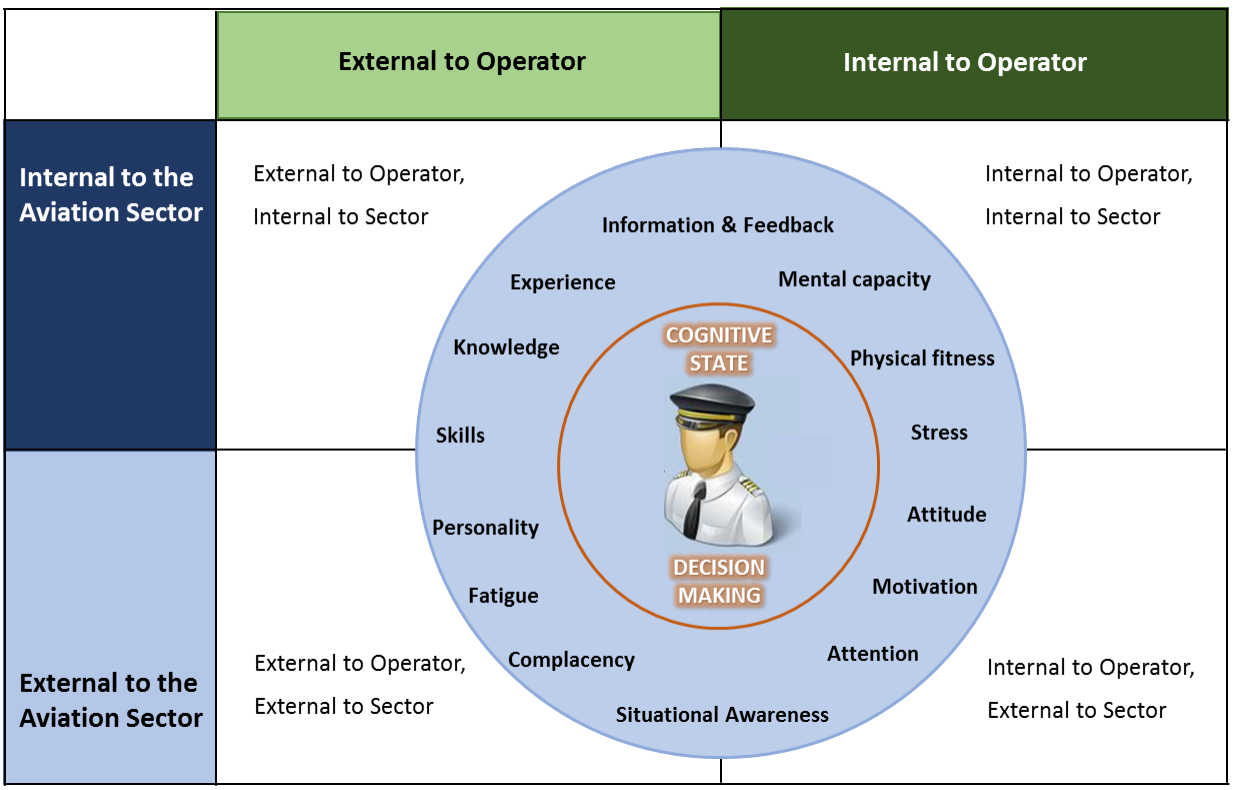


Figure 2. A Human-centred Model for aviator (Framework) (Source: Navigatus, 2015)

This human-centred model presented above served as the framework for guiding the task research design and information and data collection and analyses. Through workshops, interviews, site visits, operator and pilot survey, and incident data analysis, the model was further modified with added system components under each broad category described above to highlight some key relationships among components that were identified as critical to the sector's safety risks. For example, organisational safety culture, training provided at sector-level by training organisations, supervisions provided on the job within the organisation, and pilot outflow to big airlines were some of the key risk factors found. The source of each of such risk factor can be then located in the model in or across the corresponding quadrant(s).

