Meeting of the Advisory Board of Cambridge Centre for Risk Studies
Thursday 23 January 2014

Meeting Summary and Executive Team Action Items

Executive Summary

2014 marks the fifth year of operation of the Cambridge Centre of Risk Studies, with a growing set of research activities. The meeting of the Advisory Board reviewed progress to date and discussed the prioritization of future research objectives. The Centre's strategy embraces engagement, research, and academic output. A future goal of the Centre is to build a sustainable programme on the order of £1 million a year to fund approximately 12 FTE researchers and supporting infrastructure.

The Centre will focus on the areas that are currently distinguishing it from other researchers in the field, through its multi-disciplinary focus on the economic and social consequences of complex risks, and risk management by practitioners. An objective for the Centre is to demonstrate the impact of its research through adoption of its outputs by the communities it serves. Much of the research being pursued is capable of generating high quality peer-reviewed publications if focused on areas of network risks, risk management processes, and overviews of the global risk landscape.

Five main research themes were reviewed and prioritised as the global complex risk landscape, understanding complex business exposure, financial catastrophe risk, supply chain, and cyber risk.

Attendance:

Executive Team, Centre for Risk Studies
Dr Andrew Coburn, Director of the External Advisory Board, Cambridge Centre for Risk Studies and Senior Vice President, RMS
Professor Danny Ralph, Academic Director, Cambridge Centre for Risk Studies
Dr Michelle Tuveson, Executive Director, Cambridge Centre for Risk Studies
Simon Ruffle, Director of Technology Research, Cambridge Centre for Risk Studies

Members of Advisory Board
Phil Brice, Corporate Risk Manager, Treasury, BP
Dr Mike Maran, Chief Science Officer, Catlin
Marco Moretti, Associate Principal, McKinsey & Company
Peter Nakada, Managing Director, RMS
Professor Tso-Chien Pan, Professor and Executive Director, Institute of Catastrophe Risk Management, Nanyang Technological University, Singapore
Dr Rainer Sachs, Head of Group Accumulation and Emerging Risks, Munich Re
Dr Paul Sanderson, Deputy Head, Economic Performance and Environment, Economic and Social Research Council
Matthew Swibel, Director, Corporate Sustainability, Lockheed Martin
Dickie Whitaker, Director, Financial Services Knowledge Transfer Network

Academic Advisors and Guest Attendees
Andrew Freeman, Risk Fellow, Cambridge Centre for Risk Studies & Managing Director, Cambridge Research Associates Ltd
Professor Stelios Kavadias, Director of Research, Judge Business School, and Margaret Thatcher Professor of Enterprise Studies in Innovation & Growth
Professor Frank Kelly, Professor of the Mathematics of Systems, Statistical Laboratory, University of Cambridge, and Master of Christ's College
Professor Edmond Lo, Deputy Director, Institute of Catastrophe Risk Management, Nanyang Technological University, Singapore and Associate Professor, School of Civil and Environmental Engineering
Professor John Rees, Risk Research Coordinator, UK Research Councils (RCUK)
Professor David Spiegelhalter, Winton Professor for the Public Understanding of Risk, University of Cambridge

Apologies
Alan Smith, Global Head of Risk Strategy and Chief of Staff, Global Risk, HSBC
Lord Professor John Eatwell, President of Queens' College, Cambridge and Emeritus Professor of Financial Policy, University of Cambridge
Dr. Dougal Goodman, Chief Executive of The Foundation for Science and Technology

Strategy and Centre Positioning

The first session of the meeting reviewed the strategy of development of the Centre for Risk Studies, over the past five years and considered the appropriate strategy that it should pursue over the next several years. It reviewed the balance between the three spheres of interest: engagement, research, and academic output.

The Centre has retained its initial conceptual vision for a Centre based in the University's business school that can provide thought leadership around the risk of catastrophic failure in complex systems, applied to multi-disciplinary problems in the business world. The current focus on research activity is largely addressing issues of business impact identified by industry supporters, but is intended to generate high quality academic output in the next few years.

The early years of Centre activity focussed on engagement, mainly with larger corporate businesses through various meetings including annual Risk Summit conferences. This attracted industry supporters who have funded a growing research programme. The Centre seeks to build a sustainable programme on the order of £1 million a year to fund approximately 12 FTE researchers and supporting infrastructure.

The projected invoiced income in 2014 should enable the Centre to achieve about two-thirds of that target, depending on final budget and on accounting for previous year commitments.