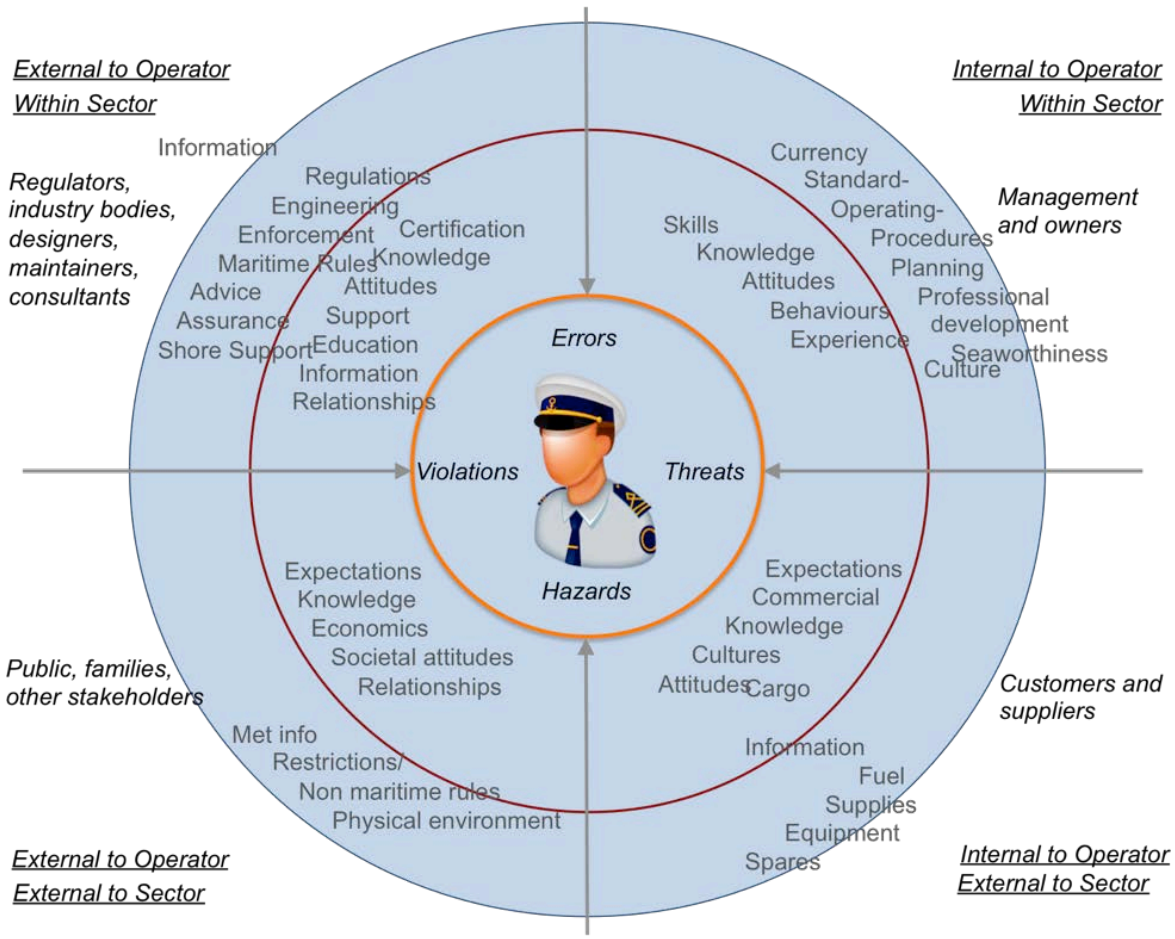


Figure 3. Modified Human-centred Model for mariner (Source: Navigatus, 2015)

Furthermore, this human-centred model also provided guidance in further listing the key risk factors into risk statements in accordance to 1) their influence to safety; 2) their strength of influence on the core safety factor (the pilot / master). These two dimensions together provided a 3 x 4 matrix comprising of the following categories (Navigatus, 2015). The Model was similarly developed for a subsequent application in the maritime sector (Figure 3). The context is both different and yet similar. In this case the central agent is the vessel master and the variables possibly strongly influenced by interaction with the vessel's bridge team.

Safety-shaping Contexts:

- **Operational context** – this includes factors that influence the pilot's / master's capacity for operations and decision-making from within the immediate operational context. (e.g. pressure to fly, communication, and pilots' skills and experience).
- **Operators/Organisations** – this category refers to factors that exist within a particular operator or within the relevant sector that could influence the immediate operational context

mentioned above. e.g. organisational culture, organisational decisions, sector-wide pilot / master experience and supply, and the sector's adoption of standards.

- **External to operators** – this category includes factors from outside the operator or the sector but that influence the organisational and sector safety-shaping context. (e.g. Rules, regulator-sector relationship, and institutional clients / customers).

Immediacy of influence:

- **Direct (D)** – factors that have direct influence on the specified safety-shaping context.
- **Proximal-indirect (P)** – factors that have relatively indirect and often non-immediate influence on the specified safety-shaping context.
- **Distal-indirect (R)** – factors that often influence a specified safety-shaping context further removed as an influence than the proximal-indirect factors.
- **Safety improvement opportunity (O)** – factors that were not raised as a risk, but are considered as potential leverages that could support improvement in safety performance.

Figure 4 below demonstrates the revised aviation model with sources of influences identified and classified according to the dimensions described above. The letters D, P, R, or O before each coloured item in the model correspond to the "Immediacy of Influence" classifications described above. The full model and more detailed risk statements can be found in the original report available on the CAA website: http://www.caa.govt.nz/assets/legacy/Safety_Reports/srp_part_135.pdf