Strategies for further fundraising to meet the target, including applying for research council underpinning funding at this stage, were briefly discussed, but the focus of the meeting was on research priorities.

The Executive Team will make final resource allocations in the light of budget actuals. The Advisory Board recommendations provide indicative prioritisations for research, and these discussions largely excluded considerations of resources, with the understanding that some of the desirable recommendations of the Advisory Board may not be able to be executed with the resources available.

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Academic prestige vs impact

Debate ranged around the relative prioritisation and tensions between these three spheres of interest, notably balancing the needs to produce outputs of academic prestige with demonstrable impact of research. i.e. how much effort to devote to producing high quality peer-reviewed publications which are valued by the University and which drive the academic careers of the research team, relative to applying resources to addressing identifiable industry applications and that can be shown to have impact in influencing business decision-makers.

The academic advisors at the meeting suggested the feasibility of producing one or two very high quality publications of broad scientific interest in a generalist scientific journal. They also stressed the value of targeting publications in management journals, and that the topics of network risks and the global risk landscape were promising topics currently being pursued at the Centre. Work that showcases the collective efforts of the multidisciplinary team at the Centre has value and the Centre holds the capability of generating papers of importance to the field.

Action Items: The Executive Team of the Centre for Risk Studies will continue to aim for prestigious publications and will prioritize resources to produce a small number of focussed high-quality publications of broad scientific interest, exploring one or more of the suggested themes around complex risk and network resilience, for example 'the 1-in-100 of the 1-in-100s'; Correlated impact on multiple networks from a catastrophic event; Consideration of the full range of threats from the taxonomy and their cumulative and interactive consequences.

Distinguishing the Cambridge Centre for Risk Studies

There was significant discussion about the distinguishing characteristics of the Cambridge Centre for Risk Studies. The Research Councils currently support 33 different 'Risk Centres' in the UK, and there are many other risk research centres internationally. The advisory board recommended reinforcing current areas where the Centre is distinguishing itself from others. This includes a holistic approach to risk via the Taxonomy of Threats, and focus on extreme risks and catastrophic failures, network analytics, and the approach to developing frameworks to examine complex risk problems.

Advisors felt that the Centre is beginning to distinguish itself in a number of ways:

- as a multi-disciplinary research group taking a holistic view of systemic shock issues, developing frameworks and approaches, in contrast to focussing on a detailed specialisation in a particular silo of risk.
- developing techniques for estimating the societal consequences of shocks, such as macroeconomic effects and market impacts, rather just direct losses.
- having a practitioner focus on risk management in corporate business, in comparison with other risk research groups that have a policy or regulatory focus.
- as a curator of network databases that directly relate to the 'exposure' of the global economy, including macroeconomic systems, the infrastructure of the economy, and financial relationships.

Action items: The Executive Team of the Centre for Risk Studies will embrace and reinforce these areas that distinguish the Centre from other research groups. In the resourcing of the research activities, we will prioritize activities that emphasise our distinctive contribution to the analysis of risk.

In the engagement with sponsors, and the communities that we serve, we will promote these elements of our work as a defining characteristic of our approach and brand.

We will explore the potential of becoming an authoritative and independent repository of datasets on the 'exposure' of the global economy.

Communities and adoption

Advisors also observed that the Centre for Risk Studies had attracted interest from distinct communities in the business world, as represented by the sponsors and companies represented at the advisory board meeting. Representation spans global corporations from different sectors. They include: the insurance-related communities, banking and financial services, technology and information services, and energy services . These communities have very specific and different needs from each other – and there would be more value in exploring the distinctive needs of particular communities than assuming that all businesses have the same needs.

The Centre for Risk Studies needs to demonstrate that its research has impact and this is most demonstrable if it can be shown that companies are adopting output from the Centre. Adoption will be faster if the outputs are geared to the needs of specific communities. Advisors urged the Centre to identify the communities with the most impact potential, to work to understand the needs of that specific community, and to drive adoption of the Centre's outputs more deeply into that community. If the Centre could 'own' a community by demonstrating broad adoption there, this would be a significant achievement that would enable expansion to other communities. We were challenged to set target objectives for adoption in key communities over the next several years.

BP urged the Centre to develop more of a community in commodities and energy producers by adding supporters from that sector.

Action Items: The Executive Team of the Centre for Risk Studies will focus resources and effort on driving adoption of outputs from the Centre by specific communities, beginning with those that are already heavily engaged – the insurance and financial services communities, and expanding the communities of global corporations in the sectors where we have support.

We will seek to achieve broad adoption in our key communities over the next several years.

The Centre will endeavour to strengthen the partnership with BP such that engagement opportunities can be pursued with BP and other companies working in the energy services sector to build a community that can represent the risk management concerns of commodities and energy producers.

Engagement and meetings strategy

The meeting discussed the strategy for future engagement by the Centre. The Centre for Risk Studies has pursued a very active programme of engagement by organizing frequent meetings for external participants: 15 external meetings in the past 12 months and 30 over the past three years. The Centre has hosted a wide variety of meetings and experimented with formats. These range from topic seminars, to moderated workshops, invited guest talks, executive education sessions, the Cambridge CRO Council dinner discussion meetings, Aspen Crisis and Risk Forum, through to the Risk Summit conferences.

These meetings are valuable in providing close contact with the business community and feedback on issues of importance to our supporter community. They are key to raising the profile of the Centre and generating the contacts that bring in supporters.

The organisation of events is a major resource commitment, and the Executive Team asked for guidance from the Advisory Board on their views of the most valuable elements of the commitment strategy. The Advisors felt that focused topic seminars and workshops were the most valuable.

The Centre's Risk Summit has developed a good reputation and is valued as an eclectic and thought-provoking event, and attracts flagship sponsorship. However, it is the most resource-intensive event that the Centre hosts and it has been difficult to maintain it as an annual event. The Advisors felt that having longer intervals between the Risk Summits would not diminish the reputation of these events, and recommended shifting the engagement strategy to give more emphasis on focused topic workshops which align particular subject matter with specific communities.

Action Items: The Executive team will prioritise topic seminars in the engagement strategy for the next few years.

After the 5th Risk Summit in June 2014, the Centre will explore restructuring the Risk Summit conferences to balance the resources and the interests of the Centre's sponsors.

Research Programme

The meeting then reviewed the research programme of the Centre for Risk Studies and commented on the five individual research themes of interlinked activity proposed. Finally the advisors helped prioritise the resource allocation across these themes for the coming year.

Research Theme 1: Global Complex Risk Landscape

This research theme was defined as establishing a comprehensive taxonomy of future large scale threats, tracking 'Emerging Risks', and developing stress-test scenarios. The Centre has developed and published a taxonomy of threats which is receiving some attention. The Centre has found subject matter editors for around a dozen of the threats and has published threat monographs providing a standardised state-of-knowledge on each as a structure for developing stress test scenarios. In 2013

stress test scenarios were developed and their consequences assessed for four threats (geo-political conflict; pandemic; cyber-catastrophe; social unrest). This has entailed innovating a methodology for assessing the macroeconomic and investment portfolio consequences of these complex threats. These scenarios are currently being completed and written up for publication.

The advisors felt that this development of a framework for tackling the issue of complex risk was a valuable contribution, and that work should continue – the Centre should not assume that the taxonomy exercise was complete. Different communities are likely to have variants that they will need addressing if they are to adopt it more broadly.

The framework demonstrates that the range of potential threats is extremely broad. It would be useful to have content and a state-of-knowledge on a lot more of the threat categories, but this is clearly beyond the resources of the small research team of the Centre. To create scale and populate more of the framework, the Centre should consider outsourcing, partnering, and collaborating with other institutions that have expertise in the individual subject areas.

The advisors urged the research effort to keep focussed on management decision-making – to understand what managers can do about the risk and support and improve their actions.

Scenarios are a powerful way of communicating and using information about risk to improve decision-making, and the advisors recommended the team to develop a suite of different scenarios that will stress test management decision-making across a range of extreme circumstances. Scenarios should also contain sensitivity studies and help users understand uncertainties involved in their assessment. The probabilities of scenarios become more important once first-order risk management processes are in place, and ultimately it will be important to position each scenario within a probabilistic domain of extreme event likelihood, but this should not be a short-term objective of the Centre.

The Centre's Risk Framework could potentially be used by many businesses and sectors to assist with their risk management. It would be more useful to individual companies if other companies are also using a similar framework, so an important objective for the Centre is to get broader adoption. This will require getting consensus around data structure, standards, and best-practice approaches.

Action Items: The Executive Team will continue to explore the application of a broad taxonomy of threats to risk management decision-making by practitioners.