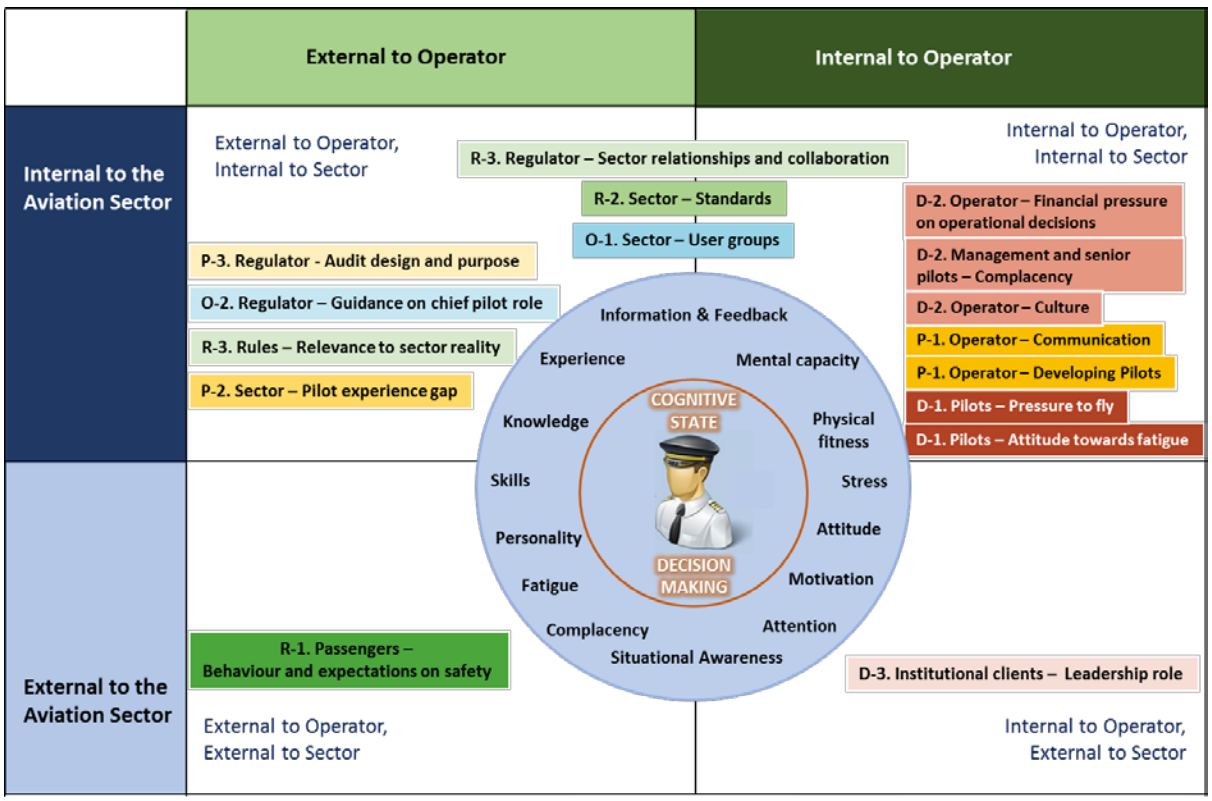


Figure 4. Final Human-centred Model for Part 135 Sector Risk as research output (Source: Navigatus, 2015)

A similar figure – as applied to the New Zealand commercial maritime as referenced at: https://www.safety4sea.com/nz-coastal-navigation-safety-review/

Conclusion

This paper describes an approach to understanding risks within a system-wide problem within a complex SoS that involves extensive sub-system variations and strong human factors components. The complexity, the emergent properties that cannot be found in any sub-system, and the large number of non-linear relationships of the SoS often pose a challenge to traditional risk management approaches that are more appropriate for closed simple systems. The identification of the core of the problem-system and human factors allowed a focused yet multi-level perspective to re-structure the understanding of the components and relationships in this complex SoS. This thus allows factors that could not be found in sub-system-level such as the leadership role of institutional clients, the sector-wide pilot experience gap, and the potential use of sector user group to be fully considered.

Similar system-modelling approaches and frameworks as described in the previous section could have wide application in guiding risk management for other complex SoS with a strong human factors component, such as maritime, finance, investment, health care, and land transport systems. Depending on the objective of problem solving and the feature of the SoS, the core factor may not necessarily have to be human, but human factors should always be considered due to its natural fallibility and human beings' key role in many SoS. In some cases where there are multiple persons involved, it is more effective to view the human within the SoS by core processes, such as the logistic and resourcing components in a complex production chain comprised of many suppliers, manufacturers, and sellers.

The key learning from this work is the value of understanding the feature of the system, while retaining focused and relevant to the objective of problem solving. Such idea is presented as part of our drive to add value to the ever-evolving world and develop methodologies to overcome the limitations of existing approaches and continuously learning from other disciplines such as system engineering and ergonomics.

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MY THOUGHTS – REMOTE WORKER RISK

THE RISK ASSESSMENT - HELP OR HINDERANCE

Cameron Smith (Protect Your Risk)

The killing of a Property Manager, and her daughter, and injury to a third person while making a routine inspection and repair of a rental property, highlights an often-overlooked health and safety risk, the risk to people who work alone or remotely.

This was seemingly, a routine visit, yet in hindsight, there were numerous signs this was a visit that should probably not have taken place – or not in the way it did. What do we now know about this tragic but, in all likelihood, preventable, event?

The tenant and killer, was a "loner", known by the Police to possess and use firearms (unlicensed), prone to aggressive behaviour and bouts of paranoia (that had become more prevalent over the recent weeks), had a previous conviction for stabbing a police officer numerous times with a hunting knife and, recently had an altercation with his landlord.

On the positive side, cell phone coverage in the Mt Tiger Road area, according to both the Spark and Vodafone websites, is good and the visit was conducted during daylight hours.

Among a number of other obligations imposed on principals by the Health and Safety at Work Act 2015, is a requirement to "to gain an understanding of the nature of the operations of the business or undertaking of the PCBU and generally of the hazards and risks associated with those operations" (Section 44 4 (b)) or perhaps more simply, carry out a risk assessment.