We will encourage a broader adoption of the approach, the framework and the taxonomy within target communities, through understanding their relevance to risk management actions, and developing a consensus around what kinds of standards will improve its usefulness.

We will seek to populate more of the framework with content around the individual threat types, and will partner with other researchers with expertise in individual subject areas.

We will continue to develop stress test scenarios and aim to achieve a suite of around a dozen scenarios within the next two years. In the next year the emphasis will be on endogenous financial crisis scenarios.

Research Theme 2: Understanding Complex Business Exposure

Research theme 2 is the compilation of network 'exposure' data on the interconnectivity of the economy, and exploring their propensity for and vulnerability to cascading failure in business relationships. Over the past few years, the Centre has collected data on macroeconomic trading relationships, banking networks, enterprises and their counterparties, and the physical infrastructure of trading, transportation and communications. This data has been an essential component of the analysis of the mechanisms and consequences of shocks.

Research theme 2 includes the development of the Centre's research website as an open-source web-based software platform to manage the framework and apply consistent data structures and analytical toolkits to the problem.

The Advisors encouraged the Centre to develop the area of network analysis, as the focus on business networks is a distinctive area of differentiation for the Centre. The examination of the networks themselves, and particularly the visualization of the networks provides interesting insights into the structure and vulnerability of the interrelationships.

Visualisation of networks is a relatively new field and there is interest from the general scientific publishers for strong images that provide insights into relationships and networks. The Centre could make a contribution to the science by developing further insights into complex risks and connectivity.

It would be useful to be able to assess the resiliency of a network using indices and metrics of connectivity that are well developed in network mathematics.

The Advisors discussed a variety of potential sources of data to add to this repository and that could provide good datasets for analysis. There was discussion about the potential for the Centre to become a repository for datasets of this type, and precedents from other centres that had taken on data repository roles for different types of data.

Providing tools and open-source access to the data structures and standardised scenarios, networks and models was a welcome objective, within the resource capability of the Centre.

Action Items: The Executive Team will continue to pursue the compilation and interpretation of network data for various components of the global economy, national macroeconomic relationships, the financial system, and business inter-relationships.

We will explore techniques for the visualisation of networks and investigate the analytics of assessing network resiliency and other attributes.

We will promote and publish insights into networks of complex business exposure.

We will explore the potential for the Centre to become a repository for data on the networks of the global economy.

Research Theme 3: Financial Catastrophe Risk

Research theme 3 is the application of the Cambridge Risk Framework to explore the risk of financial catastrophe, specifically the stability and potential for cascading failure and phase changes in financial networks. The past year has seen the initiation of this theme of research, applying the scenarios as exogenous financial shocks to banking networks and assessing market impacts on investment asset valuations. The initial stages of the financial catastrophe research have entailed a survey of leading opinion on the appropriate research agenda for the Centre for Risk Studies, the start of a compilation of a long-term historical catalogue of financial crises, and a review of models that simulate contagion in banking networks.

The Advisors noted that there are several other research institutions tackling systemic risk with significantly more resources than the Centre for Risk Studies and with a variety of different focusses. The majority of researchers working on systemic financial risk are focussed on regulatory measures to prevent future crises. However the proposed focus of the research of the Centre for Risk Studies on tail-risk management decisions by financial services practitioners is distinctive and could make a contribution to the field.

The Advisors noted that structural modelling of scenarios to assess how their impacts might flow through the macroeconomy and impact several different parts of the business of a major international

company was a valuable and distinctive approach, and has particular appeal to insurance companies managing the risk of underwriting losses combined with investment portfolio impacts.

It was noted that many financial risk managers tend to focus on lower levels of probability than the stress tests currently being explored by the Centre, with their attention more on the area of 1-in-10 than the 1-in-100 scenarios. Financial risk managers are likely to be more interested in a composite view of risk of many of the 1-in-100 scenarios, which on aggregate will have a shorter return period.

Financial risk managers are likely to be interested in network views of their own risk, particularly if network models and data can be compiled that give insights into the interlinkages of other counterparties in the larger financial community. Understanding differentiation and how some parts of the economy or asset classes are affected differently from others will be key to the usefulness of this research to practitioners.

Financial risk managers are used to stress test scenarios and tend to be more interested in endogenous shocks that the financial system creates for itself, rather than exogenous shocks from external events, and longer term macroeconomic trend scenarios.

Action items: The Executive Team will concentrate on the practitioner application of financial catastrophe risk, and follow research that has potential to provide value to financial services risk managers.

We will seek to compile network models and datasets that can provide insights into the counterparties of the broader financial community, and models that can assist with understanding the behaviour and impacts of shocks on that community.

We will add scenarios of endogenous financial shocks and macroeconomic trends to the suite of scenarios produced by the Centre, for use in financial catastrophe risk management, and identify effects and combined effects that might be experienced at shorter return periods.

Research Theme 4: Resilient International Supply Chains

Research theme 4 is the application of the Cambridge Risk Framework to the risk of catastrophic disruption to business supply chains. International supply chains have suffered from significant and unexpected shocks from various disruptive events in recent years, and corporate risk managers are seeking new approaches to assess risk of disruption. The Centre's framework provides a structure for assessing this risk, and this research theme is intended to build on the expertise of Judge Business School in operations research and supply chain management. Current research has defined metrics for loss, proposed methods of evaluating 'efficient resiliency', and is evaluating the benefits of strategic improvements to global supply chains and business relationships.

A specific focus of this work is proposed to be exploration of the insurability of supply chain risk – the interest of insurers in meeting a perceived demand by corporates but suggesting that better models and insights into this 'complex' risk would be needed to make this a viable market.

The Advisors discussed the issues of understanding supply chain risk, in particular identified the problems of obtaining detailed data on individual supply chains. They suggested that there might be more value in developing high-level views of business value flows, rather than detailed transportation models. They also suggested that generic configurations of supply chains, knowing where typical clusters of suppliers might be located, may be of more use than trying to track individual components of the supply chain. In general, there would be more value in not trying to track the detail, or develop a holistic model of a very complicated problem, but instead in assessing conceptual implications of contractual relationships, costs, and methods of doing business. It was felt that the Centre didn't need to develop expertise into the detail of supply chain operations, as there are other institutions that could be partnered with to add this if needed, but that the Centre could focus on the key risk management strategies and network relationships.

The Advisors suggested that some of the key value of this research theme could come from exploring strategies such as dual source suppliers or different types of contractual relationships that might require uninterruptable supply from a provider, and understanding what this would mean to the business relationship.

Action Items: The Executive Team will focus on the business value flows and high level strategic issues of supply chain risk.

We will use the insights from network analysis to explore the insurability of supply chain risk and the potential for and implications of improving the risk transfer market.

Research Theme 5: Understanding the threat of Cyber Catastrophe

Research Theme 5 is developing a more rigorous framework for the evaluation of extreme cyber risk, as one of the most significant threat classes in the taxonomy. Several of the supporters of the Centre have identified cyber catastrophe risk as a topic of interest to them and are supporting different elements of this research theme. Cyber risk is a very young science and has yet to formalise the various elements of a risk evaluation framework that are well established in the study of other types of catastrophe risk, such as magnitude scales, vulnerability metrics, historical catalogues, loss models etc. The Centre is proposing a risk evaluation framework for cyber catastrophe risk adapted from other types of catastrophe peril to explore the feasibility of improving cyber risk management.

The Advisors noted that there are many researchers currently investigating cyber risk – there are at least 17 different 'cyber risk' centres. Most of these researchers are concerned with technological techniques and security measures for reducing cyber risk. The Centre's distinct contribution could be to help develop a cost-benefit framework for the application of studies being done by others.

The Centre's approach in developing a cyber catastrophe scenario and assessing the broader societal and macroeconomic impacts of this is quite distinctive and could be a worthwhile contribution. Understanding the cyber economy and the interrelationships that underpin IT productivity is a useful and innovative approach.

Action Items: The Executive Team will focus on the overall framework of assessing the risk of cyber catastrophe, and adapt established techniques from other types of risks to this new peril.

The team will emphasise the broader consequences of a cyber catastrophe, and develop macroeconomic assessments of the impact of severe scenarios.

We will maintain a focus on understanding the cyber economy and the contribution of IT to complex business exposure.