A remote or lone worker risk assessment should consider these factors:

- The risks associated with the person that is the subject of the visit, including any known behaviours or criminal convictions. Let's call this is the *subject person risk".*
- The risks associated with both the specific address and the general location, including the remoteness of the location and the presence of dogs, drugs or gangs. Let's call this the *address and location risk.*
- Any risk that might arise from the nature of the visit, such as the specific reason for the visit (is the subject person aware of the visit?), specific hazards, such as the presence of hazardous substances and cell phone coverage. Let's call this the *visit risk.*
- Any risk that might be attributed to the competency and/or qualifications of the employee or contractor who are tasked with undertaking the visit. Let's call this the *employee or contractor risk.*
- And finally, the extent to which the presence of other people might increase the likelihood of exposing the employee(s) or contractor(s) to an increased level of risk. Let's call this the *other people risk.*

So, what should, or in this case, would, such a risk assessment report?

- Firstly, it should identify all the risks associated with the visit and apply a risk rating. I like the general methodology described by AS/NZS436:2013 where each risk is given both a Likelihood and Impact rating.

- Secondly, having identified the risks, the assessment should determine whether or not there is a safe work procedure (such as a SOP or SWMS) in place to manage those risks and, if so, how good is that procedure when "scored" against "a good practice" document?
- Next, is there evidence that any safe work procedure is documented, complied with and, most importantly, understood by the employee(s) or contractor(s) conducting the visit.
- And finally, was there any previous adverse risk history from prior visits and, if so, the likelihood that it might re-occur?

I don't think that it matters whether a risk assessment is either qualitative or quantitative (although I have a preference for assessing risk quantitatively), you will arrive at the inevitable conclusion that this is visit that, knowing what we now know, should never have taken place without risk mitigations being put in place. Applying a generic risk 5x5 matrix much as set out in AS/NZS436:2013, this was a visit that had a total 'risk score' approaching the maximum of 25.

		Impact				
Likelihood		**Insignificant 1**	**Minor 2**	**Moderate 3**	**Major 4**	**Catastrophic 5**
Almost Certain	**5**					**[25]**
Likely	**4**					
Possible	**3**					
Unlikely	**2**					
Rare	**1**					

And, if you apply the criteria set down in Section 22 of the Health and Safety at Work Act that requires a principal to take "reasonably practicable" steps to ensure the safety of workers and other persons, you will very quickly reach the same conclusion that any reasonable risk assessment, if undertaken with a full understanding of the risk factors, would have reached.

That is why we carry out risk assessments.

CAMERON SMITH – *Protect Your Risk*

Cameron Smith is the Principal Developer and Designer of the methodology that forms the basis of the Omni Risk assessment software that currently includes health and safety, anti-money laundering, integrity (fraud, bribery, corruption and governance) and IT/Cyber security risk assessments.

The Omni Risk Off-Site Risk Assessment has been specifically developed for organisations that have an exposure to remote or lone worker risk. The Omni Risk Off-Site Assessment links, electronically, to the BODYGUARD mobile phone remote worker safety application (app) supplied by Alarm NZ. Information about the date, time, duration of and location of the off-site visit is automatically transmitted from the risk assessment to the application that, in turn, establishes a geo-fence (normally set to 50 metres) around the address. The BODYGUARD app is fully monitored thus ensuring the safety of employees and contractors at all times.

RISKNZ INFORMATION

THE MANAGEMENT BOARD AND OFFICERS OF RISKNZ ARE

Chair:	Nigel Toms	Secretary:	Jim Harknett
Deputy Chair:	Brian Potter	Treasurer:	Gary Taylor
Executive Officer:	Vacant	Administration Officer:	Meg Jennings

Management Board Members:

Miles Crawford
Jane Rollin
Kristin Hoskin
Sally Pulley
Stephen Hunt

INTRODUCING OUR SECRETARY

Please congratulate our new Secretary, Jim Harknett. Jim was co-opted to the Management Board in 2017 as Acting Secretary. In December 2017 RiskNZ called for nominations to the 2018-19 RiskNZ Management Board. Jim was nominated for the Secretary role, and has been elected unopposed. He is confirmed as Secretary to the RiskNZ Management Board from 1 March 2017.