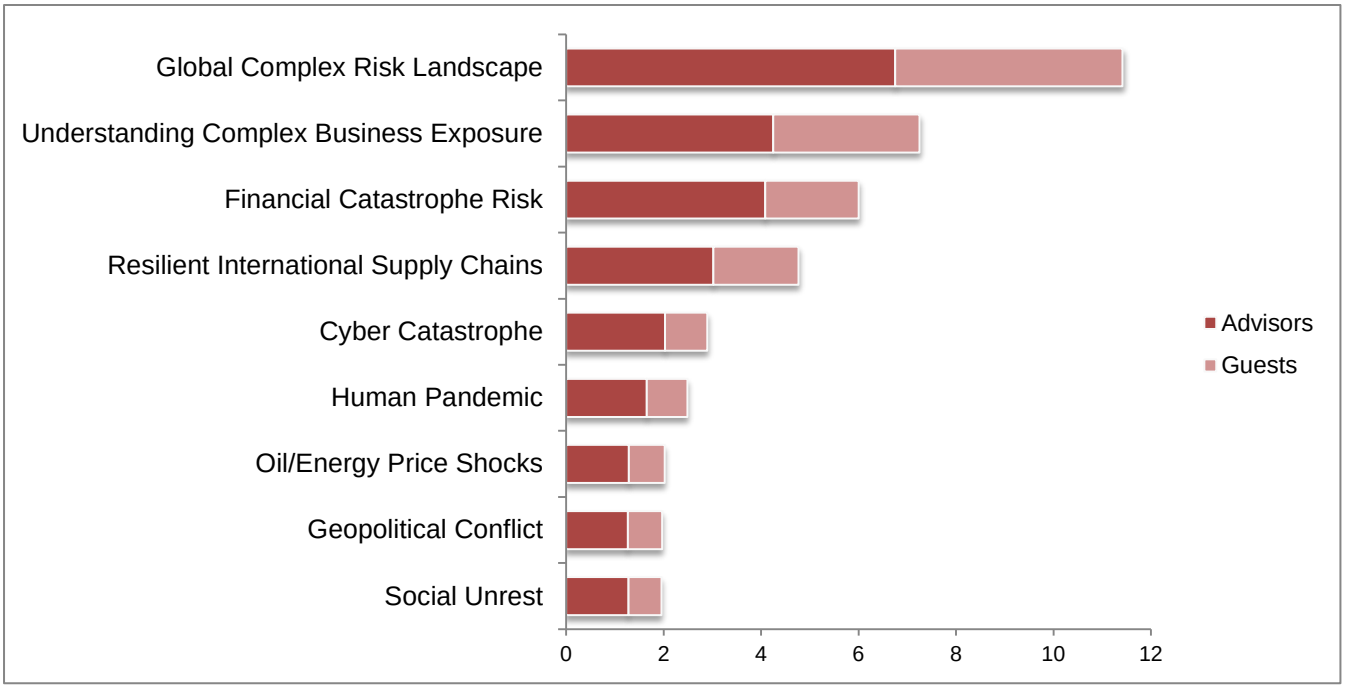
Prioritisation of Research Themes

The advisors were asked to provide their personal prioritisations for the research themes on a survey form. The survey form included the scenarios currently under development. A summary of the survey results is shown in the table and the chart below.

Advisors' survey feedback summary

		Number of 1sts (15 Advisors)	Number of 1sts, 2nds and 3rds (15 Advisors)	Weighted Score, Advisory Board (9 members)	Weighted Score Academic Advisors and Guests (6)	**Total Score (15 Advisors)**
Global Complex Risk Landscape	Establishing a comprehensive taxonomy of future 'complex risk' threats, stress-tests scenarios and assessing impacts.	6	13	6.8	4.7	**11.4**
Understanding Complex Business Exposure	Compilation of data on global economy, financial networks and supply chains. Analysis of networks and vulnerabilities.	1	11	4.3	3.0	**7.3**
Financial Catastrophe Risk	Using Framework to explore the stability and cascading failure in financial networks. Financial shock scenarios.	1	12	4.1	1.9	**6.0**
Resilient International Supply Chains	Business supplier relationships as complex risks: 'efficient resiliency', insurability of supply chain risk.	1	7	3.0	1.8	**4.8**
Understanding the Threat of Cyber Catastrophe	Developing a framework for evaluation of extreme cyber risk, as one of most significant threats in the taxonomy.	0	3	2.0	0.9	**2.9**

Advisors' weighted prioritisation of the Centre's research themes



Action Items: The Executive Team will align the research resources of the Centre to take this guidance into account, and reflect the prioritisation of the advisors in the allocation of resources to the research themes.

Since the advisory board meeting, the Executive Team have worked with the research team at the Centre to develop a detailed research project plan for the rest of the academic year that reflects some of this input. The individual researchers and participants will participate in tasks, so that the resources are allocated across the research themes to approximately reflect this prioritisation.