JIM HARKNETT

I have been self-employed offering contract and consulting services in risk and governance to a range of clients from the very small to the very large since 2012. Previously I held two executive team roles, Chief Risk Officer and Company Secretary, for Ports of Auckland. I worked in the port for 23 years.

I enjoy both disciplines of governance and risk; in particular the governance of risk - helping Boards and Chief Executives develop pragmatic frameworks, policy and processes that enhance focus and support the achievement of strategy.

I have been a member of RiskNZ for around 10 years. Last year I was asked to help out on the Management Board in a governance role. That provided me with an opportunity to see if I could contribute to RiskNZ in the longer term. So, I put my name in the hat and have been elected as Secretary.

I am married to Ruth. We have three twenty-somethings – currently all back in NZ. We enjoy eating good food with friends and family, and walking the dog.

INFORMATION FOR CONTRIBUTERS

In 2018 three further editions of RiskPost will be published; in late April/early May (before the AGM), August, and November.

RiskNZ strongly encourages all members to contribute items for this newsletter on practices, developments or issues in your particular area of risk management. Contributions should be sent to editor@risknz.org.nz. Articles are welcome at any time; please contact the editor if you wish to discuss an article. As a reminder, the editor will issue a call for articles for each Edition.

RiskPost provides a service for the display of notices and advertisements that are aligned with RiskNZ's objectives. Members are welcome to submit notices and advertising material to RiskNZ. Notices may describe an activity or service, or advertise a risk management vacancy. Notices should not exceed 150 words of plain text, inclusive of all contact and reference details.

Advertisements can be included in RiskPost and delivered by email to the RiskNZ membership base. RiskNZ's charges for advertising in RiskPost and by email vary dependent upon membership status, and the nature and scale of the advertisement.

For further details on RiskNZ's submissions of notices, advertising, and relevant changes, please send an email to the Administration Officer: adminofficer@risknz.org.nz, or contact the editor.

RiskNZ
PO Box 5890
Wellington 6140

Membership of RiskNZ is open to any person of good character or an organisation engaged in or with an interest in the practice, study, teaching or application of risk management. RiskNZ is keen to attract a wide range of Individual and Corporate members representing all the different aspects of risk management knowledge and practice. This includes those with direct involvement in the field and those with a personal or community interest.

Apply online at http://www.risknz.org.nz/join-risknz/

RISKNZ WELCOMES NEW MEMBERS

RiskNZ welcomes the following new Members for this financial year...

Corporate Members:

- Department of Conservation
- Road Transport Logistics Ltd

Individual Members:

- Ally Rutherford, Desert Road Project Management
- Amber Mander, Risk & Operations Consultant, 2AM Ltd
- Andre Chatfield, Hamilton City Council
- Annabel Davies, Risk, Regulatory, Stakeholder Manager, Trustpower Ltd
- Averil Rodgers, Strategy Development Analyst, Southland District Council
- Chloe Gallagher, PWC
- Chris Standing, Risk Engineer, Aon NZ
- Geoff Comber, General Manager, Nova Systems NZ
- Kathrine Crowley, Risk & Compliance Manager, Port Taranaki Ltd
- Meredith Lowe, Retired
- Mukhlis Ismail, Self-employed
- Nathan Gordon, Health and Safety Advisor, Te Aho o Te Kura Pounamu
- Nathan Hight, Managing Director, Hight Strategy & Risk Ltd
- Nicholas Hill, Risk Advisor & Special Projects, Canterbury & West Coast
- Regan Smith, Risk and Corporate Manager, Hastings District Council
- Richard Moore, Beca
- Ryan O'Rourke, Emergency Management Team Leader, Selwyn District Council
- Steve Hart, Health and Safety Advisor, Napier Port
- Sue Paul, Principal, Robinson Bowmaker Paul
- Sue Trezise, Sue-lutions Ltd